OFFICE OF THE TEXTILE COMMISSIONER

Final Report

Baseline survey of the technical textile industry in India

March 2009

ICRA Management Consulting Services Limited

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Executive Summary

The Office of the Textile Commissioner is the apex government body facilitating the holistic growth of India's diversified and broad based textile industry. Technical Textiles is expected to be a booming opportunity for developing economies in Asia both from a production perspective as well as consumption opportunities in a technologically evolving economy. Thus, Technical textiles holds significant potential in India and the government has already taken a few steps to promote this industry. However, in the absence of any authentic database for the industry in India, the Government is not able to make focused policy interventions for promoting the growth in production and consumption of technical textiles in the country.

Therefore, The Office of the Textile Commissioner wanted to undertake a baseline survey of the technical textile industry in India to assess the demand-supply scenario as well as interventions required to improve the level of technology, policies and regulations in this industry. The Office of the Textile Commissioner had appointed ICRA Management Consulting Services (IMaCS) to undertake this assignment.

The scope of IMaCS's engagement was to conduct baseline survey of technical textiles industry to assess the demand supply scenario of technical textiles products in India, prepare a directory of key producers, consumers, importers and exporters of technical textiles products and recommend key interventions required from the Government and other stakeholders in terms of policies & regulations.

Based on the agreed terms of reference IMaCS has carried out an assessment of technical textiles industry in India. IMaCS has collected data and information from various manufacturers, importers, exporters and end-users of tehnical textiles in India. For this purpose, IMaCS has conducted a nation-wide primary survey of around 3,000 units / respondents. Based on the survey responses, IMaCS determined the consumption pattern of various technical textiles products. On the basis of consumption patterns and the sizes of end-user industries, IMaCS has determined the domestic market sizes of technical textiles products in India. Further, IMaCS has determined the domestic market size projection of these technical textile products based on the expected growth rates of the end-user industries and expected shift in consumption pattern of technical textile products over the next 5 years (including expected shift to / from alternative materials). In cases where it was not possible to determine the market size with this approach, IMaCS has relied upon the industry survey and / or supply side assessment.

IMaCS has also assessed the imports and exports of technical textiles products in detail. IMaCS has conducted consignment-wise analysis of the imports and exports data of various technical textiles HS

codes to determine the imports and exports of these products. This approach was required because the technical textiles products are often imported / exported under various HS codes and several technical textiles products are imported / exported under the same HS codes. We have also looked at DGCIS imports and exports data in cases where these issues on account of HS codes were not applicable.

In addition, IMaCS has conducted detailed review of standards and testing requirements of technical textiles in other countries based on secondary research. We have also analysed the availability of raw-materials and machinery for the manufacture of technical textiles. We have relied upon the industry survey and discussions with machinery suppliers for this purpose.

IMaCS report on technical textiles is broadly divided into three volumes as follows:

Volume I :

Executive Summary

1. Recommendations
2. Products selected for focussed attention

Volume II : Market sizing of technical textiles in India

1. Project background
2. Technical Textile Industry – Domestic scenario and segment-wise consumption in India

Volume III : Raw-materials, machinery, standards, policies regulations and testing facilities

3. Non-woven sector of technical textiles
4. Competitive assessment of India vis-à-vis other countries
5. Raw materials for technical textiles
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8. Standards for Technical Textiles in other countries
9. Policies and regulations mandating and recommending the use of technical textile products

1. Technical Textiles Industry in India

Technical textiles are different from the conventional textiles. Unlike conventional textiles used traditionally for clothing or furnishing, technical textiles are used basically on account of their specific physical and functional properties and mostly by other user industries. Depending on the product characteristics, functional requirements and end-user applications the highly diversified range of technical textile products have been currently grouped into 12 categories based on application:

(i) Agrotech (Agriculture, horticulture and forestry)
(ii) Buildtech (building and construction)
(iii) Clothtech (technical components of shoes and clothing)
(iv) Geotech (geotextiles, civil engineering)
(v) Hometech (components of furniture, household textiles and floor coverings)
(vi) Indutech (filtration, cleaning and other industrial usage)
(vii) Meditech (hygiene and medical)
(viii) Mobiltech (automobiles, shipping, railways and aerospace)
(ix) Oekotech (environmental protection)
(x) Packtech (packaging)
(xi) Protech (personal and property protection)
(xii) Sporttech (sport and leisure)

The technical textiles industry has immense potential in the developing countries. Asia is now emerging as a powerhouse of both production as well as end-use consumption of technical textiles. China, Japan, Korea, Taiwan, other developing countries, particularly India, have great potential to make an impact in this industry in the coming decade. The demand for technical textiles will be boosted by the changing economic scenario in these countries. Considering its highly skilled and scientific/technical manpower and abundant availability of raw materials, India can emerge as a key player in the technical textiles industry.

Domestic Scenario of technical textiles in India

India currently consumes the products under all 12 categories, though not all of them are produced domestically. The percentage of indigenous production varies drastically across various products. India is a large producer of technical textiles products in Packtech, Clothtech, Hometech and Sportech segments, the products of which are primarily commodities.

Unlike the conventional textile industry in India which is highly export intensive, the technical textile industry is an import intensive industry. Many products like baby diapers, adult diapers, polypropylene spunbound fabric for disposables, wipes, protective clothing, hoses, webbings for seat belts, etc. are imported to a very large extent.

As mentioned earlier, the products with high production levels in India with substantial exports are typically commodity products and are not very R&D intensive. These products include flexible intermediate bulk containers (FIBCs), tarpaulins, jute carpet backing, hessian, fishnets, surgical dressings, crop covers, etc.

Size of the units manufacturing the products also varies to a large extent. There is significant number of small scale units manufacturing technical textile products; this segment is highly unorganised in nature. Although there are various large players present, the production of certain goods is still concentrated in the small scale segment like canvas tarpaulin, carpet backing, woven sacks, shoe laces, soft luggage, zip fasteners, stuffed toys, fabrication of awnings, canopies and blinds, etc.

There are a few Multi National Companies like Johnson & Johnson, Du Pont, Procter & Gamble, 3M, SKAPs, Kimberly Clark, etc. which are internationally very large players in technical textiles and have set up their units in India as well. There are some domestic players like SRF, Entremonde Polycoaters, Kusumgarh Corporates, Supreme Nonwovens Pvt. Ltd., Garware Wall Ropes, Century Enka, Techfab India Ltd., Ahlstrom, Pacific Non Woven, Vardhman, Unimin, etc which are also very large players in this industry.

Segment-wise consumption of technical textiles in India

The current size of technical textile consumption in India is estimated to be around Rs 37,100 crore. The overall technical textile industry in India is expected to grow at the rate of 11% year on year and reach a size of Rs 62,420 by the year 2012-13. The segment-wise estimates of consumption of technical textiles in India in the year 2007-08 and its forecasts for the year 2012-13 are given in the table below:

	Domestic Consumption (Rs crore)	
	2007-08 (E)	2012-13 (P)
Agrotech	487	709
Meditech	1,514	2,263
Mobiltech	3,158	5,145
Packtech	14,067	25,913

	Domestic Consumption (Rs crore)	
	2007-08 (E)	2012-13 (P)
Sportech	2,632	4,358
Buildtech	1,726	2,655
Clothtech	6,570	9,665
Hometech	3,191	5,300
Protech	1,259	2,021
Geotech	170	300
Oekotech*	68	160
Indutech	2,326	4,091
Total	37,100	62,420

**Oekeotech size has already been considered as a part of Geotech*

Source: IMaCS Analysis

The largest category in the technical textiles industry of India is Packtech which has around 38% share. The size of Packtech currently is around Rs 14,067 crore and is expected to grow at the rate of 13% year on year to reach a size of Rs 25,913 crore by 2012-13. Another very significant segment in the Indian technical textiles market is Clothtech, which has over 17% share of the technical textiles consumption. However, this segment is expected to register a growth of around 8% year on year and reach a size of Rs 9,665 crore by 2012-13.

Mobiltech and Hometech each has a share of around 8-9% in the total consumption and are expected to grow at 10-11% year on year for the next five years. Sportech which has a share of around 7% has above average growth potential of almost 11% year on year. It is expected to reach a size of Rs 4,358 crore by 2012-13.

Indutech which currently has only about 6% share of the total domestic technical textile consumption is expected to grow at 12% year on year for the next five years to reach a size of Rs 4,091 crore. Rest of the segments have shares of less than 5%.

Amongst the smaller segments, Protech has good growth potential. The current size of Protech is around Rs 1,259 crore and is expected to increase to almost Rs 2,021 crore by 2012-13 growing at over 9-10% year on year.

Oekotech size currently in India is very small only about Rs 68 crore, as its application is very low in India. However, over the next five years, this trend is expected to change and Oekotech is expected to reach a size of Rs 160 crore by the year 2012-13 growing at almost 19% y-o-y.

Buildtech, Meditech and Agrotech are expected to achieve a moderate growth in line with the economic growth at around 8%. Usage of Geotech is also far below its potential in India as there is lack of awareness about its advantages. The growth of Geotech, which has only about 0.5% share of consumption of technical textile in India, is dependent upon the Goverment regulations for its application and a strict supervision to ensure adequate use. The growth of this segment has been estimated at around 12%.

Hence, we can conclude that Protech, Oekotech, Sportech, Oekotech, Geotech and Packtech are the segments with the maximum growth potential. Packtech and Clothtech followed by Mobiltech and Hometech are the largest segments and the main drivers of growth for the technical textile industry (considering present size as well as expected growth rate). The overall technical textile industry in India is expected to grow at the rate of 11% year on year and reach a size of Rs 62,538 by the year 2012-13.

An overview of products in each of the 12 categories of technical textile products is given below:

Agrotech

Agrotech includes technical textile products used in agriculture, horticulture (incl. Floriculture), fisheries and forestry. The technical textile products covered under Agrotech are given below:-

- Shade-nets
- Mulch-mats
- Crop-covers
- Anti-hail nets and bird protection nets
- Fishing nets

Technical textiles consumption under Agrotech in India is estimated at around Rs 487 crore. Fishing nets constitute over 90% of the Agrotech technical textiles usage valued at Rs 442 crore in 2007-08 and are expected to grow at 5 % year on year.

National Horticulture Mission (NHM) has been actively promoting usage of Agrotech products in India through subsidies and annual plans for the states. NHM has included Agrotech products - shade-nets, mulch mats and greenhouses (greenhouse films are a part of greenhouses), anti-hail nets and bird protection nets under Protective cultivation in the state-wise Action plans. In addition, the XIth five year plan focuses on providing assistance in the hail prone states (like Jammu and Kashmir, Himachal, Uttar Pradesh and any other state which faces similar problem) for procuring anti-hail nets.

Shade nets account for around 6% of the Agrotech segment valued at Rs 28 crore and expected to grow at around 6% year on year.

Mulch mats are set to achieve a phenomenal growth in the next five years. In the XIth plan, the area expansion for mulching is envisaged as 1,00,000 hectare (Rs 150 crore in value terms) (*Source: Report of the Working Group on Horti culture, Plantation Crops and Organic Farming for the XI Five Year Plan (2007-12)*). The mulch mats market is expected to grow from Rs 12.6 crore in 2007-08 to Rs 98 crore by 2012-13.

NHM has included anti-hail nets / bird protection nets under Protective cultivation along with greenhouses, mulching and shade-nets. In the XIth plan, investments for anti-hail nets and bird-protection nets additional coverage have been targeted as 4,000 hectare. Hence, in value terms, the market size of the Anti-hail nets / bird protection nets market in India is expected to increase from Rs 4 crore in 2007-08 to around Rs 9.75 crore by 2012-13.

Overall, the domestic consumption of technical textiles under Agrotech is expected to increase from around Rs 487 crore in 2007-08 to around Rs 709 crore by 2012-13 growing at a CAGR of around 8%.

The total segment imports are Rs 12 crore and account for 2.5 % of the total domestic consumption. The exports are worth Rs 67 crore and account for around 12% of the total production.

Summary of the market-sizing for Agrotech

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
Shade-nets	**Quantity**	5,000 MT	-	2,200 MT	2,800 MT	3,747 MT	
	Value	Rs 45.5 crore	-	Rs 17.5 crore	Rs 28 crore	Rs 37.5 crore	Rs 31 crore
Mulch-mats	**Quantity**	1,050 MT	-	115 MT	900 MT	7,000 MT	
	Value	Rs 14.1 crore	-	Rs 1.5 crore	Rs 12.6 crore	Rs 98 crore	Rs 2.6 crore
Crop-covers	**Quantity**	1,000 MT	-	1,000 MT			

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
	Value	Rs 10 crore	-	Rs 10 crore	-	-	Rs 17.6 crore
Anti-hail/bird protection nets	Quantity	152.5 MT	-	17.5 MT	135 MT	325 MT	
	Value	Rs 4.5 crore	-	Rs 0.5 crore	Rs 4 crore	Rs 9.75 crore	Rs 0.9 crore
Fishing nets	Quantity	17,000 MT	675 MT	2,332 MT	15,343 MT	19,582 MT	
	Value	Rs 467.5 crore	Rs 11.6 crore	Rs 37 crore	Rs 442.1 crore	Rs 564 crore	Rs 49.5 crore
TOTAL	Quantity	**24,168 MT**	**675 MT**	**5,665 MT**	**19,178 MT**	**30,654 MT**	
	Value	**Rs 542 crore**	**Rs 12 crore**	**Rs 67 crore**	**Rs 487 crore**	**Rs 709 crore**	**Rs 102 crore**

Meditech

Meditech products include textile material used in hygiene, health and personal care as well as surgical applications. The Meditech products are available in woven, knitted and non-woven forms based on the area of application. Increasingly, synthetic fibre is being used in the production of these products.

The technical textile products covered under Meditech are as given below:-

- Baby diapers
- Incontinence diapers
- Sanitary napkin
- Surgical sutures
- Disposables
- Surgical dressing
- Contact lens
- Artificial implants

Technical textiles consumption under Meditech is estimated at around Rs 1,500 crore. The key Meditech product is surgical dressings which accounts for over 50% of the total technical textile consumption across Meditech segment. Surgical sutures account for around 21% of the total consumption followed by contact lenses and artificial implants with shares of around 12% and 8% respectively in the total consumption. The non-woven fabric in disposables accounts for 2% of the technical textile usage in Meditech segment and sanitary napkins account for 1.65%.

The artificial implants are primarily imported with around 15% share of domestic production in total usage. The non-woven fabric availability is limited in India and hence, the non-woven products such as baby diapers and adult diapers are primarily imported.

The domestic consumption of technical textiles under Meditech is expected to increase from around Rs 1,514 crore in 2007-08 to around Rs 2,263 crore by 2012-13.The demand for the Meditech products is dependent on the health and hygiene sector growth. In the medium term (next 5 years), the Meditech industry is expected to achieve growth at the rate of 8-9% year on year.

The type of fibre used varies based on the application. The synthetic fibres are steadily replacing natural fibres. However, most of products under Meditech (and related fibre) need sterilisation and should be non-carcinogenic and anti-allergen in nature.

The technical textiles usage in the Meditech products exported from India is around Rs 155 crore. The key products exported from India are surgical sutures and surgical dressings.

Summary of the market-sizing for Meditech

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
Baby Diapers	**Quantity**	-	350 million pieces approx.	-	350 million pieces approx.	500 million pieces approx.	
	Value	-	Rs 135 crore	-	Rs 135 crore	Rs 193 crore	-
Baby Diapers (TT component)*	**Quantity**	-	1,150 MT	-	1,150 MT	1,650 MT	
	Value	-	Rs 11.5 crore	-	Rs 11.5 crore	Rs 16.5 crore	-

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
Incontinence Diapers	**Quantity**	-	12.5 million pieces	-	12.5 million pieces	38.1 million pieces	
	Value	-	Rs 15 crore	-	Rs 15 crore	Rs 45.7 crore	-
Incontinence Diapers (TT component)*	**Quantity**	-	125 MT	-	125 MT	381 MT	
	Value	-	Rs 1.38 crore	-	Rs 1.38 crore	Rs 4.2 crore	-
Sanitary Napkins	**Quantity**	2,000 million pieces	250 million pieces	0.5 million pieces	2,250 million pieces	4,000 million pieces	
	Value	Rs 700 crore	Rs 40 crore	Rs 1 crore	Rs 739 crore	Rs 1,300 crore	Rs 1.1 crore
Sanitary Napkins (TT component)	**Quantity**				2,150 MT	3,800 MT	
	Value				Rs 25 crore	Rs 44 crore	-
Surgical Sutures	**Quantity**	4 – 4.25 million dozens	35 – 37 million meters	1.15 million dozens	4 – 4.5 million dozens	5 – 5.5 million dozens	
	Value	Rs 330 crore	Rs 36 crore	Rs 41 crore	Rs 325 crore	Rs 415 crore	Rs 72.3 crore
Surgical Disposables (TT fabric)	**Quantity**	300 MT	100 MT		890 MT	1446 MT	
	Value	Rs 33.95 crore	Rs 1.35 crore	Rs 3 crore	Rs 32.3 crore	Rs 61 crore	Rs 4.5 crore
Surgical Dressings	**Quantity**	-	-	-	-	-	
	Value	Rs 887 crore	Rs 31 crore	Rs 93 crore	Rs 825 crore	Rs 1,000 crore	Rs 150 crore

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
Contact Lenses	**Quantity**	-	5 – 6 million pairs	0.5 – 1 million pairs	5.2 million pairs	16.1 million pairs	
	Value	-	Rs 30 crore***	Rs 15 – 20 crore	Rs 179 crore	Rs 473 crore	-
Artificial Implants	**Quantity**						
	Value	Rs 17.5 crore	Rs 97.25 crore	-	Rs 114.75	Rs 249.1 crore	-
TOTAL	**Value**	**Rs 1,968 crore**	**Rs 552 crore#**	**Rs 156 crore**	**Rs 2,365 crore**	**Rs 3,737 crore**	**Rs 228 crore**
TOTAL (TT component)	**Value**	**Rs 1,268 crore**	**Rs 375 crore#**	**Rs 155 crore**	**Rs 1,514 crore**	**Rs 2,263 crore**	

** Baby diapers and Incontinence diapers are not manufactured in India; these products are imported, repackaged and sold in the Indian market*

*** Most of the fabric import is for caps, masks, etc and not for drapes. Hence, the share of imports is high in terms of volume but low in terms of value*

**** Though the market price of contact lens is over Rs 1000 per pair, the import price is very low leading to lower import value of contact lenses*

 # For contact lens, imports value equivalent to market value taken

Mobiltech

Mobiltech segment of technical textile products includes applications in automotive and automotive components (including aircrafts and railways). The Mobiltech products can be broadly classified into two categories – Visible components and Concealed components. The visible components include – seat upholstery, carpets, seat belts, headliners, etc. The concealed components include – Noise Vibration and Harness (NVH) components, tyre cords, liners, etc.

The technical textile products covered under mobiltech are as give below:-

- Nylon tyre cord
- Seat belt webbing

- Airbags
- Car body covers
- Seat upholstery/fabric
- Automotive carpets
- Headliners
- Insulation felts (NVH components)
- Sunvisors / sunblinds
- Helmets
- Airline disposables
- Webbings for aircrafts
- Aircraft upholstery
- Railways seating fabrics

Technical textiles consumption under Mobiltech is estimated at around Rs 3,158 crore. Nylon tyre cord accounts for over 60% of the total technical textile consumption in the segment followed by seat upholstery / fabric with a share of around 13%. Insulation felts and helmets have share of around 5-10% each in the total consumption.

The usage of technical textiles in tyres (Nylon tyre cords) is estimated as Rs 2,000 crore approx in 2007-08 which is expected to increase to Rs 2,425 crore by 2012-13. Around 40% of the demand for nylon tyre cord is met through imports. The potential market for seat belts webbing in 2012-13 is estimated at Rs. 22.1 crore up from Rs. 7.04 crore in 2007-08. The potential market for seat covers fabric / upholstery industry in 2012-13 is estimated at Rs. 868 crore up from Rs. 402 crore in 2007-08.

The potential market for insulation felt industry in 2012-13 is estimated at Rs. 494 crore up from Rs. 232 crore in 2007-08. The potential market for automotive interior carpet industry in 2012-13 is estimated at Rs. 290 crore up from Rs. 136 crore in 2007-08 while that for headliners is estimated at Rs. 59.3 crore in 2012-13 up from Rs. 28.7 crore in 2007-08. The potential market for sunvisors industry in 2012-13 is estimated at Rs. 154 crore up from Rs. 74 crore in 2007-08.

The potential market for aircraft disposables is estimated at Rs. 5.3 crore in 2012-13 up from Rs 2.65 crore in 2007-08 while that for aircraft webbings in 2012-13 is estimated at Rs. 5 crore up from Rs 2.5 crore in 2007-08 and aircraft upholstery is estimated at Rs. 0.9 crore in 2012-13 up from Rs 0.45 crore in

2007-08. The potential market for railways seat cover fabric in Railways in 2012-13 is estimated at Rs. 1.54 crore up from Rs 1.3 crore in 2007-08.

Overall, the domestic consumption of technical textiles under mobiltech is expected to increase from around Rs 3,158 crore in 2007-08 to around Rs 5,137 crore by 2012-13.The demand for the mobiltech products is dependent on the passenger cars and commercial vehicles sector growth. The passenger vehicles have grown at 13.4% y-o-y over the last five years while commercial vehicles have grown at 15.5% y-o-y. The passenger cars have grown at a CAGR of 13.8% y-o-y in the last 3 years while utility vehicles and multi-purpose vehicles have grown at 10.4% and 14.4% y-o-y respectively. The industry is expected to maintain similar growth levels over the next 5 years.

The maximum growth is expected in the airbags, seat belt webbings and helmets segment. The usage of these products is driven primarily by the road safety measures enforced by the government. The airbag modules are presently made available through imports. The usage of airbags module is expected to grow at around 25% year on year. Similarly, the helmets and webbings segment are expected to achieve a growth of around 25% y-o-y.

The other Mobiltech products with strong growth potential are - upholstery, automotive interior carpets, headliners and NVH components. The airlines disposables, airlines webbings and airlines seat covers / upholstery are also expected to grow at around 15% y-o-y.

Summary of the market-sizing for Mobiltech

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
Nylon tyre cord	**Quantity**	72,000 MT	47,500 MT	1,500 MT	118,000 MT	142,500 MT	
	Value	Rs 1,222 crore	Rs 800 crore	Rs 22 crore	Rs 2,000 crore	Rs 2,425 crore	Rs 29.5 crore
Seat belt webbing*	**Quantity**		6.25 million meters	-	10.56 million meters	21.3 million meters	-
	Value		Rs 7.75 crore	Rs 0.05 crore	Rs 7.04 crore	Rs 22.1 crore	-

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
Airbags (TT component)	**Quantity**	-	2.25 lakh nos.	-	2.25 lakh nos.	6.41 lakh nos.	-
	Value	-	Rs 12 crore	-	Rs 12 crore	Rs 35 crore	-
Car body covers	**Quantity**	1.04 lakh nos.	-	-	1.04 lakh nos.	2.1 lakh nos.	-
	Value	Rs 9 crore	-	-	Rs 9 crore	Rs 17.5 crore	-
Seat covers fabric / upholstery	**Quantity**	13.58 million meters	1.1 million meters	-	14.68 million meters	31.56 million meters	-
	Value	Rs 372 crore	Rs 30 crore	-	Rs 402 crore	Rs 868 crore	-
Automotive Interior carpets	**Quantity**	13.6 million sq. m.	-	-	13.6 million sq. m.	29 million sq. m.	-
	Value	Rs 136 crore	-	-	Rs 136 crore	Rs 290 crore	-
Headliners (TT component)	**Quantity**	4.16 million sq. m.	0.25 million sq. m.	-	4.41 million sq. m.	9.13 million sq. m.	-
	Value	Rs 27.18 crore	Rs 1.5 crore	-	Rs 28.68 crore	Rs 59.32 crore	-
Insulation felts	**Quantity**	22,500 MT	-	-	22,500 MT	48,000 MT	-
	Value	Rs 232 crore	-	-	Rs 232 crore	Rs 494 crore	-
Sunvisors / sunblinds	**Quantity**	4.03 million nos.	0.2 million nos.	-	4.23 million nos.	8.83 million nos.	-
	Value	Rs 70.52 crore	Rs 3.5 crore	0.02	Rs 74 crore	Rs 154 crore	-
Helmets	**Quantity**	16.7 million nos.	-	-	16.7 million nos.	27.6 million nos.	-
	Value	Rs 250 crore	-	-	Rs 250 crore	Rs 759 crore	-
Airlines disposables	**Quantity**	13 million nos.	3.9 million nos.	-	16.9 million nos.	33.8 million nos.	-

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
	Value	Rs 2.25 crore	Rs 0.4 crore	-	Rs 2.65 crore	Rs 5.3 crore	-
Webbings for aircrafts	Quantity	-	0.25 million meters	-	0.25 million meters	0.5 million meters	-
	Value	-	Rs 2.5 crore	-	Rs 2.5 crore	Rs 5 crore	-
Aircrafts upholstery	Quantity	-	5,000 meters	-	5,000 meters	10,000 meters	-
	Value	-	Rs 0.45 crore	-	Rs 0.45 crore	Rs 0.9 crore	-
TT usage in Railways	Quantity	0.43 million sq. m.	-	-	0.43 million sq. m.	0.51 million sq. m.	-
	Value	Rs 1.3 crore	-	-	Rs 1.3 crore	Rs 1.54 crore	-
TOTAL	Value	**Rs 2,322 crore**	**Rs 858 crore**	**Rs 22 crore**	**Rs 3,158 crore**	**Rs 5,145 crore**	**Rs 29.5 crore**

** Seat belt webbings estimate of domestic usage is excluding direct imports of seat belts by global auto OEMs; reduction in direct imports of seat belts is possible provided the manufacturing capacity of seat belt webbing and seat belts increases over the next five years*

Packtech

Packtech includes several flexible packing material made of textile used for packing various goods for industrial, agricultural, consumer and other goods. It ranges from polymer based bags used for industrial packing to jute based sacks used for packaging food grains and packaging used for tea. This packaging (excluding jute) is also referred to as flexible packaging materials.

The technical textile products covered under Packtech are as given below:-

- Polyolefin Woven Sacks (excluding FIBC)
- FIBC
- Leno bags

- Wrapping fabric
- Jute Hessian and Sacks (including Food grade jute bags)
- Soft luggage products (TT component)
- Tea-bags (filter paper)

Technical textiles consumption under Packtech is estimated at around Rs 14,067 crore. Woven sacks (excluding FIBC) account for around 50% of the technical textiles consumption under Packtech followed by Jute hessian and sacks (including Food grade jute bags) with around 30% share. FIBC and wrapping fabrics account for around 20% of the total usage. Usage of technical textiles in soft luggage products, leno bags and tea-bags is less than 5% of the total usage in Packtech.

Most of the demand for these products is satisfied by domestic production with imports of only around Rs 86 crore. Exports of Packtech products (technical textiles component) from India has been estimated as Rs 563 crore.

The domestic consumption of technical textiles under Packtech is expected to increase from around Rs 14,067 crore in 2007-08 to around Rs 25,913 crore by 2012-13.The demand for the packaging products is dependent on the industrial growth. In the medium term (next 5 years), the packaging industry is expected to achieve growth at the rate of 13% year on year. The polymer based segment containing products like woven sacks, FIBC, leno bags and wrapping fabric are expected to grow at a CAGR of 17% till 2012-13.

The maximum growth is expected in the FIBC segment which is used for bulk packaging segment. Use of FIBC will also increase with the increase in exports. The share of FIBC in the total Packtech market is expected to double over the next 5 years. Moreover, the Leno bags which are mainly used for packaging onion and potato are very effective medium for packaging and their application is expected to increase in the packaging of various other fruits and vegetables.

Another segment with high growth potential is the soft goods industry which has been growing at around 25%.

The usage of jute hessian and sacks is expected to decline marginally over the next 5 years. Due to the South Asian Free Trade Agreement (SAFTA), import of jute goods in India from Bangladesh has gone up considerably because of complete withdrawal of import duty effective from 1st January, 2008 which is posing a severe threat to Indian jute goods market. Moreover, there is a continuous threat from the substitute synthetic packaging industryit's the trend is shifting towards synthetic counterparts.

Summary of the market-sizing for Packtech

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
Polyolefin Woven Sacks (excluding FIBC)	**Quantity**	0.641 million MT	-	-	0.641 million MT	1.127 million MT	
	Value	Rs 6,725 crore	-	-	Rs 6,725 crore	Rs 12,950 crore	-
FIBC	**Quantity**	0.175 million MT	-	0.025 million MT	0.15 million MT	0.45 million MT	
	Value	Rs 1,750 crore	-	Rs 250 crore	Rs 1,500 crore	Rs 5,000 crore	Rs 441 crore
Leno bags	**Quantity**	5,400 MT			5,400 MT	10,800 MT	
	Value	Rs 57 crore	Rs 0.5 crore	Rs 0.5 crore	Rs 57 crore	Rs 125 crore	Rs 0.7 crore
Wrapping fabric	**Quantity**	0.128 million MT	-	-	0.128 million MT	0.256 million MT	
	Value	Rs 1,350 crore	-	-	Rs 1,350 crore	Rs 2,950 crore	-
Jute Hessian and Sacks (including Food grade jute bags)	**Quantity**	1.33 million MT	0.01 million MT	0.05 million MT	1.29 million MT	1.1 million MT	
	Value	Rs 4,325 crore	Rs 50 crore	Rs 300 crore	Rs 4,075 crore	Rs 3,947 crore	Rs 383 crore
Soft luggage products (TT component)	**Quantity**	11 million sq m	2.5 million sq m	1 million sq m	12.5 million sq m	38 million sq m	
	Value	Rs 142 crore	Rs 30 crore	Rs 12 crore	Rs 160 crore	Rs 500 crore	Rs 15.3 crore
Tea-bags filter paper	**Quantity**	7,100 MT	800 MT	-	7,900 MT	17,650 MT	
	Value	Rs 195 crore	Rs 5 crore	-	Rs 200 crore	Rs 441 crore	-
TOTAL	**Value**	**Rs 14,544 crore**	**Rs 86 crore**	**Rs 563 crore**	**Rs 14,067 crore**	**Rs 25,913 crore**	**Rs 840 crore**

Sportech

Sportech segment comprises of technical textile products used in sports and leisure. The technical textile products covered under Sportech are as give below:-

- Sports Composites
- Artificial turf
- Parachute Fabrics
- Ballooning fabrics
- Sail cloth
- Sleeping bags
- Sport nets
- Sport shoes components
- Tents
- Swimwear

The technical textiles usage in the Sportech segment is valued at Rs 2,632 crore in 2007-08.The sports footwear components account for around 85% of the total segment value followed by technical textiles usage in sports composites with around 11% share.

The sports footwear components are valued at Rs 2,250 crore and are expected to grow at around 11% y-o-y over the next 5 years. The technical textiles usage in sports composites is valued at Rs 293 crore. Sport composites include inflatable balls (footballs, volleyball, basketballs, etc), cricket protective equipments and boxing equipments. Around 30% of the sports composites are exported.

Artificial turfs are valued at Rs 26 crore and account for about 1% of the segment only. The artificial turfs are not manufactured in India and the demand is met through imports.

The usage of technical textiles in parachute fabrics, sleeping bags and hot air balloon fabrics is estimated as Rs 18.4 crore in 2007-08 which is expected to increase to Rs 28 crore by 2012-13. The consumption of sail cloth in India is negligible.

Sports nets, high performance swimwear and tents account for the remaining technical textiles consumption in Sportech with market size of Rs 5 crore, Rs 0.84 crore and Rs 39 crore respectively in 2007-08. India exports around 40% of its sports nets production and around 25% of its tents production. The usage of technical textiles in sports nets and tents is expected to increase to Rs 30 crore and Rs 49.8 crore respectively by 2012-13.

Overall, the usage of technical textiles in the Sportech segment is expected to increase from Rs 2,632 croire in 2007-08 to around Rs 4,358 crore by 2012-13, growing at a CAGR of just below 11%.

Summary of the market-sizing for Sportech

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
Sports composites (TT component)	**Quantity**	-	-	-	-	-	
	Value	Rs 455 crore	Rs 13 crore	Rs 175 crore	Rs 293 crore	Rs 410 crore	Rs 352 crore
Artificial turf	**Quantity**	-	140 MT	-	140 MT	280 MT	
	Value	-	Rs 26 crore	-	Rs 26 crore	Rs 52 crore	-
Parachute fabrics	**Quantity**		24,320 sq m		4 lakh meters	5 lakh meters	
	Value	Rs 7.4 crore	Rs 0.35 crore	Rs 1.5 crore	Rs 6.25 crore	Rs 7.75 crore	Rs 1.7 crore
Hot air balloons fabric	**Quantity**			-	7,000 sq m	10,000 sq m	
	Value	Rs 0.11 crore	Rs 0.07 crore	-	Rs 0.18 crore	Rs 0.25 crore	-
Sleeping bags	**Quantity**	2 lakh nos.	0.5 lakh nos.	6 lakh nos.	1.5 lakh nos.	2.5 lakh nos.	
	Value	Rs 27 crore	Rs 3 crore	Rs 18crore	Rs 12 crore	Rs 20 crore	Rs 20 crore

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
Sports Nets	**Quantity**		-	4 lakh nos.	80 MT	107 MT	
	Value	Rs 18 crore	-	Rs 13 crore	Rs 5 crore	Rs 6.7 crore	Rs 17.4 crore
Sports Footwear components	**Quantity**		1.8 million meters	-	166 million sq m	280 million sq m	
	Value	Rs 2,230 crore	Rs 20 crore	-	Rs 2,250 crore	Rs 3,810 crore	-
Sail cloth	**Quantity**	-	-	-	< 1 MT	< 1 MT	
	Value	-	-	-	< Rs 1 lakh	< Rs 1 lakh	-
Swimwear	**Quantity**		1.42 lakh pieces	24.47 lakh pieces	1050 pieces*	1350 pieces*	
	Value	Rs 60 crore	Rs 1.86 crore	Rs 54.62 crore	Rs 0.84 crore*	Rs 1.08 crore*	-
Tents	**Quantity**	2,125 MT	65 MT	640 MT	1,550 MT	1983 MT	
	Value	Rs 47 crore	Rs 3 crore	Rs 11 crore	Rs 39 crore	Rs 49.8 crore	Rs 12 crore
TOTAL	**Value**	**Rs 2,845 crore**	**Rs 67 crore**	**Rs 273 crore**	**Rs 2,632 crore**	**Rs 4,358 crore**	**Rs 403 crore**

** This size only constitutes of high performance swimwear market in India and not any fashion swimwear available in the market*

Buildtech

The Buildtech segment comprises of textiles or composite materials used in the construction of permanent and temporary buildings as well as structures. The products covered under Buildtech are given below:-

- Architectural membranes
- Hoardings & signages
- Cotton canvas Tarpaulins

- HDPE Tarpaulins
- Awnings & canopies
- Scaffolding nets
- Floor & wall coverings

The market size of the Buildtech segment has been estimated at Rs 1,726 crore. HDPE and Cotton canvas tarpaulins account for 65% of the Buildtech market size. The HDPE tarpaulins are valued at Rs 650 crore and account for around 40% of the segment share. HDPE Tarpaulins are likely to achieve growth rate in excess of 15% to reach Rs 1,330 crore by 2012-13.

The cotton canvas tarpaulin is the second largest product in this segment valued at Rs 457 crore with a share of around 25%. However, the demand of cotton canvas tarpaulins is expected to decline because of substitution by HDPE tarpaulins.

The Floor & wall coverings are rapidly growing technical textiles products accounting for around 25% of the segment value. They are estimated to grow at around 10% year on year from Rs 425 crore to Rs 685 crore.

The flex market (hoardings & signages) is estimated to grow from around 95 million square meters valued at Rs. 175 crore in 2007-08 to around 140 million square meters by 2012 –13 (growing at the rate of around 8% year on year) valued at Rs 258 crore.

Architectural membranes are expected to grow at a CAGR of 20% to reach a size of Rs 40 crore by 2012-13 from Rs 16 crore in 2007-08. Scaffolding nets and awnings and canopies account for the remaining Buildtech market with sizes of Rs 0.58 crore and Rs 2.25 crore respectively.

The Buildtech segment is estimated to grow at a CAGR of around 9% to Rs 2,655 crore by 2012-13.

Summary of the market-sizing for Buildtech

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
Architectural membranes	**Quantity**	1 million sq. m.	10 million meters	-	11 million sq. m.	27.5 million sq. m.	
	Value	Rs 1 crore	Rs 15 crore	-	Rs 16 crore	Rs 40 crore	-
Hoardings & signages	**Quantity**	4.5 million meters	90.5 million meters	-	95 million meters	140 million meters	
	Value	Rs 14 crore	Rs 161 crore	-	Rs 175 crore	Rs 258 crore	-
Cotton canvas Tarpaulins	**Quantity**	52 million sq m	9 million sq m	0.01 million sq m	61 million sq m	45 million sq m	
	Value	Rs 396 crore	Rs 66 crore	Rs 5 crore	Rs 457 crore	Rs 336 crore	Rs 5.5 crore
HDPE Tarpaulins	**Quantity**	70,000 MT	500-600 MT	400-500 MT	70,000 MT	1,13,000 MT	
	Value	Rs 650 crore	Rs 1.75 crore	Rs 1.25 crore	Rs 650 crore	Rs 1,330 crore	Rs 1.4 crore
Awnings & canopies	**Quantity**	0.134 million sq m	0.016 million sq m	-	0.15 million sq. m.	0.3 million sq. m.	
	Value	Rs 1.75 crore	Rs 0.5 crore	-	Rs 2.25 crore	Rs 4.5 crore	-
Scaffolding nets	**Quantity**	0.4 million sq m	-	-	0.4 million sq m	0.8 million sq m	
	Value	Rs 0.58 crore	-	-	Rs 0.58 crore	Rs 1.17 crore	-
Floor & wall coverings	**Quantity**	75 million sq m	7 million sq m	15 million sq m	67 million sq m	108 million sq m	
	Value	Rs 750 crore	Rs 100 crore	Rs 425 crore	Rs 425 crore	Rs 685 crore	Rs 570 crore
TOTAL	**Value**	**Rs 1,813 crore**	**Rs 344 crore**	**Rs 431 crore**	**Rs 1,726 crore**	**Rs 2,655 crore**	**Rs 577 crore**

Clothtech

The Clothtech segment of technical textiles comprises of all textile components used primarily in garment applications, which have some specific functional applications. These components are largely hidden, e.g. interlinings in shirts, sewing threads, shoe laces, labels, hook and loop fasteners (Velcro), etc. Various fabrics like umbrella cloth are also classified under the Clothtech segment.

The technical textile products covered under Clothtech are as give below:-

- Shoe laces
- Interlinings
- Zip Fasteners
- Elastic Narrow Fabrics (Tapes)
- Velcro
- Labels
- Umbrella Cloth
- Sewing Threads

Technical textiles consumption under Clothtech is estimated at around Rs 6,570 crore. Sewing threads alone account for around 60% of the technical textiles consumption under Clothtech followed by labels with around 19% share. Interlinings accounts for around 8% share, whereas elastic narrow fabric tapes have a share of almost 6%. Usage of technical textiles in shoe laces and zip fasteners is around 5% of total segmental usage. Velcro and umbrella cloth account for the remaining around 2% of the total usage in Clothtech.

The domestic consumption of technical textiles under Clothtech is expected to increase from around Rs 6,570 crore in 2007-08 to around Rs 9,665 crore by 2012-13.The demand for the clothtech products is dependent on the growth of the garment industry. In the medium term (next 5 years), the clothtech segment is expected to achieve growth at the rate of almost 8% year on year. Exports of Clothtech products (technical textiles component) from India are estimated as Rs 338 crore.

The maximum growth is expected in the Hook and loop fastener (Velcro) market. The share of Velcro in the total Clothtech market is expected to double over the next 5 years. With the high growth in the soft luggage industry, the consumption of zip fasteners is also expected to increase 12% year-on-year for the next five years. Elastic narrow tapes are also expected to have a healthy growth rate of over 11% year on year.

With the growth in the footwear industry, the growth in the consumption of shoe laces is also expected to be higher than the overall growth of Clothtech category. Demand for sewing threads is expected to be stable growing in line with the clothtech segment.

Moreover due to a slowdown in the garment exports from India, the growth in interlinings and labels is expected to be lower than other products of the clothtech category.

Most of the demand for these products is satisfied by domestic production with imports of only around Rs 400 crore. The umbrella cloth (taffeta) is 100% imported and not manufactured in India at all. Interlinings and narrow fabrics like elastics and Velcro also have imports over 15% of their domestic consumption.

Summary of the market-sizing for Clothtech

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
Shoe laces	**Quantity**			-	2540 MT	3400 MT	
	Value	Rs 195 crore	Rs 20 crore	-	Rs 215 crore	Rs 365 crore	-
Interlinings	**Quantity**	100 million meters	125 million meters	8 million meters	215 million meters	290 million meters	
	Value	Rs 440 crore	Rs 85 crore	Rs 8.5 crore	Rs 515 crore	Rs 700 crore	Rs 11.4 crore
Zip Fasteners (TT component)	**Quantity**	614 million meters	6 million meters	20 million meters	600 million meters	1050 million meters	
	Value	Rs 144.5 crore	Rs 7 crore	Rs 1.5 crore	Rs 150 crore	Rs 265 crore	Rs 1.7 crore
Elastic Narrow Fabrics (Tapes)	**Quantity**	830 million meters	111 million meters	110 million meters	830 million meters	1110 million meters	
	Value	Rs 455 crore	Rs 65 crore	Rs 155 crore	Rs 365 crore	Rs 625 crore	Rs 273 crore
Velcro	**Quantity**	155 million meters	20 million meters	8 million meters	165 million meters	300 million meters	

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
	Value	Rs 62 crore	Rs 9 crore	Rs 5.5 crore	Rs 65 crore	Rs 150 crore	Rs 9.7 crore
Labels	Quantity	17550 million pieces	1190 million pieces	175 million pieces	18560 million pieces	24840 million pieces	
	Value	Rs 1220 crore	Rs 85 crore	Rs 27crore	Rs 1280 crore	Rs 1710 crore	Rs 38 crore
Umbrella Cloth	Quantity	-	9 million sq meter	-	9 million sq meter	14 million sq meter	
	Value	-	Rs 80 crore	-	Rs 80 crore	Rs 120crore	-
Sewing Threads	Quantity	136990 MT	1860 MT	8845 MT	130,000 MT	191,000 MT	
	Value	Rs 3990 crore	Rs 50 crore	Rs 140 crore	Rs.3900 crore	Rs.5730 crore	Rs 226 crore
TOTAL	Value	**Rs 6,507 crore**	**Rs 401 crore**	**Rs 338 crore**	**Rs 6,570 crore**	**Rs 9,665 crore**	**Rs 550 crore**

Hometech

The Hometech segment of technical textiles comprises of the textile components used in household applications. These products range from blinds used in the houses to the filter products used in the vacuum cleaners. They are an important component in the mattress and pillows as well. They are made of both natural and synthetic fibres. For example, carpet backing cloth is made from jute as well synthetic fibres.

The technical textile products covered under Hometech are as give below:-

- Fiberfil
- Mattress and pillow components
- Carpet backing Cloth (Jute & Synthetic)
- Stuff Toys
- Blinds

- HVAC Filters
- Filter cloth for vacuum cleaners
- Nonwoven wipes
- Mosquito nets

Technical textiles consumption under Hometech is estimated at around Rs 3,200 crore in 2007-08. Fiberfil and pillow and mattress components together constitute over 50% of the technical textile usage under the Hometech segment followed by blinds with a share of around 20%, stuffed toys with a share of 13% and carpet backing cloth with around 9% share. The HVAC and vacuum filter fabrics and non woven wipes segments are very small and constitute less than 1% of the total Hometech segment.

Most of the demand for these products is satisfied by domestic production with imports of only around Rs 50 crore. But, in certain segments like nonwoven wipes, the percentage of imports is very high and the domestic production is low. Exports of Hometech products from India are very low except Fiberfil of which around 10% of the domestic consumption is exported. The exports of all the other products (excluding Fiberfil) are less than Rs 10 crore.

The domestic consumption of technical textiles under Hometech is expected to increase from around Rs 3,191 crore in 2007-08 to around Rs 5,300 crore by 2012-13. The demand for the hometech products depends on the growth of the disposable incomes. In the medium term (next 5 years), the hometech segment is expected to achieve growth at the rate of almost 11% year on year.

The stuffed toys segment is expected to grow at around 20% y-o-y over the next 5 years. The HVAC filters are another segment which is expected to have a growth of over 20% y-o-y. With the increase in commercial infrastructure (office buildings) and the real estate development the consumption of blinds is also expected to increase drastically.

Non-woven wipes is one of the key applications of non-wovens in Hometech segment. Though the market for non-woven wipes is quite small, the segment has high growth potential over the next 5 years. The market for nonwoven wipes is estimated at 1.8 million square meters valued at Rs 10 crore and is expected to double over the next 5 years.

Fiberfil and carpet backing fabrics are fairly well developed segments in India. Most of the production of these products takes place in India with negligible imports. Hence, these products are not expected to grow substantially (a stable growth rate of around 5% expected).

Summary of the market-sizing for Hometech

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
Fiberfil	**Quantity**	120,400 MT	500 MT	10,950 MT	109,950 MT	140,300 MT	
	Value	Rs 720 crore	Rs 2 crore	Rs 60 crore	Rs 660 crore	Rs 840 crore	Rs 76.6 crore
Carpet backing Cloth (Jute & Synthetic)	**Quantity**	145 million sq m	2.5 million sq m	0.3 million sq m	145 million sq m	180 million sq m	
	Value	Rs 280 crore	Rs 5.5 crore	Rs 1.5 crore	Rs 285 crore	Rs 360 crore	Rs 1.5 crore
Stuffed toys	**Quantity**	55 million pieces	5 million pieces	0.2 million pieces	60 million pieces	120 million pieces	
	Value	Rs 416 crore	Rs 5.5 crore	Rs 1.5 crore	Rs 420 crore	Rs 1050 crore	Rs 1.5 crore
Blinds	**Quantity**		0.6 million sq meters*	0.05 million sq meters	30 million sq meters	60 million sq meters	
	Value		Rs 9 crore*	Rs 4 crore	Rs 630 crore	Rs 1270 crore	Rs 4.6 crore
HVAC Filters	**Quantity**		1 million square meters		1.5 million square meters	3.5 million square meters	
	Value		Rs 12 crore[$]	-	Rs 16 crore	Rs 45 crore	-
Mattress and pillow components	**Quantity**	270 million square meters	9500 square meters	1.5 lakh square meters	270 million square meters	310 million square meters	
	Value	Rs 945 crore	Rs 0.3 crore	Rs 1.2 crore	Rs 945 crore	Rs 1350 crore	Rs 3 crore
Nonwoven wipes[@]	**Quantity**			-	1.8 million square meters	3.5 million square meters	
	Value	Rs 2 crore	Rs 8 crore	-	Rs. 10 crore	Rs. 20 crore	-

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
Filter fabrics for vacuum cleaners	**Quantity**	33,800 square metres		-	33,800 square metres	62,280 square metres	
	Value	Rs 0.35 crore		-	Rs 0.35 crore	Rs 0.80 crore	-
Mosquito nets	**Quantity**		0.75 million nos.	0.12 million nos.	90 million meters	145 million meters	
	Value	Rs 225 crore	Rs 7.5 crore	Rs 3.5 crore	Rs 225 crore	Rs 364 crore	Rs 4.1 crore
TOTAL	**Value**	**Rs 2,584 crore**	**Rs 50 crore**	**Rs 72 crore**	**Rs 3,191 crore**	**Rs 5,300 crore**	**Rs 92 crore**

** In addition, coated fabric are imported and fabricated into blinds in India*

$ This includes filter media used for filter applications other than that of HVAC filters

@ In addition non woven fabric is imported and converted into wipes in India.

Protech

Protech is an ensemble of textile products and related material used in the manufacture of various protective clothing for personnel working in hazardous environment. The protective clothing includes garments and related paraphernalia for protection from harmful chemical environment, extreme temperature environments, low visibility, ballistic protection, etc.

Defence is one of the largest consumers of protective textiles. The Indian Defence Forces with a total strength of around 1.5 mn individuals comprising the army, navy, air force. Approximately 25-30 % of the troops are involved in high risk, counter insurgency & special operations in super high attitude areas and require protective clothing. In addition, around 1.2 mn individuals are present in paramilitary forces and other security forces. In addition, defence also requires uniforms / special uniforms which have not been classified as technical textiles.

The usage of protective textiles in defence comprises the following:-

1. Bullet proof jackets
2. NBC suits

3. High altitude clothing
4. Fire retardant apparel

The annual requirement of these products for defence installations is given below:-

Items	Defence requirement (units)
High altitude clothing	Around 1.5 - 2 lakh
NBC suits	Around 50,000
FR suits	Around 1 - 2 lakhs
Bullet proof jackets	Over 2 lakhs

The total usage of protective technical textiles in defence is estimated as around Rs 1,000 crore. With increasing terror threats, the usage of bullet proof jackets and other protective clothing is set to rise. For example, additional orders were placed in Jan 2009 to procure 20,000 bullet proof jackets on an emergent basis by the Ministry of Home Affairs (MHA) for central police organisation including the National Security Guards and the Central Reserve Police Force.

Most of these requirements are catered to by imports and part of it is supplied by domestic players among which Ordinance Factory Board (OFB) is the largest supplier. OFB receives orders from Director General of Ordinance Supplies (DGOS) which in turn are given based on the requirements of Master General of Ordnance (MGO). OFB receives orders for these products from the MGO on an annual requirement basis. OFB manufactures NBC suits, high altitude clothing (also known as Extreme cold climate clothing or ECC clothing), fire-retardent clothing and tents. High altitude clothing includes jackets, trousers, caps and gaiters. At present, only two types of tents are made - Tent extendable and Arctic tents. By 2010, OFB also has plans to manufacture Bullet proof jackets to meet the growing domestic demand. In addition, OFB also manufactures parachutes (supply dropping parachutes, aircraft brake parachutes, parachutes for paratroopers and aircraft pilot ejection parachutes), sleeping bags and mattresses which are not classified under protech applications.

OFB is the only indigenous manufacturer for the NBC suits and high altitude clothing in India. The total fabric consumption of OFB is estimated as around 25,000 metres. OFB has a turnover of Rs 700 crore. Non woven and rubberized fabrics consumption is less than 2% of total fabric consumption. Non woven fabric requirement is only for NBC suits.

Production details of OFB

Items	Production (2007-08)	Expected growth rate
High altitude clothing	5,000-7,000 nos.	15%
NBC suits	22,000 nos.	15%
Sleeping Bags	50,000 nos.	5%
Mattresses (Kapok)	1.5 lakh nos.	5%
Tents	15,000 nos.	8-10%

Source: Industry survey

The technical textile products covered under Protech are as given below:-

1. Ballistic protective clothing – Bullet-proof jackets
2. Fire retardant apparels
3. Fire retardant fabrics (for furnishings)
4. Radiation protection textile/NBC suits
5. High visibility clothing/Foul weather clothing
6. Chemical protection clothing
7. Industrial gloves/Cut. Slash protection
8. High altitude clothing

The products in the Protech category are typically 100% technical textile products with the exception of industrial gloves (where technical textile is fully or partly used in the end product). The technical textile consumption under Protech is estimated as around Rs 1,259 crore. The key Protech products are high altitude clothing, bullet-proof jackets and fire retardant fabrics which account for 52%, 20% and 14% of the technical textile consumption respectively in Protech segment. The fire retardant apparels and high visibility clothing each accounts for around 5% of the usage of technical textiles under Protech, rest NBC suits, chemical protection clothing and industrial gloves constitute less than 2% each.

The domestic consumption of technical textiles under Protech is expected to increase from around Rs 1,259 crore in 2007-08 to around Rs 2,021 crore by 2012-13.The demand for the Protech products is dependent on the improvements in worker safety practices, fire protective standards for construction and increase in defence sector spending on protective clothing. In the medium term (next 5 years), the protective textiles industry is expected to achieve growth at the rate of 9-10% year on year.

Amongst Protech products, high growth is expected in the fire retardant fabric, high visibility clothing material and chemical protective clothing.

Summary of the market-sizing for Protech

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
Ballistic Protective Clothing	**Quantity**	1.1 lakh pieces	< 100 pieces	0.1 lakh pieces	Around 1 lakh pieces[#]	Over 2 lakhs[#]	
	Value	Rs 253.6 crore	Rs 0.64 crore	Rs 4.2 crore	Rs 250 crore[#]	Rs 500 crore[#]	Rs 4.6 crore
Fire Retardant Apparels	**Quantity**	7.7 lakh pieces	0.25 lakh pieces	0.42 lakh pieces	7.9 lakh pieces	11.6 lakh pieces	
	Value	Rs 72.8 crore	Rs 2.6 crore	Rs 4.4 crore	Rs 71 crore	Rs 104 crore	Rs 5.6 crore
Fire Retardant fabrics	**Quantity**	6 million meters	-	-	6 million meters	15 million meters	
	Value	Rs 180 crore	-	-	Rs 180 crore	Rs 450 crore	-
NBC suits	**Quantity**	22,000 pieces	-	-	22,000 pieces[#]	50,000 pieces	
	Value	Rs 22 crore	-	-	Rs 22 crore[#]	Rs 50 crore	-
High Visibility Clothing / Reflective wear*	**Quantity**	-	6 million nos. *Fabric equivalent*	-	6 million nos.	12.1 million nos.	
	Value	-	Rs 66 crore	-	Rs 66 crore	Rs 132.7 crore	-
Chemical Protection Clothing (CPC)*	**Quantity**	-	78,000 pieces *Fabric equivalent*	-	78,000 pieces	1,14,000 pieces	
	Value	-	Rs 10.87 crore	-	Rs 10.87 crore	Rs 20 crore	-
Industrial gloves (TT component)	**Quantity**	100.6 million pieces	2.1 million pieces	80.5 million pieces	22.2 million pieces	35 million sq m	
	Value	Rs 43.1 crore	Rs 0.4 crore	Rs 34.5 crore	Rs 9 crore	Rs 14.1 crore	Rs 44 crore

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
High Altitude Clothing*	**Quantity**	7,000 pieces	0.18 million pieces *Fabric equivalent / garments*	-	0.18 million pieces	0.21 million pieces	
	Value	Rs 0.25 crore	Rs 650 crore	-	Rs 650 crore	Rs 708 crore	-
TOTAL	**Value**	**Rs 572 crore**	**Rs 731 crore**	**Rs 43 crore**	**Rs 1,259 crore**	**Rs 2,021 crore**	**Rs 54.3 crore**

** Predominantly, the fabric is imported under HS codes 5602 / 5603 and the protective apparel is manufactured in India*

 # Potential demand, actual demand is constrained by supply shortage

Geotech

Geotech segment comprises of technical textile products used in Geotechnical applications pertaining to soil, rock, earth etc. This class of products is loosely called Geotextiles. However Geotextiles specifically refers to permeable fabric or synthetic material, woven or non-woven, which can be used with geotechnical engineering material).

The principal functions performed by Geotextiles are confinement /separation, reinforcement, filtration and drainage, and protection. Application areas include Civil Engineering (roads and pavements, slope stabilization and embankment protection, tunnels, rail-track bed stabilization, ground stabilization and drainage etc), Marine Engineering (Soil Erosion control and embankment protection, breakwaters) and Environmental Engineering (landfills and waste management).

Other specialized Geotech products comprise Geogrids (plastics filaments and tapes etc formed into a very open, grid like configuration having large apertures), Geonets (extruded polymer ribs set in net like fashion with small apertures), Geomembranes (impermeable fabric as barrier) and Geocomposites (products using two or more Geotextiles e.g. Pre-fabricated Drains-PVD).

Current Geotextiles Market in India (Imports and domestic production) is around Rs 226 Crore, comprising imports of an estimated Rs 105 Crore and domestic production of around Rs 121 Crore. In terms of product category, the market includes Rs 226 Crore of synthetic woven/non-woven Geotextiles (85 Crore of woven and 67 Crore of Non-woven) as well as other products like Geogrids and Others (Geomembranes, Geonets and Geocomposites). Agro-based Geotextiles (made of Jute and Coir) are also developing and finding acceptance as a class of products. Market size for these products was around Rs 31 Crore.

Market Size including imports (Rs Crore)	
Synthetic Geotextile products	**226**
Woven Geotextiles	85
Non Woven Geotextiles	67
Geogrids/Others	35
Geomembranes/Geocomposites (PVD etc)	39
Agro-based Geotextiles	**31**
Total	**257**

Out of this, current consumption is around Rs 170 Crore. The consumption of Geotextiles is expected to be driven by the investments in the Infrastructure sector (both public, private as well as PPP mode investments). Consumption of Geotextile products is expected to grow at 12% to reach Rs 300 Crore by 2012-2013.

Summary of the market-sizing for Geotech

Geotextiles (total)	*2007-08*				*2012-2013*	
	Production	*Imports*	*Exports*	*Consumption*	*Consumption*	*Export Potential*
Rs Crore	**152**	**105**	**87**	**170**	**300**	**128**

Oekotech

Oekotech segment refers to use of technical textiles in Environmental Engineering. The primary segment in this is Landfill waste management. This refers to the use of Geosynthetic products to secure landfills against leakage of municipal or hazardous waste. Other areas include secondary protection in

Chemical/Oil Industries (ground covers and the like around process tanks for secondary containment should the tanks leak).

A modern engineering landfill has the following components - a basal lining system to prevent the contamination of soil, and ground water by pollutants, a capping system to seal the waste when the capacity of the landfill is exhausted, an impervious sealing layer which prevents the entry of pollutants in the ground, a leachate collection system for the collection and transmission of leachates to a collection pit, a secondary leachate collection/leak detection system.

The market is expected to grow based on spends on municipal waste disposal in accordance with Municipal Solid Wastes (Management & Handling) Rules, 2000, as well as greater awareness and government activity on Hazardous Waste in accordance with Supreme Court Guidelines. The market for Landfill management projects is currently Rs 68 Crore.

Summary of the market-sizing for Oekotech

Current Market size is Rs 68 Crore. Market over the next 5 years i.e. 2007-2012 is as shown:

Category	*Annual Waste (MT)*	*Landfill Area (Sq KM)*	*Avg Cost of TT (Rs.Sq M)*	*Value (Rs Crore)*	*Volume (Million Sq M)*
Municipal Waste	14 Mn	14.2	340	482.8	28.4
Hazardous Waste	8 Mn	4.2	340	142.8	8.4

Indutech

Indutech includes technical textile products used in the manufacturing sector. The technical textile products covered under Indutech are given below:-

- Conveyor belts (TT component)
- Drive belts (TT component)
- Cigarette filter rods
- Decatising cloth
- Bolting cloth
- AGM glass battery separators
- Coated abrasives (TT component)

- Ropes & cordages
- Composites (technical textiles component)
- Printed circuit boards (TT component)
- Computer printer ribbon
- Paper making fabrics
- Filteration Products

Technical textiles consumption under Indutech in India is estimated at around Rs 2,326 crore. Prineted circuit boards, AGM battery separators and other applications of fibre glass constitute around one-third of the technical textiles usage in Indutech valued at Rs 743 crore in 2007-08 and are expected to grow at over 17% year on year. Ropes and cordages account for around 30% share in the Indutech segment valued at Rs 669 crore in 2007-08. Computer printon ribbon, filteration products, conveyor belts & drive belts, cigarette filters are the other key products in the segment each accounting for around 8-10% of the segment.

Overall, the domestic consumption of technical textiles under Indutech is expected to increase from around Rs 2,326 crore in 2007-08 to around Rs 4,090 crore by 2012-13 growing at a CAGR of around 12%.

The total segment imports are Rs 859 crore and account for one third of the total domestic consumption. The exports are worth Rs 762 crore and account for around 35% of the total production.

Summary of the market-sizing for Indutech

		2007-08				2012-13	
		Production	**Imports**	**Exports**	**Domestic Consumption**	**Domestic Consumption**	**Export Potential**
Conveyor belts (TT component)	**Quantity**	6,040 MT	400 MT	2,500 MT	3,940 MT	6,062 MT	
	Value	Rs 160 crore	Rs 11 crore	Rs 66 crore	Rs 105 crore	Rs 162 crore	Rs 106 crore
Drive belts (TT component)	**Quantity**	6,018 MT	1,237 MT	2,178 MT	5,067 MT	7,288 MT	
	Value	Rs 86 crore	Rs 34 crore	Rs 36 crore	Rs 84 crore	Rs 121 crore	Rs 40 crore

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
Cigarette filter rods	**Quantity**	Approx 14,310 million nos.	Approx 90 million nos.	Around 400 million nos.	14,000 million nos.	17,000 million nos.	
	Value	Rs 157 crore	Rs 2 crore	Rs 7 crore	Rs 152 crore	Rs 182 crore	Rs 7.7 crore
Decatising cloth	**Quantity**	1.15 million meters	0.05 million meters	-	1.2 million meters	1.4 million meters	
	Value	Rs 26 crore	Rs 4 crore	-	Rs 30 crore	Rs 35 crore	-
Bolting cloth	**Quantity**	2 lakh sq m	4 lakh sq m		6 lakh sq m	7 lakh sq m	
	Value	Rs 10 crore	Rs 15 crore		Rs 25 crore	Rs 30 crore	-
AGM glass battery separators	**Quantity**	-	20.1 million sq m	-	20.1 million sq m	51.6 million	
	Value	-	Rs 60.3 crore	-	Rs 60.3 crore	Rs 150.8 crore	-
Coated abrasives (TT component)	**Quantity**	16.7 million meters	-	-	16.7 million meters	26.9 million meters	
	Value	Rs 89 crore	-	-	Rs 89 crore	Rs 143 crore	-
Ropes & cordages	**Quantity**	126,371 MT	10,000 MT	21,000 MT	115,371 MT	170,066 MT	
	Value	Rs 704 crore	Rs 165 crore	Rs 200 crore	Rs 669 crore	Rs 1,037 crore	Rs 402 crore
Composites (TT component)	**Quantity**	73,000 MT	60,000 MT	33,000 MT	1,00,000 MT	1,75,000 MT	
	Value	Rs 651 crore	Rs 443 crore	Rs 434 crore	Rs 650 crore	Rs 1,400 crore	Rs 609 crore
Printed circuit boards (TT	**Quantity**	-	6,615 MT	-	6,615 MT	35,577 MT	

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
component)	Value	-	Rs 33 crore	-	Rs 33 crore	Rs 178 crore	-
Computer printer ribbon	Quantity		554 nos.	519 nos.	12.9 million sq m	18.4 million sq m	
	Value	Rs 184.4 crore	Rs 16.5 crore	Rs 7.1 crore	Rs 193.8 crore	Rs 290 crore	Rs 7.1 crore
Filteration Products	Quantity		3.75 million sqm	0.1 million sqm			
	Value	Rs 86crore	Rs 60 crore	Rs 4 crore	Rs 142 crore	Rs 243 crore	-
Paper making fabrics	Quantity		1128 pieces	540 pieces	5,300 MT	12,500 MT	
	Value	Rs 85.5 crore	Rs 15 crore	Rs 7.5 crore	Rs 93 crore	Rs 119 crore	Rs 10 crore
TOTAL	**Value**	**Rs 2,239 crore**	**Rs 859 crore**	**Rs 762 crore**	**Rs 2,326 crore**	**Rs 4,091 crore**	**Rs 1,182 crore**

2. Competitive assessment of India vis-à-vis other countries

India has advantage of higher cost competitiveness over the major industrialised countries like US, Germany, UK, etc, primarily for labour intensive technical textile products. However, India lacks competitive advantage vis-à-vis other South Asian countries like China. The primary contributors to the cost disadvantage of India are higher cost of power, poor infrastructure resulting in higher cost of logistics, higher interest rates and taxes (including indirect taxes with anomalies on account of CST and VAT). These costs make the Indian companies uncompetitive by up to 10% vis-à-vis South Asian countries and by around 5% vis-à-vis US and Europe. India nevertheless enjoys a significant labour cost advantage over other south-east Asian countries, US and Europe.

In order to assess the cost competitiveness of the Indian technical textiles industry, IMaCS has assessed the cost competitiveness across the following dimensions:-

(i) Operating costs including labour costs, power costs and transaction costs

(ii) Capital cost (and interest costs)

(iii) Taxes and duties

Overall, the following table benchmarks India vis-a-vis US, Europe and China in terms of competitiveness in manufacturing technical textiles:-

	India	US	Europe	China
Cost competitiveness	Least competitive	More competitive than India by around 5.5-6%	More competitive than India by around 5.5-6%	More competitive than India by around 9%
Labour cost (including the impact of productivity)	Strong labour cost advantage primarily in labour intensive technical textiles products	Labour cost disadvantage of around 8% as compared to India	Labour cost disadvantage of around 7% as compared to India	At par with India
Technology	Dependent on import of technology and machinery for most of the high-end technical textiles products (incl. Non-woven)	Strong	Extremely strong	Availability of low-cost machinery and technology (quality of products manufactured is not very good if cheaper technology is used)

The cost disadvantage of Indian technical textiles manufacturers and exporters vis-à-vis US and Europe is around 5.5% to 6% while as compared to China, India has a cost disadvantage of around 9%. The cost disadvantage is higher for India for various high-end technical textiles products with lower scale of production in India as compared to the global giants of US and Europe which have the advantage of large economies of scale. The cost disadvantage is because of lower scale of production and hence higher fixed cost per unit of production as well as shortage / unavailability of specialised raw-materials in India. On the other hand, the total cost advantage from the labour cost in India outweighs the negative impact of the other cost factors primarily for the labour intensive technical textiles products with labour cost of 15% to 20% of the total cost (like surgical sutures, surgical dressings, seat covers, nylon tyre cord, insulation felts, footwear components, etc), as compared to US and Europe.

3. Non-woven sector for technical textiles

Nonwoven fabrics are broadly defined as sheet or web structures bonded together by entangling fibre or filaments (and by perforating films) mechanically, thermally or chemically. They are flat, porous sheets

made directly from separate fibres or from molten plastic or plastic film. They are not made by weaving or knitting and do not require converting the fibres to yarn.

The domestic consumption of non-woven in India is estimated at around 1 lakh MT in 2007-08. The market for non-woven technical textiles is expected to increase to over 1.5 lakh MT by 2012-13. The market for non-woven is dominated by the segments like Mobiltech, Meditech and Geotech. The domestic market for non-woven is dominated by automobile interior carpets & NVH products, surgical dressings, non-woven interlinings, tea-bags fabric and the absorbent fabrics - diapers & sanitary napkins. In addition, non-woven is also used in several other products like cigarette filters, headliners, airlines disposables, surgical disposables, non-woven wipes, non-woven abrasives, sports footwear components (linings), mulch-mats, crop covers, etc. Nylon tyre cord has not been considered as non-woven.

This section elaborates major application areas of non-wovens, technologies used in production of non-wovens and brief profile of key producers of non-woven products in India.

4. Raw-materials for technical textiles

Technical Textiles are manufactured from a variety of fibres/filaments based on the desired properties of the end product. The fibres/filaments used can be broadly classified as *Natural* and *Man Made*. Man-made fibre and filament yarn accounts for around 40% share of total fibre consumption in the textile industry with balance accounted by natural fibres.

The segment wise consumption of various man-made fibres/filaments and polymers is given below:

Natural Fibre	PP	HDPE	LDPE / LLDPE	Viscose	Polyester	Acrylic	Aramid	Nylon
Hometech	✔			✔	✔			
Agrotech	✔		✔		✔			✔
Clothtech	✔			✔	✔			✔
Mobiltech	✔			✔		✔		✔
Buildtech	✔	✔			✔	✔		✔
Geotech	✔				✔			
Indutech	✔	✔			✔			✔
Packtech	✔	✔	✔		✔			✔
Sportech	✔	✔	✔		✔			✔
Meditech	✔				✔	✔		✔
Protech						✔	✔	
Oekotech		✔						

Polypropylene is the most widely used raw material for the technical textile products. The consumption of polypropylene (polymer) is estimated as around 1.5 million MT. The domestic demand is primarily met by indigenous production. The share of imports is estimated as less than 10%.

Nylon is used for manufacturing several technical textile products. Regular Nylon filament yarn is produced in India though the consumption has outpaced the indigenous production in recent years resulting in increase in imports. The consumption of nylon filament yarn is estimated at around 50,000 MT of which imports account for around 25% share. The capacity for Nylon tyre yarn (used for making Nylon tyre cord) is not sufficient to fulfil indigenous consumption, thus, the demand is partly fulfilled by imports. The consumption of nylon tyre yarn is estimated as around 85,000 MT of which imports account for around 20% share.

High Density Polyethylene (HDPE), Low Density Polyethylene (LDPE) and Linear Low Density Polyethylene (LLDPE) are the key raw-materials used for manufacturing technical textiles. The consumption of HDPE / LLDPE in India is estimated as 1.7 million MT. Additional capacity build-up by RIL, IPCL, GAIL and HPL has resulted in increased availability of HDPE from domestic producers. Because of significant capacity addition, India has become a net exporter of HDPE. The production of LDPE in India has increased over the last 5 years to around 200,000 MT though the consumption has increased at a much faster pace resulting in increase in imports. With low level of exports, India is a net importer of LDPE with imports share of around 20% in the total consumption.

Aramid has the largest share amongst the specialty fibres. The demand for aramid fibre is around 400 MT which is met by imports. USA and Germany account for majority of imports of Aramid to India followed by China. Du Pont is the leading manufactuerer of Aramid fibres. The company markets its product under the brand name Du Pont Kevlar.

The detailed analysis of the demand supply scenario of the raw-materials used for manufacturing technical textiles is covered in the section “Details of raw-materials for technical textiles”. This section provides details on:

1. Production and consumption of both natural and man-made fibres in the technical textile industry based on areas of application
2. Key producers of these fibres and polymers in India
3. Import-export statistics of key fibres and polymers.

5. Technical Textiles Machinery

There is a strong reliance on imported machinery and technology used in technical textiles industry. Though the locally made conventional machinery is available in India, the manufacture of technical textiles also requires specific unconventional spinning, weaving, knitting, braiding and nonwoven technologies (and machinery) which are imported from European countries. Technology (and machinery) required for DREF spinning and Warp spinning, Weaving (Projectile, Rapier, Air-jet, Water-jet, circular, 3-D and multi-phase), knitting – circular, flat and warp knitting and braiding, is usually imported from Germany, Italy, Austria and other European countries. The machinery for non-woven lines is also imported from European countries. In addition, there are approximately 30 spun bond non-woven manufacturing units in India that have installed machinery manufactured in China. Most of these machines are manufactured based on the spun bonding technology developed by Lurgi.

This section provides an overview of technology used for manufacture of technical textile. This section further details the machinery used in production of technical textiles classified by type of fabric – woven or non-woven. This section also elaborates key woven and non-woven machinery capacities installed in India and key suppliers of technical textile machinery in India and abroad. The technical textile machinery in India is primarily imported.

6. Testing facilities for technical textile in India

Technical textile production requires conformance to standards (both international and national) based on the type of product and the nature of application. In India, the testing facilities for technical textiles are predominantly set up by the Textile Research Associations (TRAs). These facilities provide the necessary tests required for the products being manufactured at a nominal cost. In addition to these facilities, some of the major manufacturers also have their own in-house testing facilities required to monitor key production parameters.

The Ministry of Textiles, Government of India has also nominated these TRAs to set up Centre of Excellence (CoE) for specific segments of technical textiles. The proposed CoE in the country are:

- SASMIRA (Synthetic and Art Silk Mills Research Association)
- MANTRA (Man Made Textiles Research Association)
- BTRA (Bombay Textile Research Association)
- SITRA (South India Textile Research Association)
- NITRA (Northern India Textile Research Organization)

The details of the testing facilities for technical textiles at these organizations are covered in this section.

7. Standards, Policies and regulations for Technical Textiles

The mandatory usage of technical textile products is largely driven by rules and regulations or standards of respective industries / end user segments. The developed countries have standards and specifications in place and have ensured enforcement of the same. This section provides a glimpse of standards (or rules and regulations) in developed countries mandating/recommending the usage of technical textile products. The key tests for each product in the 12 technical textile product categories are listed in this section.

Rules and regulations with respect to usage of Hometech products

The rules and regulation regarding the usage of fire-retardant textiles in USA and UK are as given below:

1. Mandatory usage of fire-retardant textiles in USA - The usage of fire-retardant textiles in public occupancies, has been mandated by the set flammability test procedure for seating furniture for use in public occupancies.
2. Recommended usage of fire-retardant textiles in UK - The "The Furniture and Furnishings (Fire Safety) Regulations, 1988" recommends use of technical textile based on the levels of fire resistance for the upholstery.

Rules and regulations with respect to usage of Protech products

The rules and regulation regarding the usage of Personal-Protective-Equipment (PPE) (PPE includes: face mask, eye glasses, helmets, footwear, gloves, respiratory protection products, fire retardant clothing etc.) in select developed countries is given below:

1. Mandatory usage of PPE in USA - The "Occupational Health and Safety Act (OHSA)" mandates the use of Personal Protective Equipment (PPE) for people employed in high hazard occupation.
2. Mandatory usage of PPE in Europe – "The Personal Protective Equipment at Work Regulations act" is prevalent in Europe, which governs and mandates the use of PPE at the workplace.
3. Regulations for usage of PPE in South Africa - South African Department of Health have a protective clothing policy for radiation control, which regulates the use of protective clothing in workplace and high hazardous occupancies.
4. Recommended usage of PPE for motorcycling activities - 'Motorcycling Australia', the governing body of motorcycle sport in Australia, encourages and recommends the use of PPE for all motorcycle activities.

Rules and regulations with respect to usage of Meditech products

There are no regulations mandating the use of a particular meditech product, the usage of meditech products is generally recommended based on the level of barrier protection required for the medical/healthcare activity. Following are the Meditech products, the use of which are recommended by prevailing standards/policies:

1. Usage of sutures in USA - Food and Drug Administration (USA), has approved and recommended synthetic absorbable sutures for almost all surgical uses (except cardiac and neurological procedures).
2. Usage of sterile packaging in USA - International Association of Healthcare Central Service Material Management (IAHCSMM) (USA) has the "Sterile Storage and Transport Standards" which recommends the use of sterile packaging for safe medical procedures.

As standard practice, healthcare textiles including disposable clothing is currently being used by healthcare professionals (tertiary hospitals and pharmaceutical companies) all over the world to control infection in a healthcare setting.

Rules and regulations with respect to usage of Geotech products

The rules, regulation and recommendation regarding the usage of geotextiles in USA are as given below:

1. The usage of geotextiles (Geotech) is recommended by the "Wetland Best Management Practices". The code recommends the following:
    a. Usage of geotextile fabric during construction to minimize disturbance, fill requirements, and maintenance costs.
    b. Usage Geotextiles in drainage, for drainage material to be separated from the adjacent fill layers by geotextile fabric
    c. Usage of geotextiles in roads, to increase the bearing strength of the road and to preserve the bearing strength of fill material by preventing contamination with fine soil particles.
    d. Use of geotextile fabric at landing sites in wetlands and on soils with low bearing strength to minimize soil erosion and compaction.

Rules and regulations with respect to usage of Sportech products

There are very few policies/standards mandating the use of other sportech products, though the following products are recommended for usage in sports mentioned below:

1. Usage of PPE in sports - The usage is recommended for Auto & motor sports, baseball, boxing, equestrian sports, wrestling, rugby, skateboarding, hockey, bicycling, snowmobiling, lacrosse, skiing, women's softball, rollerblading. For example in USA, several protective equipments are mandated for use in Ice Hockey, these include face-mask/helmet, elbow and knee pads, hip girdle with tail-bone protection and shin guards.
2. Usage of mouth guards in sports – The usage is recommended for acrobatics, football, martial arts, skiing, basketball, gymnastics, racquetball, skydiving, boxing, handball, rugby, soccer, discus throwing, ice hockey, shot putting, squash, field hockey, lacrosse, skate boarding, surfing, volleyball, water polo, weight lifting and wrestling.

Rules and regulations with respect to usage of Mobiltech products

There are few products in the mobiltech segment having mandatory usage policies/standards. Recommended and mandatory usage of select key mobiltech products is given below:

1. Usage of seat belts - Most western countries including, Hong Kong, Japan, New Zealand, Australia, France, Germany, Hungary, Ireland, Spain, Sweden, U.S. (Except New Hampshire and American Samoa), U.K. and E.U. have mandatory seat belt laws.
2. Installation of airbags in vehicles - USA has mandatory usage requirements for Airbags.
3. Usage of helmets - For motorcycles helmets, in most of the countries, both developed and developing, there are regulation mandating their usage.
4. Usage of sir filters - There is no jurisdiction making the usage of filters mandatory, however stringent emission regulations makes their use imminent. The emission laws in USA among others are:
    a. American 2007 heavy truck engine emissions regulations
    b. 2004 - New York City retrofit program

Rules and regulations with respect to usage of Oekotech products

A regulation regarding the usage of oekotech products in USA is governed by the Code of Federal Regulation (CFR). The CFR provides - the design specifications, test requirements and mandates the use

of different type of containers, for the storage and collection of residential, commercial and institutional solid waste.

Rules and regulations with respect to usage of Buildtech products

The usage of technical textile products in the Buildtech segment is governed by the respective building codes prevalent in different countries. These codes do not mandate the use of technical textiles - mandatory specification standards for different products to be used in building/construction in place.

The building codes provide the following details for usage of buildtech products - definition of categories of building parts and materials, performance criteria required for defined building parts and materials, approval of building parts and materials with the required performance, customised inputs on buildtech material based on the region/area of usage etc.

Select regulations and rules regarding usage of buildtech products in USA are given below:

1. The OHSA regulates and mandates the use of fall protection system including the Safety Nets (Scaffolding Nets) and Personal Fall Arrest Systems at the place of construction.
2. The building code requirements for air infiltration and moisture protection barriers encourages the use of House-wraps

Most of the technical textile segments do not have mandatory or recommended usage policies at all. Moreover the regulations vary from region to region and there are no universal policies and regulations mandating the use of technical textile products. The policies and regulations have an effect on the demand of technical textile products and growth of industries associated with these technical textiles.

1. Recommendations

In the last five years, the Indian government has taken several steps which have helped the technical textiles industry in its growth-path. Some of the steps taken by the government are:

- **National Textile Policy**: enunciated that "considering the growing prospects for technical textiles world wide, priority will be accorded for their growth and development".
- **Fiscal duty**:
  - Technical textiles is predominantly man-made fibre / yarn based and distortion in the excise duty structure with fibre stage duty at 16 percent and fabric at 8 percent, which prevailed till last year was affecting adversely the profitability of this industry in terms of unrebated cenvat at fabric stage. The government reduced the excise duty on man- made fibre / yarn from 16 percent to 4 percent which has provided a level playing field to this industry.
  - Customs duty on polyester staple fibres and tow and polyester filament yarns has been reduced from 10 per cent to 5 per cent.
  - Customs duty on polyester chips has been reduced from 10 per cent to 5 per cent.
  - Aramid yarns for manufacture of bulletproof jackets for supply to armed forces have been exempted from both customs duty and CVD.
  - There were distortions in the excise duty structure for synthetic textiles / yarns. While Synthetic Fibres and Filament Yarns attracted a mandatory excise duty of 8% (including their raw materials and Intermediates), the excise duty on cotton yarns was optional at 4% advalorem. In view of the above, the excise duty on synthetic fibres and filament yarns (along with their raw materials and Intermediates starting from Naphtha, Benzene, PX, PTA) was reduced to 4% bringing about equality in the duty structure.
  - Since the machineries for production of technical textiles are not indigenously produced, the major machinery for manufacture of technical textiles have been covered under the concessional list of 5 percent basic customs duty.
- **Coverage of technical textiles under Technology Upgradation Fund Scheme (TUFS)**: All the machinery for production of different items of technical textiles has been covered under TUFS. The second hand imported nonwoven machinery and converting machinery for nonwoven items with 10 years vintage and residual life of 10 years has been covered under TUFS. Under this scheme there is 5% interest reimbursement plus 10% capital subsidy for

specified processing machinery, specified machinery required in manufacture of technical textiles and garmenting machineries.

- **De-reservation of sanitary napkins / baby diapers**: The sanitary napkins / baby diapers were earlier reserved for SSI sector which was hindering the setting up of large scale units in this segment; these have now been de-reserved.
- **Institutional mechanism**: Government has created an institutional mechanism in terms of Inter-Ministerial Committee (IMC) and Steering Committee for Growth and Development of Technical Textiles (SCGDTT) to constantly review, monitor and take necessary action for promotion of technical textiles.

Based on the results of the Baseline Survey of Technical Textiles in India, 2008, the impediments to growth for the technical textiles industry in India can be classified under four broad areas. It is imperative for all the stakeholders (government, agencies supporting the industry, manufacturers, importers and exporters) to work towards resolving these impediments. The impediments to growth[1] are classified as given below:-

1. Lack of demand
2. Cost competitiveness
3. Availability of skilled manpower
4. Testing infrastructure / technology support

- **Lack of demand**
  - Low awareness of the benefits of technical textiles, primarily in sectors like meditech, agrotech and geotech, is hampering the potential demand of technical textiles in India
  - Absence of defined standards and regulations promoting usage of products made of technical textiles is another key issue behind the lack of demand for technical textiles
- **Cost competitiveness**
  - Small scale of operations because of low domestic demand
  - Lack of availability of specialised raw-materials

[1] There are several other impediments to growth at product level which have been covered for each of the 12 segments of technical textiles.

- High capital expenditure requirement (though the demand for several technical textiles products is so low that the projects are not viable)
- Higher cost of capital
- Higher cost of logistics and utilities (transaction costs and transaction delays for exports)

❖ **Availability of skilled manpower**

- Availability of skilled manpower is a key constraint because of strong competition from services sector
- Need for institutional training to skilled manpower for manufacturing technical textiles products

❖ **Testing infrastructure / technology support**

- Need for development of skilled manpower for testing agencies for large scale expansion
- Technology / consultancy support to manufacturers of technical textiles

IMaCS recommendations for facilitating the growth of technical textiles in India are primarily targeted at resolving the impediments to growth discussed above. Our recommendations are given below:-

❖ Cost competitiveness

- **Comprehensive fibre policy**

  There are several issues in terms of the indirect taxes at various stages of the supply chain of technical textiles / textiles. IMaCS recommends formation of a comprehensive fibre policy for the country.

- **Reduction of Excise duty on plant protection products**

  Majority of Indian farmers are not using agrotech technical textiles products leading to lower than potential returns from their investment in seeds, fertilizers, irrigation and labour to pests, diseases and weeds resulting in lower farmer income. One of the important hurdles is the high cost of these products despite subsidies provided under National Horticulture Mission (NHM). In order to make these products available to the farmers at cheaper prices, there should be reduction in excise duty on agrotech technical textiles products (similar to fertilisers, seeds and tractors which are not subjected to levy of excise duty).

- **Revision of rates for subsidy under NHM for plant protection products (agrotech)**

NHM provides a subsidy of 50% of the cost of plant protection technical textiles products like shade-nets and mulch-mats subject to maximum prices of these products as prescribed in the NHM policy. But, the average market price for these products is much more than the prices prescribed under NHM. Hence, the prices for these products in NHM should be revised.

- **Customs duty on parts of umbrella, including umbrella panels**

  In the Union budget 2007-08, the customs duty on parts of umbrella, including umbrella panels was reduced from 12.5 per cent to 5 per cent. Most of the umbrella cloth used in India is being imported. The duty on umbrella cloth should be increased back to 12.5 per cent to make the domestic industry more competitive. Further, the Indian manufacturers should be given excise benefits to make this industry more competitive vis-a-vis' other countries.

- **Import duty on nylon**

  Government stated policy is that customs duty on raw material should be at par or lower than on the finished goods. In the case of technical textiles products using nylon, like nylon tyre cord, nylon ropes, nylon fish-net twines, etc, the duty is same or less than that on nylon. This is anomaly needs to be corrected by reducing the import duty on nylon.

	Nylon	Nylon Filament yarn	Nylon tyre cord
Customs Basic Duty:	10	10	10
Addl Duty(CVD):	10	4	10
Spl Addl Duty(Spl.CVD):	4	4	4
Excise Cess	3	3	3
Customs Cess	3	3	3

- **Introduction of Anti Dumping Duty on Radial Truck and Bus tyre imports from China**

  In Sep, 2005 Indian tyre industry / ATMA filed a Petition for imposition of Anti Dumping Duty against import of Bias truck & bus tyres imports from China and Thailand. Following a detailed investigation and based on recommendation by the Designated Authority, Finance Ministry, in July, 2007, imposed Anti Dumping Duty against import of Bias Truck and Bus tyre imports from China and Thailand. In July, 2008 Indian tyre companies / ATMA filed a Petition against import of Radial truck and bus tyre imports from China. Initiation of the case is in the process. The anti-dumpting duty on these tyres is extremely important to safeguard the interests of the tyre industry and in-turn that of nylon-tyre cord industry in India.

- **India's offer list (for preferential / concessional tariff treatment) under various Bilateral / Regional Trade Agreements**

  Natural Rubber, prime raw-material of tyres, is included in India's negative list under various bi-lateral / regional trade agreements (RTAs) whereas tyres are generally included in several trade agreements (operational and under finalization). Since domestic tyre industry is not allowed access to import of its key raw-material (i.e. Natural Rubber) at preferential tariff, there is no justification to include tyres in India's preferential / concessional listing under the existing / future trade agreements.

  Concessional / preferential Customs Duty on automotive tyres under Regional Trade Agreements is much lower than the applied rate of 10%, as given below:

  (i) Under SAFTA RTA, concessional duty of 5% on imports from Pakistan & Sri Lanka while nil import duty on imports from Bangaldesh, Bhutan, Maldives & Nepal

  (ii) Under Asia Pacific Trade Agreement, import duty of 8.5-8.6%

  The concessional tariff treatment on the tyres is negatively impacting the interests of the tyre industry and in-turn that of nylon-tyre cord industry in India.

- **Levy of Sales Tax (CST) on Mobiltech products used in manufacturing of vehicles for exports purpose**

  The basic spirit of all tax laws (like excise duty, sales tax, custom duty, etc.) is that no tax should be levied on goods being exported. Appropriate procedure/form etc. should be introduced for exempting goods (including mobiltech products) from levy of CST, which are used in the manufacture of products to be exported.

- **Exemption of Service Tax for export oriented technical textiles units**

  For the exports of technical textiles, the service tax is exempted only in case of insurance for overseas agent cargo. Other services like project consultant's fee (for setting up or upgradation of the plant), inland freight charges (to the port) for exports, C&F agent's commission at the port and insurance expenses, etc are not in ambit of service tax exemption. The export oriented technical textiles units should be given service tax exemption from all these services sought for export purposes.

❖ Standards and regulations for promoting usage of TT products

- **Formulation of standards**
  - BIS standards are particularly important for Geotech, Oekotech, Protech, Meditech and Buildtech as the standards for other segments can be defined by end-user industries as per requirements
  - The standards should provide level playing field for Indian and International players, and hence, should be based on specifications and not on any patented technologies
  - To liaise with institutions like Railways & NHAI to finalise the standards and regulations mandating usage of geotextiles
  - To liase with Indian armed forces and police departments to develop the standards for protective (anti-ballistic) textiles
  - The export market for industrial work wear requires the certification 'European CEE' (certification for products used in protection against chemicals, micro-organisms, mechanical risks and contact heat). As the work conditions in India are different from those in developed countries, the industrial workwear standards are required on similar lines. These standards can be developed by BIS.
  - Norms for medical waste management are required for increasing adoption of medical disposables in India. These standards can be developed in consultation with the Ministry of Health.
- **Inclusion of crop covers under NHM for subsidy *(from immediate effect)***
  - Crop-covers are not included under NHM resulting in almost negligible domestic usage of these products. Almost 100% of the crop-covers manufactured in India are exported. In order to develop the demand for crop-covers in India, the crop covers should be included under NHM. NHM should also help in creating the awareness and benefits of these products.
  - Facilitation required to the farmers for availing NHM subsidy in shorter duration
- **Mandatory usage of seat-belts, helmets and medical disposables**
  - Usage of seat-belts should be made mandatory in all buses, LCVs and M&HCVs and in all cars on long-distance roads *(with immediate effect)*
  - Strict implementation of usage of helmets for riders and pillions

- Mandatory usage of medical disposables in all government / government-aided hospitals; treatment under all emergency cases to be mandatorily considered as HIV positive thereby necessitating mandatory usage of medical disposables. *The legislation for mandatory usage of medical disposables can be implemented in a phased manner with the support from state governments and Ministry of Health. In the first phase, the usage of medical disposables can be mandated in all state-run hospitals / government aided hospitals within the financial year 2009-10. Subsequently, the legislation should extend to cover all private hospitals and clinics in the country.*

➢ **Mandatory usage of fire-retardent textiles at public places / construction sites / Railway coaches**

- The usage of fire-retardent textiles should be made mandatory at all public places like theatres, auditoriums, trains (curtains, seat-covers, etc), hotels, hospitals & restaurants. These are currently suggested in the National Building Code but are not mandatory. Necessary regulatory amendments should be effected to the municipal and town planning acts to ensure compliance. *The legislation for mandatory usage of fire retardant textiles should be implemented immediately for any new constructions. For the old constructions, the government can provide incentives to shift to fire-retardent textiles.*
- The usage of fire-retardent textiles should be made mandatory in all railway coaches. The regulation in this regard can be implemented by the Indian Railways.

❖ Increasing awareness of technical textiles

➢ **Exemption of Excise duty on technical textiles samples for free distribution**

One of the primary roadblocks in the usage of technical textiles in India is lack of awareness of applications and benefits of technical textiles. In order to facilitate awareness programmes by the manufacturers, there should be complete exemption of excise duty on samples for free distribution as has been permitted in the Pharmaceutical Industry.

➢ **Centres of Excellence to play a key role in increasing the awareness of Geotextiles, Agro-textiles and Medical textiles**

- Ensure inclusion of Geotech in Civil Engineering curriculum of various engineering colleges like IITs with specialized masters programmes for Geotech, Buildtech and Oekotech
- Introduction of courses at Masters level textiles engineering for technical textiles

- Conduct joint promotion and training with institutions involved in extension activities for farmers like agricultural universities, co-operatives, agrochemical and fertilizer manufacturers, financial institutions/banks, on usage of Agro-textiles

- **Formation of Association of Manufacturers of Technical Textiles**

  - In the absence on any association for technical textiles manufacturers in India, Office of Textiles commissioner is managing all the industry development activities for the industry including the day-to-day operational issues. In such a scenario, presence of an association would help the Office of Textiles Commissioner in focusing on more critical issues related to the development of the industry. The association would also help in bringing together the manufacturers of technical textiles and undertake large scale awareness programmes (funded by industy players through annual fee for association).

2. List of selected products for focussed attention

The technical textiles industry in India is growing at a fast pace with most of the segments outpacing the expected growth according to the ECTT report. This strong growth over the last 5 years has occurred because of the robust growth witnessed by the Indian manufacturing as well as services industries in addition to the agriculture industry. Household incomes are on the rise leading to higher consumer spend on products that use technical textiles. Moreover, the industry was well supported by the Government with the steady implementation of the schemes for the industry upliftment like TUFS.

Over the next 5 years, all the 12 segments of technical textiles industry are expected to achieve strong growth. The growth is expected to be stimulated by the focus of the Government and the industry on manufacturing non-woven fabrics in India. IMaCS is of the opinion that the current downturn in the Global economy will have short-term impact on Indian technical textiles industry with industry maintaining the long term growth forecasts.

IMaCS has prepared a list of 20 products for focussed attention based on the criteria decided during the SCGDTT meeting as well as feedback from Office of Textiles Commissioner. Accordingly, the products for which production base exists in the country and technology is readily available and already established, have not been considered. The products for focussed attention are high end technical textile products with knowledge barrier and may require reverse engineering.

The list of 20 products for focused attention is given below:-

		2007-08			2012-13
S No.	**Product**	**Imports**	**Exports**	**Domestic Consumption**	**Domestic Consumption**
1	Artificial implants	Rs 97.25 crore	-	Rs 114.75 crore	Rs 249.1 crore
2	Geotech products	Rs 105 crore	Rs 87 crore	Rs 170 crore	Rs 300 crore
3	Ballistic Protective clothing	Rs 0.64 crore	Rs 4.2 crore	Rs 250 crore#	Rs 500 crore#
4a	Fire retardant fabrics	-	-	Rs 180 crore	Rs 450 crore
4b	Fire retardant apparel	Rs 2.6 crore	Rs 4.4 crore	Rs 71 crore	Rs 104 crore

		2007-08			2012-13
S No.	**Product**	**Imports**	**Exports**	**Domestic Consumption**	**Domestic Consumption**
5	High altitude clothing	Rs 650 crore	-	Rs 650 crore	Rs 750 crore
6	Nuclear Biological and Chemical (NBC) suits/Hazmat suits	-	-	Rs 22 crore	Rs 50 crore
7	Absorbent Glass mat Battery separators	Rs 60.3 crore	-	Rs 60.3 crore	Rs 150.8 crore
8	Architectural membranes	Rs 15 crore	-	Rs 16 crore	Rs 40 crore
9	Composites	Rs 443 crore	Rs 434 crore	Rs 650 crore	Rs 1,400 crore
10	Floor & wall coverings	Rs 100 crore	Rs 425 crore	Rs 425 crore	Rs 685 crore
11	Non-woven wipes	Rs 8 crore	-	Rs 10 crore	Rs 20 crore
12	Crop-covers	-	Rs 10 crore	-	-
13	Airbags	Rs 12 crore	-	Rs 12 crore	Rs 35 crore
14	Seat-belt webbing	Rs 7.75 crore	Rs 0.05 crore	Rs 7.04 crore	Rs 22.1 crore
15	Mulch-mats	-	Rs 1.5 crore	Rs 12.6 crore	Rs 98 crore
16	Shade-nets	-	Rs 17.5 crore	Rs 28 crore	Rs 37.5 crore
17	Interlinings	Rs 85 crore	Rs 8.5 crore	Rs 515 crore	Rs 700 crore
18	Elastic Narrow fabrics	Rs 65 crore	Rs 155 crore	Rs 365 crore	Rs 625 crore
19	Coated abrasives (TT component)	-	-	Rs 89 crore	Rs 143 crore
20	Surgical disposables	Rs 1.35 crore	Rs 3 crore	Rs 32.3 crore	Rs 61 crore

 # Potential demand, actual demand is constrained by supply shortage

1. Project background

The Office of the Textile Commissioner is the apex government body charged with facilitating the holistic growth of India's diversified and broad based textile industry. Technical Textiles is expected to be a booming opportunity for developing economies in Asia both from a production perspective as well as consumption opportunities in a technologically evolving economy. Thus, Technical textiles holds significant potential in India and the government has already taken a few steps to promote this Industry. However, in the absence of any authentic database for the industry in India, the Government is not able to make focused policy interventions for promoting the growth in production and consumption of technical textiles in the country.

Therefore, The Office of the Textile Commissioner wanted to undertake a baseline survey of the technical textile industry in India to assess the demand-supply scenario as well as interventions required to improve the level of technology, policies and regulations in this industry. The Office of the Textile Commissioner had appointed ICRA Management Consulting Services - IMaCS to undertake this assignment.

The scope of IMaCS's engagement was to conduct baseline survey of technical textiles industry to assess the demand supply scenario of technical textiles products in India, prepare a directory of key producers, consumers, importers and exporters of technical textiles products and recommend key interventions required from the Government and other stakeholders in terms of policies & regulations.

Based on the agreed terms of reference IMaCS has carried out an assessment of technical textiles industry in India. IMaCS has collected data and information from various manufacturers, importers, exporters and end-users of tehnical textiles in India. For this purpose, IMaCS has conducted a nation-wide primary survey of around 3,000 units / respondents. Based on the survey responses, IMaCS determined the consumption pattern of various technical textiles products. On the basis of consumption patterns and the sizes of end-user industries, IMaCS has determined the domestic market sizes of technical textiles products in India. Further, IMaCS has determined the domestic market size projection of these technical textile products based on the expected growth rates of the end-user industries and expected shift in consumption pattern of technical textile products over the next 5 years (including expected shift to / from alternative materials). In cases where it was not possible to determine the market size with this approach, IMaCS has relied upon the industry survey and / or supply side assessment.

IMaCS has also assessed the imports and exports of technical textiles products in detail. IMaCS has conducted consignment-wise analysis of the imports and exports data of various technical textiles HS

codes to determine the imports and exports of these products. This approach was required because the technical textiles products are often imported / exported under various HS codes and several technical textiles products are imported / exported under the same HS codes. We have also looked at DGCIS imports and exports data in cases where these issues on account of HS codes were not applicable.

In addition, IMaCS has conducted the review of standards and testing requirements of technical textiles in other countries based on secondary research. We have also analysed the availability of raw-materials and machinery for the manufacture of technical textiles. We have relied upon the industry survey and discussions with machinery suppliers for this purpose.

IMaCS report on technical textiles is broadly divided into three volumes as follows:

Volume I :

Executive Summary

1. Recommendations
2. Products selected for focussed attention

Volume II : Market sizing of technical textiles in India

1. Project background
2. Technical Textile Industry – Domestic scenario and segment-wise consumption in India

Volume III : Raw-materials, machinery, standards, policies regulations and testing facilities

3. Non-woven sector of technical textiles
4. Competitive assessment of India vis-à-vis other countries
5. Raw materials for technical textiles
6. Technical textiles machinery
7. Testing facilities for technical textiles in India
8. Standards for Technical Textiles in other countries
9. Policies and regulations mandating and recommending the use of technical textile products

2. Overview of the Technical Textiles Industry in India

Introduction

Technical textiles are different from the conventional textiles. Unlike conventional textiles used traditionally for clothing or furnishing, technical textiles are used basically on account of their specific physical and functional properties and mostly by other user industries. Depending on the product characteristics, functional requirements and end-user applications the highly diversified range of technical textile products have been currently grouped into 12 categories based on application:

(xiii) Agrotech (Agriculture, horticulture and forestry)
(xiv) Buildtech (building and construction)
(xv) Clothtech (technical components of shoes and clothing)
(xvi) Geotech (geotextiles, civil engineering)
(xvii) Hometech (components of furniture, household textiles and floor coverings)
(xviii) Indutech (filtration, cleaning and other industrial usage)
(xix) Meditech (hygiene and medical)
(xx) Mobiltech (automobiles, shipping, railways and aerospace)
(xxi) Oekotech (environmental protection)
(xxii) Packtech (packaging)
(xxiii) Protech (personal and property protection)
(xxiv) Sporttech (sport and leisure)

The technical textile industry has immense potential in the developing countries. Asia is now emerging as a powerhouse of both production as well as end-use consumption of technical textiles. China, Japan, Korea, Taiwan, other developing countries, particularly India, have great potential to make an impact in this industry in the coming decade. The demand for technical textiles will be boosted by the changing economic scenario in these countries. Considering its highly skilled and scientific/technical manpower and abundant availability of raw materials, India can emerge as a key player in the technical textiles industry.

Domestic Scenario of technical textiles in India

India currently consumes the products under all twelve categories, though not all of them are produced domestically. The percentage of indigenous production varies drastically across various products. India is a large producer of technical textiles products in Packtech, Clothtech, Hometech and Sportech segments, the products of which are primarily commodities.

Unlike the conventional textile industry in India which is highly export intensive, the technical textile industry is an import intensive industry. Many products like baby diapers, adult diapers, PP spunbound fabric for disposables, wipes, protective clothing, hoses, webbings for seat belts, etc. are imported to a very large extent.

As mentioned earlier, the products with high production levels in India with substantial exports are typically commodity products and are not very R&D intensive. These products include flexible intermediate bulk containers (FIBCs), tarpaulins, jute carpet backing, hessian, fishnets, surgical dressings, crop covers, etc.

Size of the units manufacturing the products also varies to a large extent. There is significant number of small scale units manufacturing technical textile products; this segment is highly unorganised in nature. Although there are various large players present, the production of certain goods is still concentrated in the small scale segment like canvas tarpaulin, carpet backing, woven sacks, shoe laces, soft luggage, zip fasteners, stuffed toys, fabrication of awnings, canopies and blinds, etc.

There are a few Multi National Companies like Johnson & Johnson, Du Pont, Procter & Gamble, 3M, SKAPs, Kimberly Clark, etc. which are internationally very large players in technical textiles and have set up their units in India as well. There are some domestic players like SRF, Entremonde Polycoaters, Kusumgarh Corporates, Supreme Nonwovens Pvt. Ltd., Garware Wall Ropes, Century Enka, Techfab India Ltd., Pacific Non Woven, Vardhman, Unimin, etc which are also very large players in this industry.

Segment-wise consumption of technical textiles in India

The current size of technical textile consumption in India is estimated to be around Rs 37,100 crore. The overall technical textile industry in India is expected to grow at the rate of 11% year on year and reach a size of Rs 62,420 by the year 2012-13. The segment-wise estimates of consumption of technical textiles in India in the year 2007-08 and its forecasts for the year 2012-13 are given in the table below:

	Domestic Consumption (Rs crore)	
	2007-08 (E)	2012-13 (P)
Agrotech	487	709
Meditech	1,514	2,263
Mobiltech	3,158	5,145
Packtech	14,067	25,913
Sportech	2,632	4,358
Buildtech	1,726	2,655
Clothtech	6,570	9,665
Hometech	3,191	5,300
Protech	1,259	2,021
Geotech	170	300
Oekotech*	68	160
Indutech	2,326	4,091
Total	37,100	62,420

**Oekeotech size has already been considered as a part of Geotech*

Source: IMaCS Analysis

The largest category in the technical textiles industry of India is Packtech which has around 38% share. The size of Packtech currently is around Rs 14,067 crore and is expected to grow at the rate of 13% year on year to reach a size of Rs 25,913 crore by 2012-13. Another very significant segment in the Indian technical textiles market is Clothtech, which has over 17% share of the technical textiles consumption. However, this segment is expected to register a growth of around 8% year on year and reach a size of Rs 9,665 crore by 2012-13.

Mobiltech and Hometech each has a share of around 8-9% in the total consumption and are expected to grow at 10-11% year on year for the next five years. Sportech which has a share of around 7% has above average growth potential of almost 11% year on year. It is expected to reach a size of Rs 4,358 crore by 2012-13.

Indutech which currently has only about 6% share of the total domestic technical textile consumption is expected to grow at 12% year on year for the next five years to reach a size of Rs 4,091 crore. Rest of the segments have shares of less than 5%.

Amongst the smaller segments, Protech has good growth potential. The current size of Protech is around Rs 1,259 crore and is expected to increase to almost Rs 2,021 crore by 2012-13 growing at over 9-10% year on year.

Oekotech size currently in India is very small only about Rs 68 crore, as its application is very low in India. However, over the next five years, this trend is expected to change and Oekotech is expected to reach a size of Rs 160 crore by the year 2012-13 growing at almost 19% y-o-y.

Buildtech, Meditech and Agrotech are expected to achieve a moderate growth in line with the economic growth at around 8%. Usage of Geotech is also far below its potential in India as there is lack of awareness about its advantages. The growth of Geotech, which has only about 0.5% share of consumption of technical textile in India, is dependent upon the Goverment regulations for its application and a strict supervision to ensure adequate use. The growth of this segment has been estimated at around 12%.

Hence, we can conclude that Protech, Oekotech, Sportech, Oekotech, Geotech and Packtech are the segments with the maximum growth potential. Packtech and Clothtech followed by Mobiltech and Hometech are the largest segments and the main drivers of growth for the technical textile industry (considering present size as well as expected growth rate). The overall technical textile industry in India is expected to grow at the rate of 11% year on year and reach a size of Rs 62,538 by the year 2012-13.

AGROTECH

Agrotech includes technical textile products used in agriculture, horticulture (incl. Floriculture), fisheries and forestry. The technical textile products covered under Agrotech are given below:-

- Shade-nets
- Mulch-mats
- Crop-covers
- Anti-hail nets and bird protection nets
- Fishing nets

Technical textiles consumption under Agrotech in India is estimated at around Rs 487 crore. Fishing nets constitute over 90% of the Agrotech technical textiles usage valued at Rs 442 crore in 2007-08 and are expected to grow at 5 % year on year.

National Horticulture Mission (NHM) has been actively promoting usage of Agrotech products in India through subsidies and annual plans for the states. NHM has included Agrotech products - shade-nets, mulch mats and greenhouses (greenhouse films are a part of greenhouses), anti-hail nets and bird protection nets under Protective cultivation in the state-wise Action plans. In addition, the XIth five year plan focuses on providing assistance in the hail prone states (like Jammu and Kashmir, Himachal, Uttar Pradesh and any other state which faces similar problem) for procuring anti-hail nets.

Shade nets account for around 6% of the Agrotech segment valued at Rs 28 crore and expected to grow at around 6% year on year.

Mulch mats are set to achieve a phenomenal growth in the next five years. In the XIth plan, the area expansion for mulching is envisaged as 1,00,000 hectare (Rs 150 crore in value terms) (*Source: Report of the Working Group on Horti culture, Plantation Crops and Organic Farming for the XI Five Year Plan (2007-12)*). The mulch mats market is expected to grow from Rs 12.6 crore in 2007-08 to Rs 98 crore by 2012-13.

NHM has included anti-hail nets / bird protection nets under Protective cultivation along with greenhouses, mulching and shade-nets. In the XIth plan, investments for anti-hail nets and bird-protection nets additional coverage have been targeted as 4,000 hectare. Hence, in value terms, the market size of the Anti-hail nets / bird protection nets market in India is expected to increase from Rs 4 crore in 2007-08 to around Rs 9.75 crore by 2012-13.

Overall, the domestic consumption of technical textiles under Agrotech is expected to increase from around Rs 487 crore in 2007-08 to around Rs 709 crore by 2012-13 growing at a CAGR of around 8%.

The total segment imports are Rs 12 crore and account for 2.5 % of the total domestic consumption. The exports are worth Rs 67 crore and account for around 12% of the total production.

Summary of the market-sizing for Agrotech

		2007-08				2012-13	
		Production	**Imports**	**Exports**	**Domestic Consumption**	**Domestic Consumption**	Export Potential
Shade-nets	**Quantity**	5,000 MT	-	2,200 MT	2,800 MT	3,747 MT	
	Value	Rs 45.5 crore	-	Rs 17.5 crore	Rs 28 crore	Rs 37.5 crore	Rs 31 crore
Mulch-mats	**Quantity**	1,050 MT	-	115 MT	900 MT	7,000 MT	
	Value	Rs 14.1 crore	-	Rs 1.5 crore	Rs 12.6 crore	Rs 98 crore	Rs 2.6 crore
Crop-covers	**Quantity**	1,000 MT	-	1,000 MT			
	Value	Rs 10 crore	-	Rs 10 crore			Rs 17.6 crore
Anti-hail/bird protection nets	**Quantity**	152.5 MT	-	17.5 MT	135 MT	325 MT	
	Value	Rs 4.5 crore	-	Rs 0.5 crore	Rs 4 crore	Rs 9.75 crore	Rs 0.9 crore
Fishing nets	**Quantity**	17,000 MT	675 MT	2,332 MT	15,343 MT	19,582 MT	
	Value	Rs 467.5 crore	Rs 11.6 crore	Rs 37 crore	Rs 442.1 crore	Rs 564 crore	Rs 49.5 crore
TOTAL	**Quantity**	**24,168 MT**	**675 MT**	**5,665 MT**	**19,178 MT**	**30,654 MT**	
	Value	**Rs 542 crore**	**Rs 12 crore**	**Rs 67 crore**	**Rs 487 crore**	**Rs 709 crore**	**Rs 102 crore**

As per ECTT report, the potential market sizing for 2007-08 was as given below:-

Market size (ECTT report)		**2001-02**	**2007-08 (P)**
Shade-nets	**Quantity**	780 MT	8,250 MT
	Value	Rs 9 crore	Rs 99 crore

Market size (ECTT report)		2001-02	2007-08 (P)
Mulch-mats	**Quantity**	63 MT	400 MT
	Value	Rs 1 crore	Rs 5.7 crore
Crop-covers	**Quantity**	2,000 MT	4,670 MT
	Value	Rs 25 crore	Rs 58 crore
Anti-hail/bird protection nets	**Quantity**	-	-
	Value	-	-
Fishing nets	**Quantity**	13,300 MT	17,800 MT
	Value	Rs 226 crore	Rs 302 crore
TOTAL	**Quantity**	**-**	**-**
	Value	**Rs 261 crore**	**Rs 465 crore**

The key impediments to the growth of agrotech products are:-

1. Low awareness about the benefits of agrotech products leading to lower off-take of these products
2. High initial investment is required for setting up the infrastructure for production
3. Inability to cope with the volatility in raw-material prices as the raw material (HDPE, LLDPE) costs form a significant percentage of total costs
4. NHM provides a subsidy of 50% of the cost of plant protection technical textiles products like shade-nets and mulch-mats subject to maximum prices of these products as prescribed in the NHM policy. But, the average market price for these products is much more than the prices prescribed under NHM.
5. The lead time for the farmer to get the NHM subsidy after completing the necessary documentation is also a deterrent towards usage of agrotech products.
6. Cascading impact of taxes negatively influences inter-state sales of agrotech products.

The demand for Agrotech products like shade nets, Mulch mats etc depends upon the performance of agriculture sector and also on the awareness and acceptance of these products by the farming community. The subsidies extended by the National horticulture mission will continue to play a crucial role for these products.

Shade nets/Fabrics

Shade nets have widespread applications in floriculture (roses, orchids, etc), horticulture (Cabbage, pepper, Grapes etc), vanilla cultivation, tea plantations, drying of agri-products, cattle-sheds, parking lots, swimming pools, etc. The shade nets provide protection to the plants from wind, extreme weather conditions and reduce water evaporation.

India with more than 32 MT of fruits and 66 MT of vegetables is the second largest producer of fruits and vegetables. India is the second largest producer of flowers after China with about 1,15,921 hectares of area under floriculture. India has adopted some of the newer techniques for agriculture, but modern techniques involving the use of polymers are still lagging behind. In comparison, China's agricultural sector uses modern techniques and consumes products like shade nets extensively. Hence, the potential of the shade-nets market in India is huge, in comparison with its existing usage.

Product characteristics

Shade nets are generally made of Polypropylene or HDPE in knitted or woven form. Shade-nets are tough, durable, tear resistant and light weight. The standard sizes of nets available are 2, 3, 4 & 8 metres in width and 25, 50 and 100 metres in length. The most common dimensions of these nets are 3 m (width) by 50 m (length) with GSM of 120 to 180. The shade nets are generally Green or Black in colour. The shade percentage, which indicates the degree of shade provided by the shade-nets, varies from 25 percent to 90 percent. The shade percentage depends upon the application / plants under cultivation.

Type of Crop	Recommended shading by manufacturers
Roses, Strawberries, Gooseberries, Tomatoes, Cucumber and fruit bearing plant	25%
general Pot and foliage plants and Cut greens, Orchids, Anthuriums, Ginger,	50%
Indoor plants, certain Orchids, plantation crops, Tea, Coffee, Cardamom	75%
Cattle sheds, Poultry houses, and vehicular shades	95%

Source: Industry survey

Key application areas of shade-nets

The key application areas of shade nets are:

- Agricultural applications - grape cultivation, orchid plantations, tea plantations, nurseries
- Non-agricultural applications – swimming pool coverage, parking lots, etc

The demand for shade nets largely depends upon the usage in floriculture and horticulture. The increasing awareness of the benefits of using shade nets and assistance from schemes of National Horticulture Mission (NHM) are making a significant impact on the demand.
The demand for shade nets for grapes cultivation is slowing down as farmers are increasingly using paper instead of shade nets. The papers help to protect the plants from cold climate apart from providing the functionality of shading. How ever, the inspection of plants for any disease becomes difficult in case of paper usage.

The tea garden nurseries hold a lot of potential for shade-nets. The shade nets usage in the tea gardens nurseries is derived from the number of tea gardens going for replantation. Since the re-plantation of tea gardens is fairly minimal in India, shade nets usage is not significant in tea gardens.

The demand for shade nets is also increasing in non-agricultural applications like parking lots, garden fences, etc.

Market dynamics and key growth drivers: Horticulture Industry in India

Production base of horticultural crops has been expanding since independence. From eighth plan onwards, this sector has witnessed tremendous growth in area, production and productivity. The area has increased from 13.43 million hectare in 1991-92 to 21.74 million hectare in 2004-05 (which is about 13% of the total cultivated area) while production increased from 97.83 million MT (1991-92) to 171.86 million MT during 2004-05.

The states/ UTs namely Chattishgarh, Gujarat, Haryana, Jharkhand, Madhya Pradesh, Nagaland, Punjab, Uttar Pradesh, Dadar & Nagar Haveli have less than 10 per cent coverage of area under horticultural crops and thus require priority attention to horticulture development in the XI Plan. The states namely Andhra Pradesh, Assam, Bihar, Karnataka, Maharashtra, Orissa, Rajasthan, Tamil Nadu and Uttarankhand cover about 10-25 per cent area under horticultural crops. There is still tremendous scope for exploitation of horticulture production in these states. Other states cover more than 25 % area in horticultural crops.

In 2005-06, there were about 6,300 nurseries under public and private sectors. In addition, over 1,300 nurseries were developed during 2006-07 under Central Govt. Sponsored Schemes like NHM and TMNE.

At present, there are over 7,500 registered small and medium scale nurseries. Large nurseries are about 100 in the country. Under NHM, about 2,830 new nurseries are to be established by the end XI Plan.

The crop wise requirement of planting material in various horticultural crops has been estimated in the XI plan by a modest expansion of 4% per annum. Thus the total requirement of planting material of fruits, coconut, cashew, black pepper, tree spices, areca-nut, etc. which was around 1400 millions by 2002 which can be projected as 2,000 million by 2012.

In fruit crops projected demand of planting material during 2007-08 is estimated as 7,145,841, which will increase to 83,59,632 during 2011-12 (4% increase y-o-y). In vegetable seeds, the annual seed requirement is expected to be more than 185 MT of breeders' seed. The area under floriculture would increase by 5,000 hectare during the XI plan period the demand for planting material during the period would be around 19,681 lakhs, which would require approximately 2,232 ha of nursery area.

The demand for shade nets is geographically dispersed and it is quite a challenge to serve this market. The states of Maharashtra, Tamil Nadu, Andhra Pradesh, Himachal Pradesh and Karnataka are the major consumers of shade-nets in India. Typically, the shade net manufacturers sell a significant percentage of products to dealers who in turn sell them to the cultivators.

Norms of Assistance for programmes under NHM

Grant from the Govt. of up to 50% of the cost of shade-nets @ Rs. 14 / sq. m. limited to 2 hectare per beneficiary. The market price of shade-nets is around Rs 22 per sq. m.

Consumption of shade-nets as per NHM

NHM has included shade-nets under Protective cultivation along with greenhouses and mulching. Protective cultivation Action plans (including shade-nets, mulching and greenhouses) for different states approved for 2006-07 (as per NHM) is given in Annexure 1. The area covered under the NHL state action plans for Protective cultivation increased from 3,055 hectare in 2005-06 to 8,235 hectare in 2006-07 (excluding North-eastern and Himalayan states). The shade net targets (2007-08) under NHM for some of the key horticulture states is given in Annexure 2. The total shade nets target coverage is around 1,600 hectares.

Other applications of shade-nets account for around 20% of the consumption (based on discussion with manufacturers).

Market size of shade-nets and future forecast

The market size of shade-nets has been estimated as given below:-

Shade-nets usage in India

Existing penetration	Over 5,000 hectares
Total potential area	1 lakh hectares
Life of shade-nets	4 years
Annual shade nets usage targeted as per NHM state action plans (adjusted)	1,600 hectares
Average price	Rs 10 to 22 per square metre (for GSM 100 to 200) (or Rs 100 per kg)
Average GSM of shade-nets usage	140 GSM (50 – 200 GSM, generally between 120 GSM to 180 GSM)
Share of applications other than agriculture in shade-nets usage	20% of total usage
Total shade-nets consumption	**Rs 28 crore approx** **Around 2,000 hectare or 2,800 MT**

Source: Industry survey, NCPAH, NHM state action-plans, Report of the Working Group on Horticulture, Plantation Crops and Organic Farming for the XI Five Year Plan (2007-12), IMaCS Analysis

In addition to the 7500 nurseries in India, about 2,830 new nurseries are expected to be established by the end XI Plan under NHM (increase of around 6.5% y-o-y over the next 5 years).

As per Report of the Working Group on Horticulture, Plantation Crops and Organic Farming for the XI Five Year Plan (2007-12), the crop wise requirement of planting material in various horticultural crops has been estimated by a modest expansion of 4% per annum. Thus the total requirement of planting material of fruits, coconut, cashew, black pepper, tree spices, areca-nut, etc is projected as 2,000 million by 2012 (around 1400 millions by 2002).

In fruit crops projected demand of planting material during 2007-08 is estimated as 7,145,841, which will increase to 8,359,632 during 2011-12 (4% increase y-o-y). In vegetable seeds, the annual seed requirement is expected to be more than 185 MT of breeders' seed. The area under floriculture would increase by 5,000 ha during the XI plan period the demand for planting material during the period would be around 19,681 lakhs, which would require approximately 2,232 hectare of nursery area i.e. around 400-500 hectare of additional shade-nets for floriculture nurseries per annum.

Though in the XIth plan, the area expansion for shade-nets is envisaged as 200 hectare (Rs 100 crore in value terms) only, the state governments are expected to focus on increasing the usage of shade-nets in

their states. Since the average life of shade-nets is 4 years and the existing penetration of shade-nets is over 5,000 hectare, the replacement demand of shade-nets in 2012-13 is expected to be over 1,250 hectares. In addition, the incremental demand of shade-nets would be around 700-800 hectares per annum. Hence, we have assumed yearly growth rate of 6% for the shade-nets usage based on incremental requirement of nurseries.

The current and future forecast of shade-nets consumption is given below:-

Shade nets domestic usage	2007-08	2012-13
Quantity	2,000 hectare or 2,800 MT	2,676 hectare or 3,747 MT
Value	Rs 28 crore	Rs 37.47 crore

Source: Industry survey, IMaCS Analysis

The Indian shade-nets market size is expected to increase from 2,000 hectare (or 2,800 MT) in 2007-08 to around 2,676 hectare (or 3,747 MT) by 2012-13. No inflationary increase has been assumed for the price of shade-nets fabric. Hence, in value terms, the market size of the shade-nets market in India is expected to increase from Rs 28 crore in 2007-08 to around Rs 37.47 crore by 2012-13.

Key manufacturers

Rishi Packers Ltd and Tuflex (Netlon India Ltd) are the largest manufacturers and exporters of shade nets in India. Most of the shade-nets manufacturing units in India are small-scale units, concentrated in the states of Maharashtra and Gujarat. Some of the other manufacturers of shade fabrics are Malmo Exim Ltd (Mumbai), Kwality Nets (Mumbai), B & V Agro (Mumbai) and Sunpak (Tamil Nadu).

Manufacturer	Year	Production quantity	Installed capacity
Rishi packers*	2006-07	715 MT or 590 hectare	1500 MT
Tuflex (or Netlon)	2007-08		700 MT
Kwality Nets	2005-06	65 MT	
Agro Shade Industries	2004-05	30 MT	
Agrotech	2005-06	130 hectare	
Amrish Engineering	2004-05	60 MT	
B & V Agro Irrigation Co.	2004-05	350 MT*	
Colour Concentrate	2004-05	120 MT	
Dhanya Polymers	2004-05	60 MT	
Golden Agronet	2004-05	60 MT	
Malmo Exim Ltd.	2005-06	132 MT	
Shree Siddhivinayak Polyfab	2004-05	100 MT	

Manufacturer	Year	Production quantity	Installed capacity
Sunpack	2004-05	250 MT	
Supak Pvt. Ltd.	2004-05	250 MT	

** 20 lakh pieces in 2005-06*

Source: Capitaline, Annual reports, Industry survey, www.plastemart.com

Imports and Exports of Shade-nets

The estimated export figures for shade-nets are as given below:-

HS Code	Description	Exports (in MT)	Exports (in Rs crore)
		2007-08(E)	**2007-08(E)**
39269099, 39269029, 39269080, 39249090	HDPE SHADE NETS	**Around 200 MT***	**~ Rs 2.5 crore**
39269080, 39232990, 39261019, 39269099	PP WOVEN FABRICS WITH UV STABILIZER/MASTER BATCH	**Around 2000 MT**	**~ Rs 15 crore**
60059000	AGRO SHADE NETS – HDPE WARP KNITTED SHADE NETS	**Around 10 – 15 MT #**	**~ Rs 0.1 crore**

Source: IBIS, IMaCS Analysis

** Shade nets exports under HS code 39X is estimated as around 150 hectare and converted to MT using GSM 140*

 # Shade nets exports under HS code 60X is estimated as around 7 - 10 hectare and converted to MT using GSM 140

UAE accounts for over 75-80% of exports of HDPE shade-nets of India with HS code 39X followed by Ireland with around 20% share. In addition, India also exports shade-nets to countries like Maldives, Sri Lanka, Sudan, Trinidad etc.

Italy, Belgium and Poland account for over 80-85% of exports of PP woven fabrics with UV master-batch with HS code 39X. The remaining exports are accounted by USA and Bulgaria.

The exports of shade-nets in the year 2012-13 are expected to Rs 30.8 crore.

The imports of shade nets are almost negligible and the domestic demand is completely satisfied by domestic production.

Raw-materials

The standard sizes of shade-nets available are in widths of 2, 3, 4 &8 metres and in length of 50 and 100 metres. The most common dimensions of these nets are 3 m (width) by 50 m (length). The shade nets are generally Green or Black in colour with varying shade percentage from 25 percent to 90 percent.

Shade nets are generally made of Polypropylene or HDPE in knitted or woven form. The basic raw material is the HDPE/PP granules (Reliance Industries Ltd. is the major supplier). The HDPE granules are used in most of the cases as it is cheaper than Polypropylene. Additives are added to these shade nets for UV stabilization. The additives allow nets to resist the atmospheric agents, particularly the harmful UV rays, thereby, increasing the life of the nets and provide protection to the plants.

Key machinery manufacturers/suppliers in India

Existing HDPE Woven sack processors can manufacture HDPE Agri-shade nets on the same tape extruder with an additional investment in knitting machines. Thus increasing the product mix leading to higher capacity utilization of the machinery would bring in a higher net profitability.

The raschel knitting machines used for manufacturing shade-nets are mostly imported. GCL India Pvt ltd (Bangalore) is one of the local manufacturers of raschel knitting machines. The key raschel knitting machinery manufacturers in the world are Karl Mayer (Germany), LIBA Maschinenfabrik GmbH (Germany) and Brückner Technology Holding GmbH (Germany).

Knitting loom machines are widely used for the knitting process. SASMIRA has developed a method by which the leno weaving machines can be used instead of Raschel knitting machines. Malmo Exim and few other SSI units are using these machines.

The Indian associates / suppliers for these machinery manufacturers are:

- ATE engineering (Bombay) for Karl mayer
- Brückner Machinery and Service India Pvt Ltd (Pune) for Bruckner.

The machinery costs around Rs 2-2.5 crore and has a capacity of 60-150 linear metre / hour. The cost of the machine depends on whether the raw material is in monofilament form or in tape form. The machinery cost is inclusive of warping machine which is used along with the knitting machine.

Quality Control and Standards - No BIS code is available for shade nets.

Mulch Mats or Ground covers

Mulching is defined as covering of soil around the plants to conserve soil moisture, reducing nutrient loss by leaching and weeds control where chemical fertilizers and weedicides are used and to modify soil temperature. Mulching also reduces run-off, increase penetration of rainwater, controls erosion, corrects the chemical balance of the soil and reduces damage done by pests and diseases. Apart from these major results mulching produces secondary effects such as improvement of soil structure, increase in micro-activity, earthworm populations and root systems that are more extensive. Black film prevents the germination and growth of weed seeds in contrast to clear film. It absorbs more sun energy and retains higher heat underneath the film.

In India, straw, hay, sawdust, asphalt paper, etc is traditionally used for mulching. Use of technical textiles for mulching is yet to grain momentum.

At present, mulch mats are being used mainly in vegetable (which are short duration crops) and few fruit crops. Mulch mats keep ripening fruits, off the soil. The reduced contact with the soil decreases fruit rot as well as keeps the fruit and vegetables clean. This is beneficial for the production of several fruits including strawberries. Before plantations of the seedlings, the beds of the field are covered with the mulch film (generally a black opaque film) and the holes are made at the desired spots where in the seeds are planted. The use of mulch mats along with the use of drip irrigation can lead to significant increase in productivity. But, the non-biodegradable mulches must be removed from the field and disposed off properly.

Product characteristics and Raw-materials

Mulch mats are made of both natural (wool and jute) and man made fibres (LLDPE, HDPE). Mulch mats can be classified as:-

- Woven
- Non-woven
- Mulch-films

Wool fibre is used for designing **Non-woven Mulch mat**, LLDPE polymer is used for **Mulch films** (Extruded sheets in various thicknesses, microns) and fibres like jute and cotton are used for **Woven mulch mats**.

Mulch mats made of biodegradable material are incorporated into the soil as fertiliser for the next crop. Wool mulch mats allow water to enter in to the soil (unlike black sheet) and act as a barrier to prevent excessive soil desiccation during dry period. It also provides better insulation and prevents damage from ground frost. On the other hand, HDPE/LLDPE mulch films are cheaper and last for one to four years.

Mulch films made of LLDPE are most commonly used for mulching in India. Reliance industries Ltd is the major supplier of LLDPE. The films of various thicknesses are manufactured by the process of extrusion. The thickness of the films is based on the crop requirement and the time-period for which the mulch films are intended to be used. For instance, some manufacturers recommend 7 microns film for crops like groundnut. Mulch films of thickness 100 microns are used for mango trees, which are used over many years. The most common thicknesses of films are 25, 50 and 100 microns. The coverage of mulch films is dependent on the thickness. UV master-batch is added to ensure UV stabilisation.

Thickness (Micron)	Coverage (sq. m. per kg)	Type of crops
7	140	Short duration crops (3 to 4 months)
25	40	
50	20	Medium duration crops (11-12 months)
100	10	Long duration crops (more than 12 months)

Source: Industry survey, NCPAH

The mulch films are available in the market in the form of rolls. The most commonly available films have a width of 1-1.15 metres. The films are generally black in colour as black colour absorbs the maximum heat and hence leads to higher soil temperature.

Market dynamics and key growth drivers

Mulch-mats are largely used in floriculture, horticulture and fruit crops. The major consumption of mulch films is in the cultivation of strawberries, watermelon, groundnuts, vegetables, etc. The demand of mulch films is seasonal in nature as the mulch films are used at the beginning of the agricultural season.

The increasing awareness of the benefits of using mulch-mats and assistance from schemes of National Horticulture Mission (subsidy of 50% of the total cost subject to a maximum of Rs. 7000/hectare limited to 2 hectare per beneficiary) will have a significant impact on the demand.

The capacity for mulch films is interchangeably used with nursery bags, green house films, etc. Mulch films are made on order. The manufacturers prefer to sell the products through distributors / dealers to reach the end customers in far off places.

Norms of Assistance for programmes under NHM

Grant from the Govt. of up to 50% of the cost of mulching @ Rs. 14,000 / hectare limited to 2 hectare per beneficiary. The market price of mulch mats is around Rs 21,000 per hectare.

Consumption of mulch-mats as per NHM

NHM has included mulching under Protective cultivation along with greenhouses and shade-nets. Protective cultivation Action plans (including shade-nets, mulching and greenhouses) for different states approved for 2006-07 (as per NHM) is given in Annexure 1. The area covered under the NHL state action plans for Protective cultivation increased from 3,055 hectare in 2005-06 to 8,235 hectare in 2006-07. Mulch-mats account for around 75% of the area coverage under protective cultivation. Around 1,512 hectare of area was added for mulching in the north-eastern and Himalayan states alone during the Xth plan. The mulching targets (2007-08) under NHM for some of the key horticulture states is given in Annexure 3. The total mulching target coverage under NHM is around 9,600 hectares. We have assumed around 60-65% target achievement for mulching.

Market size of mulch-mats and future forecast

The market size of mulch-mats has been estimated as given below:-

Mulch-mats usage in India

Existing penetration	Over 10,000 hectares
Total potential area	10 lakh hectares
Life of mulch-mats	0.5 to 4 years (Average life of 2 years at present)
Annual mulch-mats usage targeted as per NHM state action plans (adjusted)	6,000 hectares
Average price	Rs 140 per kg (or Rs 21,000 per hectare)
Average GSM of mulch-mats usage	15 GSM (7 – 100 GSM, generally between 7 GSM to 25 GSM in India)
Total mulch-mats consumption	**Rs 12.6 crore approx** **Around 6,000 hectare or 900 MT**

Source: Industry survey, NCPAH, NHM state action-plans, Report of the Working Group on Horticulture, Plantation Crops and Organic Farming for the XI Five Year Plan (2007-12), IMaCS Analysis

At present, mulch mats are being used mainly in vegetable (which are short duration crops) and few fruit crops, therefore, the average life of mulch-mats is around 2 years. The existing penetration of mulch-mats is over 10,000 hectare.

In the XIth plan, the area expansion for mulching is envisaged as 1,00,000 hectare (Rs 150 crore in value terms) (*Source: Report of the Working Group on Horticulture, Plantation Crops and Organic Farming for the XI Five Year Plan (2007-12)*). Assuming that the area addition will happen largely for crops with higher average life (and higher GSM) and the average life would increase to around 3 years, the replacement demand of mulch-mats in 2012-13 is expected to be around 50,000 hectares.

We have assumed 50% achievement of the target for additional mulching area as per XIth plan. In this scenario, the replacement demand in 2012-13 will be around 25,000 hectrares. The incremental demand will be 10,000 hectare (at 50% achievement level of the XIth plan target). Hence, the total demand of mulch-mats is estimated at around 35,000 hectares per annum. In addition, the average life of mulch-mats is assumed as 3 years and average GSM as 20, for 2012-13.

The current and future forecast of mulch-mats consumption is given below:-

Mulch-mats domestic usage	2007-08	2012-13
Quantity	6,000 hectare or 900 MT	35,000 hectare or 7,000 MT
Value	Rs 12.6 crore	Rs 98 crore

Source: Industry survey, IMaCS Analysis

The Indian mulch-mats market size is expected to increase from 6,000 hectare (or 900 MT) in 2007-08 to around 35,000 hectare (or 7,000 MT) by 2012-13. No inflationary increase has been assumed for the price of mulch-mats. Hence, in value terms, the market size of the mulch-mats market in India is expected to increase from Rs 12.6 crore in 2007-08 to around Rs 98 crore by 2012-13.

Key manufacturers of the product with information on capacity / production / sales

Some of the major manufacturers of mulch mats are Unimin, Fiberweb India, Shivam Polymers, Climax Synthetics Pvt. Ltd, Creative polymers Pvt. Ltd and Essen Multipack Ltd. Many of these players are located in Gujarat. Most of the manufacturers of mulch mats are small-scale industries.

Imports & Exports of mulch-mats

The quantum of imports for mulch mats is not significant as per discussions with the industry players.

The estimated export figures for ground covers (used for weed control) are as given below:-

HS Code	Description	Exports (in MT)	Exports (in Rs crore)
		2007-08(E)	**2007-08(E)**
39269099	GROUND COVERS (GSM 70-90)	**Around 115 MT**	**Approx. Rs 1.5 crore**

Source: IBIS, IMaCS Analysis

Ground covers are exported from India to Netherlands and UK as well as to Sri Lanka in small amounts. In the year 2012-13 the exports are expected to reach Rs 2.6 corre gorwing at a CAGR of 12%.

Unimin, Fiberweb India and KT Exports (I) Pvt. Ltd are the key exporters of soil/ground covers (mulching) for weed control and moisture retention.

Key machinery manufacturers/suppliers in India

Monolayer Blown Film Lines as well as Multilayer Blown Film Lines are used for the manufacture of mulch films. Monolayer lines give higher specific output per screw RPM. They have grooved feed technology for forward movement of the raw material and candle type screen changer to ensure wastage control and long production runs.

The machinery required is available locally and there are number of manufacturers for the same. The major Indian manufacturer of these lines is Kabra Extrusion Technik Ltd (KET). A Plastic Mulch Laying Machine was also developed at CIAE, Bhopal.

Some of the manufactures have indicated the usage of Leaflet tubing machinery which does the melting and extrusion of films in various desired shapes.

Quality Control and standards in India

Mulch Films (HDPE & LDPE) are covered under IS 10889:2004 and IS 2508:1984.

Anti Hail Nets and Bird protection nets

Anti-hail nets are used to protect the crops like apple, litchi, etc from hails in hail prone areas and high altitude areas like Himachal Pradesh, Jammu & Kashmir, Uttar Pradesh, North-eastern states, etc. The anti hail nets are normally provided for each individual tree.

Huge losses are caused by birds in most of the crops. The crops like grapes, guava, pomegranate are severely infested by parrots. Sometimes the parrots can destroy the entire crop within hours. To avoid such huge losses, **bird protection nets** are used.

Product characteristics – Bird protection nets

Bird protection net is a mesh product designed to exclude the birds and stop the expensive losses they can inflict on the crop. With an optimal holes size, it is large enough to allow movement of bees and keeps shade to a minimum. It does not prevent light from reaching the plants below and so flourish. Bird netting allows free movement of air means that dangerous fungus does not develop on the fruit. These nets are manufactured from Polypropylene or HDPE Monofilament yarn (UV stabilised) and knitted into a durable mesh fabric. Bird protection nets are typically around 25 to 40 GSM ultra-light fabrics. These nets are tough, durable, tear resistant and light weight. The standard sizes of nets available are 1, 2, 3 & 6 metres in width and 10, 20, 50 and 100 metres in length. These nets are generally Green, Blue or White in colour. The shade percentage, which indicates the degree of shade provided by the nets, is around 20%.

- Bird protection nets are placed over trees and fields to protect the fruit from being eaten by birds.
- These net are strong yet lightweight and protect the fruit without restricting plant growth.
- The nets are usually worked with two stitch-forming guide bars, and have a basic construction in which the openings are produced.
- The size of the diamond-shaped openings can be increased or decreased by varying the repeat length of the connecting sections.
- The use of polyethylene tape yarns or monofilament yarns makes the net extremely durable and hard-wearing.

Product characteristics – Anti-hail nets

Anti-hail nets are used to prevent hail damage in a broad variety of crops. These are woven from HDPE yarn or are combination of HDPE monofilament and tape in knitted form, stabilised against UV rays. These nets are transparent in color with hole size of 2*100 mm to allow the crops to receive a low level of

shade (13% to 30%). The GSM of these nets varies from 60 to 100. These nets are flexible, light, strong and easy to spread, and can be placed on simple support structures.

Norms of Assistance for programmes under NHM

The XIth plan provides assistance in the hail prone states (like Jammu and Kashmir, Himachal, Uttar Pradesh and any other state which faces similar problem) for procuring anti-hail nets. Grant from the Govt. of 50% of the cost of anti-hail nets up to Rs. 500 / tree subject to a maximum of 50 trees per beneficiary is provided. Grant from the Govt. of 50% of the cost of bird-protection nets @ Rs. 2,000 / hectare subject to a maximum of 1 hectare per beneficiary is provided.

Consumption of anti-hail / bird protection nets as per NHM

The usage for anti-hail nets has been inconsistent across states over the last 5 years. In 2002-03, 10,750 trees were covered under anti-hail nets in the North-Eastern states, Uttaranchal & Himachal Pradesh. The usage dropped in 2003-04 and 2004-05 as the usage in Sikkim and Manipur reduced. In 2005-06, 12,030 trees were covered under anti-hail nets in Uttaranchal, Sikkim & Himachal Pradesh. In Meghalaya, 4,994 trees were covered under anti-hail nets in 2006-07. In 2007-08, over 20,875 trees were targeted under anti-hail nets and 109 hectare under bird-protection nets in Himachal Pradesh and Uttaranchal. In 2008-09, over 26,751 trees are targeted under anti-hail nets and 131 hectare under bird-protection nets in Himachal Pradesh and Uttaranchal. Hence, the anti-hail nets usage has grown at a CAGR of around 15%.

NHM has included anti-hail nets / bird protection nets under Protective cultivation along with greenhouses, mulching and shade-nets. In the XIth plan, investments for anti-hail nets and bird-protection nets additional coverage have been targeted as 4,000 hectare.

Market size of anti-hail nets / bird protection nets and future forecast

The market size of Anti-hail nets has been estimated as given below:-

Anti-hail nets usage in India

Existing penetration	Over 50,000 trees
Life of Anti-hail nets	7 to 8 years
Annual Anti-hail nets usage targeted as per state action plans (adjusted)	20,000 trees (at around 200 trees per hectare)
Average price	Rs 32 per sqm
Average GSM of Anti-hail nets	Around 100 GSM
Total Anti-hail nets	**Rs 3 crore approx** **Around 100 MT**

Source: Industry survey, NCPAH, National Technology Mission for North Eastern states, Report of the Working Group on Horticulture, Plantation Crops and Organic Farming for the XI Five Year Plan (2007-12), IMaCS Analysis

Bird-protection nets usage in India

Annual Bird protection nets usage targeted as per state action plans (adjusted)	Around 100 hectare
Average price	Rs 11 per sqm
Average GSM of Bird protection nets	Around 25 to 40 GSM
Total Bird protection nets	**Rs 1 crore approx** **Around 30-35 MT**

Source: Industry survey, NCPAH, National Technology Mission for North Eastern states, Report of the Working Group on Horticulture, Plantation Crops and Organic Farming for the XI Five Year Plan (2007-12), IMaCS Analysis

The existing penetration of Anti-hail nets is around 50,000 trees while that of bird-protection nets is negligible.

In the XIth plan, the area expansion for anti-hail nets is envisaged as 4,000 hectare (*Source: Report of the Working Group on Horticulture, Plantation Crops and Organic Farming for the XI Five Year Plan (2007-12)*). Hence, the demand of Anti-hail nets / bird protection nets in 2012-13 is expected to be over 1,000 hectares. In terms of anti-hail nets for trees, the trees coverage per annum under anti-hail nets is expected to increase to over 45,000 trees per annum (increasing at a CAGR of 15%) i.e. anti-hail nets usage of 225 MT. Assuming 50% target achievement (of 1,000 hectare), the bird-protection nets usage is projected to be around 300 hectare in 2012-13 (or approx. 100 MT).

The current and future forecast of Anti-hail nets / bird protection nets consumption is given below:-

Anti-hail nets / bird protection nets domestic usage	**2007-08**	**2012-13**
Quantity	135 MT	325 MT
Value	Rs 4 crore	Rs 9.75 crore

Source: Industry survey, IMaCS Analysis

The Indian Anti-hail nets / bird protection nets market size is expected to increase from 135 MT in 2007-08 to around 325 MT by 2012-13. No inflationary increase has been assumed for the price of Anti-hail nets / bird protection nets. Hence, in value terms, the market size of the Anti-hail nets / bird protection nets market in India is expected to increase from Rs 4 crore in 2007-08 to around Rs 9.75 crore by 2012-13.

Key manufacturers of anti-hail nets / bird protection nets

Some of the major manufacturers of Anti-hail nets / bird protection nets are Tuflex, Kwality Nets and Garware Wall ropes.

Imports & Exports of Anti-hail nets / bird protection nets

The quantum of imports for Anti-hail nets / bird protection nets is not significant as per discussions with the industry players.

The estimated export figures for Anti-hail nets / bird protection nets are as given below:-

HS Code	Description	Exports (in MT)	Exports (in Rs crore)
		2007-08(E)	2007-08(E)
56075090	Bird protection nets	**Around 15-20 MT**	**Approx. Rs 0.5 crore**

Source: IBIS, IMaCS Analysis

Bird-protection nets are being exported from India to New Zealand. In addition, small quantities of predator nets are also exported to New Zealand. These exports are expected to grow at a CAGR of 12% and reach a size of Rs 0.9 crore.

Key machinery manufacturers/suppliers in India

Similar to shade-nets

Quality Control and Standards

No BIS code is available for anti-hail nets and bird protection nets.

Crop covers

Crop-covers create an excellent microenvironment for seed germination and seedling growth. A crop-cover is placed over a large area (several rows) of a crop. In cooler climates, crop-covers are often placed over direct seeded rows or recently transplanted crops to create a warmer, more humid microenvironment to facilitate rapid plant establishment of warm season crops. Crop covers also provide crop protection from insects.

Advantages of using crop covers:

- Higher soil and air temperatures compared to those in the open field which leads to early harvest
- Protect crops from rain, hail, snow and wind
- Providing protection against insect pests
- Improvements in seed bed conditions
- Crop covers can also be used as a means to separate varieties to maintain line purity by excluding insects and thus preventing cross pollination
- Higher yields and improved crop quality

Product characteristics

The crop covers can be classified as:-

- Woven
- Non Woven
- Sheet / Film

Non-woven crop-covers are the most common across the world. The light weight and the permeability of these covers allow gas exchange and penetration of rain, controls insects, enhances growth and freeze protection and eliminates hand ventilation. Although non-woven materials are more expensive, they do not burn or chaff crops as readily by allowing some penetration of water and lowering the maximum temperatures beneath the cover.

The non-woven crop covers are UV Treated fabrics of polypropylene manufactured using the spun bond technique. The crop covers are light in weight (generally 17-19 grams per square metre) so that the plants are not crushed under their weight. Generally 17 to 19 GSM UV treated white fabric is used in hot climate and 20 to 30 GSM in cold climates to protect the crops from frost. The non woven fabrics are packed in the form of rolls of 3 metre width and length of 450-500 metres.

In addition, woven crop-covers are also used around the world. The simplest and most economical form of crop covers are the direct or floating covers with no sustaining wire or cane hoops.

The primary raw material, Polypropylene is available locally. (Reliance Industries Ltd is the largest manufacturer).

Market dynamics and key growth drivers

The discussions with the manufacturers have revealed that the domestic market size of crop-covers is insignificant. However, the Indian market holds a great potential for the non-woven crop covers. It is estimated that the ultimate potential area requiring crop covers is one million hectares. But, in the absence of any government policy for promoting the use of crop-covers in India, the domestic consumption has not picked up.

The manufacturers cater to the export demand from the middle-east countries like UAE, Oman, as well as developed countries like UK and USA. The demand from these countries is the most important factor affecting the industry. The future performance of the industry depends on value addition and new product development apart from cost competitiveness.

Key manufacturers and exporters

Unimin India Ltd, Fiberweb India Ltd, KK Non-woven and KT Exports are the major manufacturers and exporters of crop covers in India apart from Surya Textech (Chandigarh) and Vimal Industries (Himanchal Pradesh).

Manufacturer	Year	Product	Production quantity**	Installed capacity
Unimin	2007-08	SBPF	165 MT*	
Fiberweb India	Jan-Dec, 2007	Non-woven fabrics (spunbond)	3,312 MT	4,000 MT

Source: Capitaline, Annual reports, Industry survey

** The production of SBPF at Unimin India has dropped from 2,243 MT in 2005-06 to 165 MT in 2007-08 because of on-going operational issues in the plant.*

***The non-woven fabric is sold for other applications also*

Market size of crop-covers and future forecast

The domestic consumption of crop-covers is negligible (as discussed with manufacturers). Plastic sheets or low tunnels are used instead of crop-covers in India. Hence, the total size of the industry is equivalent to exports. Since there is no focus on crop-covers in the XIth plan, the usage of crop-covers is not expected to pick-up in India over the next 5 years. Once the production at Unimin picks up again, the total

production of crop-covers is expected to increase considerably. Several other units have also set-up spun-bond non-woven capacities. Hence, the exports of crop-covers are expected to increase by 20% y-o-y over the next 5 years.

The current and future forecast of crop-covers production in India is given below:-

Crop-covers production	2007-08	2012-13
Quantity	1,000 MT	2,500 MT
Value	Rs 10 crore	Rs 25 crore

Source: Industry survey, IMaCS Analysis

Imports & Exports of crop-covers

The quantum of imports for crop-covers is not significant as per discussions with the industry players. The estimated export figures for crop-covers are as given below:-

HS Code	Description	Exports (in MT)	Exports (in Rs crore)
		2007-08(E)	**2007-08(E)**
39269099, 56031100	CROP-COVERS (GSM 17-21)	**Around 1,000 MT**	**Approx. Rs 10 crore**

Source: IBIS, IMaCS Analysis

Crop-covers are exported from India to Middle-east countries UAE, Saudi Arabia and Oman. The exports of crop covers in the year 2012-13 are expected to be to the tune of Rs 17.6 crore, growing at 12% year on year.

Key machinery manufacturers / suppliers in India

Most of the machinery used is imported from Germany, China and Taiwan. Unimin India Ltd has installed machinery of Reicofil GmbH (Germany).

For spun-bond non-woven manufacture, the commonly used production line is Reicofil double beam production line manufactured by Reifenhauser Gmbh of Troisdorf, Germany. Several Indian players have imported Chinese machinery (e.g. single beam PP spunbond line from Shaoyang, China) at a much cheaper price.

Quality Control and standards in India

There are no Indian standards available

Fishing nets

Fishnets are key technical textiles used in fishing industry. Fishing nets are knitted fabrics used for marine and inland fishing by fisherman, fishing trawlers and boats. The characteristics and specifications of fishnets vary based on the method adopted for fishing.

Product characteristics

Fishing nets are classified as:

- HDPE fishnets
- Nylon Mono-filament fishnets and
- Nylon Multi-filament fishnets

Fishnets are made from Nylon or HDPE twines which could be used in monofilament form or single twines twisted together for multifilament form. The basic characteristics for fishnets are transparency and invisibility in water. The critical operational characteristics of fishnets are - high tensile strength, high knot breaking strength, high abrasion resistance and low drag resistance. The mesh size ranges from 10 mm to 2,000 mm based on area and method of application. The various types of knots used for fishnet construction are single, double and U-knots. In case of multifilament nets, the number plies in the yarn varies from 2 to 36. The length and breadth dimensions of the fishnets are primarily driven by customer specifications. These nets are available in 100 m, 250 m, 500 m, 600 m and 1000 m spools.

Market dynamics and key growth drivers – Fishing industry in India

India is one of the leading fish producing countries in the world with third position in fisheries and second in aquaculture. India is endowed with vast fisheries resources in terms of a coast line of 8,118 km and 2.02 million square km of Exclusive Economic Zone, including 0.530 million square km of continental shelf. The inland fisheries resources include rivers and canals (1.95 lakh km), reservoirs (3.15 million ha), floodplain wetlands (0.35 million ha), estuaries (0.26 million ha), freshwater waters (2.41 million ha) and brackish-water bodies (1.24million ha). At present, an estimated 14 million people are engaged in fishing, aquaculture and ancillary activities.

Fisheries contribute 1-2% of the national GDP and 5-6% of the agricultural and allied activities. Demand for fish and fish products are increasing both in the domestic and export markets. This has been caused due to the health concerns and the perception of fish as a healthy food with high levels of digestible protein and cholesterol lowering capabilities. The projected demand for fish in the country by 2012 is 9.74 million tonnes (Fisheries Division, 2006, NCAP, 2006) including 5.9 million MT for the domestic

market, up from the demand for fish in 2005-06 of 6.37 million MT. The projected supply of fish is 9.60 million MT by 2012 with major share of 5.34 million MT from inland aquaculture followed by 3.10 million MT from marine fisheries. Hence, the fish production in India is expected to increase at around 7% p.a.

Going further there would be increased modernisation of fishing industry and improved fisheries culture which would boost the industry growth.

Market size of fishing nets and future forecast

The total production of fishnets in 2007-08 is estimated as around 12,000 MT *(Source: Indian Fishnets Manufacturers Association) by the members of the association*. In addition, large players like garware Wall Ropes, Garware Marine, Kwality Nets, etc are also manufacturing fishnets (around 5,000 MT per annum). *The market size of fishnets was estimated as 13,300 MT in 2001-02 by ECTT report. Several companies like JK, Nirlon, Enka etc have lowered/stopped supplying raw-materials to the fishnet manufacturers.*

Average life of fishing nets is 2 – 3 years with mending (repair after use). The fishnets price is around Rs 275 per kg (average).

The fishing nets industry in India is expected to grow at a rate marginally less than the growth of fishing industry in India (as technology improvement would increase fish production per fishnet). Hence, the growth of fishnets industry is expected to be around 4-5% per year.

The current and future forecast of fishnets (100% technical textiles) is given below:-

Fishnets domestic usage	2007-08	2012-13
Quantity	15,343 million MT*	19,582 million MT
Value	Rs 442.1 crore	Rs 564 crore

Source: Industry survey, IFMA, IMaCS Analysis

** The domestic usage of fishnets has been deducedfrom the fishnets production by accounting for imports and exports of fishnets. The production of fishnets in India is around 17,000 MT.*

The potential domestic market for the fishnets industry in 2012-13 is estimated at Rs. 564 crore up from Rs 442.1 crore in 2007-08 (E). No inflationary increase has been assumed for the price of fishnets. In

volume terms, the usage of fishnets is expected to grow from 15,343 MT in 2007-08 to 19,582 MT in 2012-13.

Key manufacturers of fishnets in India

There are as many as 250-300 players manufacturing fishing nets or importing/exporting fishing nets in India. Most of these units are SSI units. Garware marine has a production capacity of 500 MT of fishing nets and production of 371 MT fishing nets (year-ending June 2007). Garware Wall Ropes is the largest player in the fishnets market with a capacity of 6,970 MT of nettings *(Source: Capitaline)* of which the capacity of fishing nets is around 5,000 MT. The company manufactured 6,133 MT of nettings in 2007-08. Garware Wall Ropes manufactured 15,842 MT of Synthetic ropes/twines and yarn in 2007-08 (capacity 27,514 MT). These twines are used for manufacturing ropes as well as nets including fishnets.

Hinafil India Pvt Ltd has production capacity of 960 MT of nylon mono-filament fishnets with production of only 39 MT in 2006-07.

SRF Polymers Limited is a major player in the fishnets twines industry with production of 500 MT of nylon twines (capacity of 1,440 MT) every year. These twines are used to manufacture fishnets / fish lines.

There is a lot of excess capacity of fishnets in India (Garware Marine and Garware Wall Ropes are not using their complete capacity for production). The capacity of fishnets in India is expected to increase at 5-10% y-o-y as the small-scale players in the industry are expected to increase.

Imports & Exports of fishnets

The import figure for fishing nets is as given below:-

HS Code	Description	Imports (in MT)	Imports (in Rs crore)
		2007-08(E)	**2007-08(E)**
56081110	MADE UP FISHING NETS OF NYLON	**Around 650 MT**	**~ Rs 11 crore**
56081110	MADE UP FISHING NETS OF NYLON (USED)	**Around 550 MT**	**~ Rs 2 crore**
56075010	NYLON FISH NET TWINE	**Around 25 MT**	**~ Rs 0.4 crore**

Source: DGCIS, IMaCS Analysis

Used fishing nets are imported primarily from Pakistan followed by Sri Lanka and Bangladesh. India imports 60-70% of the fishnets from China, 20-25% from Thailand, around 8-10% from Italy and the remaining from Sri Lanka. Jaya Engineering located at Thuthukudi, Tamil Nadu has imported fishing nets of around 6 crore in 2007-08 from UK.

The estimated export figures for fishing-nets are as given below:-

HS Code	Description	Exports (in MT)	Exports (in Rs crore)
		2007-08(E)	**2007-08(E)**
56081900, 56081110, 56081190, 56074900, 56075090	HDPE FISHING NETS*	**Around 1500 MT**	**~ Rs 25 crore**
56081110, 56081190, 56075090	NYLON FILAMENT KNITTED FISHING NETS	**Around 700 MT**	**~ Rs 10 crore**
56075010	NYLON FISH NET TWINE	**Around 132 MT**	**~ Rs 2 crore**

Source: IBIS, DGCIS, IMaCS Analysis

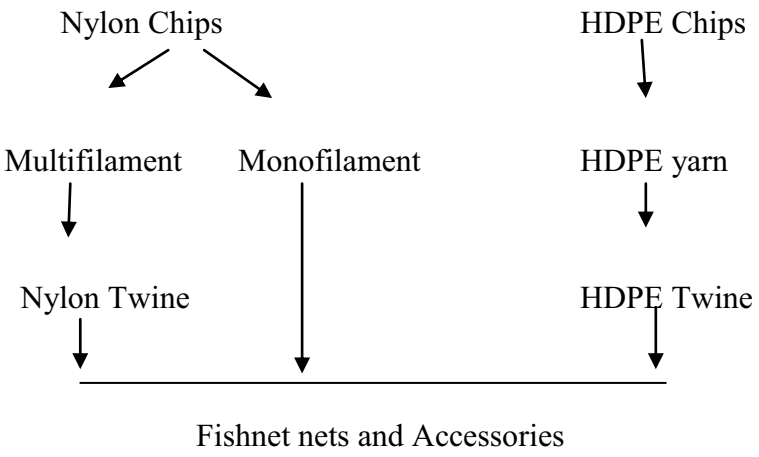
** Various nets are imported under the HS code 56081900 including fishnets/twines, sports nets, safety nets, shade-nets, etc of man-made fibres. The estimates of HDPE fishing nets are covered above.*

Africa accounts for around 40% exports of fishnets from India while the remaining 60% fishnets are exported to Sri Lanka, Middle-East and European countries. These exports are expected to grow at 6% CAGR and reach a size of Rs 49.5 crore by the year 2012-13.

Navshie exports had fishing nets exports of around Rs 5 crore in 2007-08 while Ayyava Nadar & Sons had exports of around Rs 1.5 crore fishing nets.

Raw-materials and machinery for manufacturing fishnets

Fishnets are manufactured using nylon chips as well as HDPE as given below:-



Around 2-3% of nylon goes as wastage in the manufacture of fishing nets.

Fish nets are manufactured using power driven net making machines in small and medium scale sectors and by hand knitting in the cottage sector. The machineries required and raw materials are available locally from local traders. Sometimes the machines are also imported from countries like Japan (Amita, Toyo).

90% of Nylon is sourced from domestic suppliers and nearly 10% is imported. Major vendors for nylon in India are SRF, GSFC, JCT and Century. The raw-material imports are taking place from Thailand, Russia, Germany and China.

MEDITECH

Meditech products include textile material used in hygiene, health and personal care as well as surgical applications. The Meditech products are available in woven, knitted and non-woven forms based on the area of application. Increasingly, synthetic fibre is being used in the production of these products.

The technical textile products covered under Meditech are as given below:-

- Baby diapers
- Incontinence diapers
- Sanitary napkin
- Surgical sutures
- Disposables
- Surgical dressing
- Contact lens
- Artificial implants

Technical textiles consumption under Meditech is estimated at around Rs 1,500 crore. The key Meditech product is surgical dressings which accounts for over 50% of the total technical textile consumption across Meditech segment. Surgical sutures account for around 21% of the total consumption followed by contact lenses and artificial implants with shares of around 12% and 8% respectively in the total consumption. The non-woven fabric in disposables accounts for 2% of the technical textile usage in Meditech segment and sanitary napkins account for 1.65%.

The artificial implants are primarily imported with around 15% share of domestic production in total usage. The non-woven fabric availability is limited in India and hence, the non-woven products such as baby diapers and adult diapers are primarily imported.

The domestic consumption of technical textiles under Meditech is expected to increase from around Rs 1,514 crore in 2007-08 to around Rs 2,263 crore by 2012-13.The demand for the Meditech products is dependent on the health and hygiene sector growth. In the medium term (next 5 years), the Meditech industry is expected to achieve growth at the rate of 8-9% year on year.

The type of fibre used varies based on the application. The synthetic fibres are steadily replacing natural fibres. However, most of products under Meditech (and related fibre) need sterilisation and should be non-carcinogenic and anti-allergen in nature.

The technical textiles usage in the Meditech products exported from India is around Rs 155 crore. The key products exported from India are surgical sutures and surgical dressings.

Summary of the market-sizing for Meditech

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
Baby Diapers	**Quantity**	-	350 million pieces approx.	-	350 million pieces approx.	500 million pieces approx.	
	Value	-	Rs 135 crore	-	Rs 135 crore	Rs 193 crore	-
Baby Diapers (TT component)*	**Quantity**	-	1,150 MT	-	1,150 MT	1,650 MT	
	Value	-	Rs 11.5 crore	-	Rs 11.5 crore	Rs 16.5 crore	-
Incontinence Diapers	**Quantity**	-	12.5 million pieces	-	12.5 million pieces	38.1 million pieces	
	Value	-	Rs 15 crore	-	Rs 15 crore	Rs 45.7 crore	-
Incontinence Diapers (TT component)*	**Quantity**	-	125 MT	-	125 MT	381 MT	
	Value	-	Rs 1.38 crore	-	Rs 1.38 crore	Rs 4.2 crore	-
Sanitary Napkins	**Quantity**	2,000 million pieces	250 million pieces	0.5 million pieces	2,250 million pieces	4,000 million pieces	
	Value	Rs 700 crore	Rs 40 crore	Rs 1 crore	Rs 739 crore	Rs 1,300 crore	Rs 1.1 crore
Sanitary Napkins (TT component)	**Quantity**				2,150 MT	3,800 MT	
	Value				Rs 25 crore	Rs 44 crore	-

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
Surgical Sutures	**Quantity**	4 – 4.25 million dozens	35 – 37 million meters	1.15 million dozens	4 – 4.5 million dozens	5 – 5.5 million dozens	
	Value	Rs 330 crore	Rs 36 crore	Rs 41 crore	Rs 325 crore	Rs 415 crore	Rs 72.3 crore
Surgical Disposables (TT fabric)	**Quantity**	300 MT	100 MT		890 MT	1446 MT	
	Value	Rs 33.95 crore	Rs 1.35 crore	Rs 3 crore	Rs 32.3 crore	Rs 61 crore	Rs 4.5 crore
Surgical Dressings	**Quantity**	-	-	-	-	-	
	Value	Rs 887 crore	Rs 31 crore	Rs 93 crore	Rs 825 crore	Rs 1,000 crore	Rs 150 crore
Contact Lenses	**Quantity**	-	5 – 6 million pairs	0.5 – 1 million pairs	5.2 million pairs	16.1 million pairs	
	Value	-	Rs 30 crore***	Rs 15 – 20 crore	Rs 179 crore	Rs 473 crore	-
Artificial Implants	**Quantity**						
	Value	Rs 17.5 crore	Rs 97.25 crore	-	Rs 114.75	Rs 249.1 crore	-
TOTAL	**Value**	**Rs 1,968 crore**	**Rs 552 crore#**	**Rs 156 crore**	**Rs 2,365 crore**	**Rs 3,737 crore**	**Rs 228 crore**
TOTAL (TT component)	**Value**	**Rs 1,268 crore**	**Rs 375 crore#**	**Rs 155 crore**	**Rs 1,514 crore**	**Rs 2,263 crore**	

** Baby diapers and Incontinence diapers are not manufactured in India; these products are imported, repackaged and sold in the Indian market*

*** Most of the fabric import is for caps, masks, etc and not for drapes. Hence, the share of imports is high in terms of volume but low in terms of value*

**** Though the market price of contact lens is over Rs 1000 per pair, the import price is very low leading to lower import value of contact lenses*

 # For contact lens, imports value equivalent to market value taken

As per ECTT report, the potential market sizing for 2007-08 was as given below:-

Market size (ECTT report)		2001-02	2007-08 (P)
Baby Diapers	**Quantity**	53.85 million nos.	80.81 million nos.
	Value	Rs 70 crore	Rs 105.05 crore
Baby Diapers (TT component)	**Quantity**	161.55 MT	242.43 MT
	Value	Rs 1.78 crore	Rs 2.67 crore
Incontinence Diapers	**Quantity**	3.5 million nos.	22.51 million nos.
	Value	Rs 20 crore	Rs 135.07 crore
Incontinence Diapers (TT component)	**Quantity**	32.97 MT	212.07 MT
	Value	Rs 0.36 crore	Rs 2.33 crore
Sanitary Napkins	**Quantity**	959.69 million nos.	1997.44 million nos.
	Value	Rs 335.89 crore	Rs 699.1 crore
Sanitary Napkins (TT component)	**Quantity**	718.81 MT	1496.08 MT
	Value	Rs 8.32 crore	Rs 17.27 crore
Surgical Sutures	**Quantity**	-	-
	Value	Rs 225 crore	Rs 441 crore
Healthcare Textiles	**Quantity**	-	-
	Value	Rs 3.2 crore	Rs 120.24 crore
Surgical Dressings	**Quantity**	-	-
	Value	Rs 450 crore	Rs 694.48 crore
Artificial Implants	**Quantity**	-	-
	Value	Rs 89.2 crore	Rs 144.8 crore
TOTAL	**Quantity**	**-**	**-**

Market size (ECTT report)		2001-02	2007-08 (P)
	Value	**Rs 1,203.75 crore**	**Rs 2,362.01 crore**
TOTAL (TT component)	**Quantity**	**-**	**-**
	Value	**Rs 777.86 crore**	**Rs 1,422.79 crore**

The key impediments to the growth of meditech products are:-

1. High cost of machinery and high excise costs and other manufacturing costs make diaper production in India costlier than the imports
2. Absence of any norms for medical waste management of medical disposables in India
3. The usage of surgical disposables is low because of low awareness levels and lack of standards enforcing the usage of medical disposables
4. The organised surgical dressing industry is subjected to excise duty which is exempted for small scale industries manufacturing surgical disposables. Also, the small scale industries are eligible for VAT exemption in some states. Hence, the indirect costs on the production render the products manufactured by organised industry expensive as compared to unorganised industry.
5. The decision to purchase medical implant is driven by the doctors, who generally prefer imported products over indigenous ones.

Baby Diapers

Baby diapers are used to absorb and retain body fluids of infants in period between birth and 24 months. Diapers are essentially made by a sandwich of an absorbent pad between fabric sheets. The technical textile component of the diaper is the non-woven fabric which prevents fluid leakage and gives diaper the desired shape.

Product characteristics

The baby diapers are generally available in four sizes - small, medium, large and extra large, with an overall snug fitting. The typical product characteristics are as given below:

(i) Super absorbent polymer should ensure complete dryness and prevent growth of bacteria
(ii) The non-woven used should be hydrophilic and absorb fluids fast
(iii) Fastening mechanism, optionally adjustable.
(iv) The cover should be breathable
(v) Optional, leg guards to prevent leakage

The spunbond non-woven fabric used in diapers is 20-25 GSM and accounts for close to 12-15% by weight of the diaper.

Market dynamics and key growth drivers

In India, there are around 60-70 million babies up to thirty months age group, which is the potential size of the Indian baby diaper market. However, the penetration of these products has been less due to the following reasons:

(i) Costly diaper products
(ii) Easy availability of maid/baby sitter
(iii) Lack of awareness amongst parents

In future, the market will be driven primarily by increased acceptance of these products either through increased awareness or reduction in product prices.

Key manufacturers of baby diapers and non-woven for baby diapers

The baby diaper market in India is quite oligopolistic in nature; the marketing of baby diapers in India is limited to a few large companies. The baby diapers marketed in India are primarily imported and repackaged for sale. The major brands like Huggies (Kimberley Clark Lever), Pampers (Procter and Gamble), Snuggy (Godrej-SCA) and Wipro Baby Soft cover more than 95% of the domestic market.

The key suppliers of non-woven for baby diapers in India are Unimin India Ltd. and Fiberweb Pvt. Ltd.

Manufacturer	Year	Product	Production quantity**	Installed capacity
Unimin	2007-08	SBPF	165 MT*	
Fiberweb India	Jan-Dec, 2007	Non-woven fabrics (spunbond)**	3,312 MT	4,000 MT

Source: Asian CERC, Annual reports, Industry survey

** The production of SBPF at Unimin India has dropped from 2,243 MT in 2005-06 to 165 MT in 2007-08 because of on-going operational issues in the plant.*

***The non-woven fabric is sold for other applications also*

Consumption norms and the market size

The non-woven fabric is 20-25 GSM and accounts for close to 12-15% by weight of the diaper i.e. around 3-4 grams per diaper. With an average weight of 30-35 grams per diaper the total baby diaper tonnage in 2007-08 is approximately 5900 MT.

Non-woven consumption norms (baby diaper industry)

Diaper usage (million pieces)	350
Amount of non-woven per diaper (gms)	3 to 3.5
% of non-woven by weight (average)	~10%
Total non-woven used (Tonnes)	**1,150**

Source:Godrej-SCA, The Indian Textile Journal, Industry survey, IMaCS Analysis

With an average price of Rs. 10-12 per piece, the diaper market by volume in India is approximately 350 million pieces (the diapers are available in three sizes small, medium and extra large based on the baby's

age). The value of the non-woven fabric in the diaper is approximately Rs. 11.5 crore and expected to grow with increased penetration of diaper usage.

The diaper market in India is growing at the rate of 5%-10% year on year.

The current and future forecast of non-woven consumption in the baby diaper industry is given below:-

Non-woven usage in baby diapers industry Domestic usage	**2007-08**	**2012-13**
Non-woven fabric Quantity	1,150 MT	1,650 MT
Non-woven fabric Value	Rs 11.5 crore	Rs 16.5 crore

Source: Industry survey, IMaCS Analysis

The potential market for non-woven fabric in the baby diaper industry in 2012-13 is estimated at Rs. 16.5 crore up from Rs 11.5 crore in 2007-08 (E). No inflationary increase has also been assumed for the price of non-woven fabric. In volume terms, the usage of non-woven fabric in the baby diaper industry is expected to grow from 1,150 MT in 2007-08 to 1,650 MT in 2012-13.

Imports and Exports of baby diapers

The import figures for baby diapers are as given below:-

HS Code	**Description**	**Imports**	**Imports**
		2007-08(E)	**2007-08(E)**
48184010*	BABY DIAPERS	**Around 350 million pieces**	**Rs 135 crore approx.****

Source: IBIS, IMaCS Analysis

** In addition, baby diapers are also imported in very small quantities under HS codes 48184090, 48189000*

*** Though the market price of diapers is around Rs 10 – 12 per piece, the import price is around Rs 4 per piece*

Singapore accounts for around 40% imports of baby diapers in India followed by Saudi (around 20-25% share), Malaysia (around 10% share) and China & UAE with around 5% share each. Imports in small quantities also take place from Thailand, Vietnam, Poland & Turkey.

The exports are negligible as compared to the imports.

Incontinence Diapers

Incontinence diaper also known as adult diapers are for people with loss of bladder control which typically applies to people in the age group of 70 years and more. Incontinence diapers are disposable single use products specifically designed to absorb and retain fluids. The diapers are typically made of the absorbent material of cellulose with poly-beads to convert fluid into gel. The non-woven material is placed on top for dry feeling.

Product characteristics

The baby diapers are generally available in two sizes medium and large with an overall snug fitting. The typical product characteristics are as given below:

1. Super absorbent polymer should ensure complete dryness and prevent growth of bacteria
2. Super absorbent should quickly convert liquid to gel
3. The non-woven used should be hydrophilic and absorb fluids fast
4. Fastening mechanism, optionally adjustable.
5. The cover should be breathable
6. Optional, leg guards to prevent leakage

Market dynamics and key growth drivers

According to 2001 census India has in excess of 30 million adults with age equal and above 70 years. The number is set to increase with increasing medical care available to the population. The incontinence products are used for aged people who find it difficult to control the bladder, a certain percentage of this population. The incontinence products are expensive and have low penetration. The penetration of adult diapers is very low and restricted to urban retail market and medical institutions around the country. The medical institutions account for about 40% of the adult diaper market volume wise. The rest is through retail markets.

The future market would be driven primarily by increased awareness, penetration coupled with drop in product prices.

Key manufacturers of adult diapers

The adult diapers are primarily imported by almost all companies and marketed with different packaging in the domestic market (similar to the baby diapers). Kimberley-Clark Lever with Depend and Godrej-

SGA with Tena are the major branded players in the market. The other players are Elder Hartmann, Nobel Hygiene Care with Friends and Diaper India (Total Care). The spunbond non-woven technical textile raw material is primarily imported as there are few non-woven producers in India.

Consumption norms and the market size

The non-woven used for these adult diapers is around 10 grams per piece. The non-woven material gives the feeling of dryness when the fluids are absorbed and converted into a gel by the poly-beads in the absorbent material.

Non-woven consumption norms (adult diapers industry)

Diaper usage (million pieces)	12.5
Amount of non-woven per diaper (gms)	10
Total non-woven used (MT)	**125**

Source: Industry survey, IMaCS Analysis

With an average price of Rs. 45 - 55 per piece, the adult diapers market by volume in India is approximately 12.5 million pieces. The diaper market in India is growing at the rate of 25% year on year.

The current and future forecast of non-woven consumption in the adult diaper industry is given below:-

Non-woven usage in baby diapers industry Domestic usage	**2007-08**	**2012-13**
Non-woven fabric Quantity	125 MT	381 MT
Non-woven fabric Value	Rs 1.38 crore	Rs 4.2 crore

Source: Industry survey, IMaCS Analysis

The potential market for non-woven fabric in the adult diaper industry in 2012-13 is estimated at Rs. 4.2 crore up from Rs 1.38 crore in 2007-08 (E). No inflationary increase has also been assumed for the price of non-woven fabric. In volume terms, the usage of non-woven fabric in the adult diapers industry is expected to grow from 125 MT in 2007-08 to 381 MT in 2012-13.

Imports and Exports of adult incontinence diapers

The import figures for adult incontinence diapers are as given below:-

HS Code	Description	Imports	Imports
		2007-08(E)	2007-08(E)
48184010, 48184090 *	ADULT DIAPERS	**Around 12.5 million pieces**	**Rs 15 crore approx.**

Source: IBIS, IMaCS Analysis

** In addition, adult diapers are also imported in very small quantities under HS code 48189000*

*** Though the market price of adult diapers is around Rs 45 – 55 per piece, the import price is around Rs 12 per piece*

China accounts for around 50% imports of adult diapers in India followed by Taiwan (around 15% share), Malaysia (around 10% share), Hong Kong (with 5-10% share), USA (with 5% share) and UAE, Thailand, Singapore, Germany accounting for less than 5% share each.

The exports are negligible as compared to the imports. Primarily Indian firms market imported products. However few producers in India are subsidiary of their manufacturing firms in China and other destinations and import products into India.

Quality Control and Standards – The quality is based on the absorbency rate of the diaper. There are no documented standards in India.

Sanitary Napkin

Sanitary napkin is a hygiene absorbent product used by women during menstrual periods. Sanitary napkins are essentially made by a sandwich of an absorbent pad between fabric sheets. The technical textile component of the diaper is the non-woven fabric which prevents fluid leakage.

Product characteristics

The typical product characteristics are as given below:

1. Super absorbent polymer should ensure complete dryness
2. Hydrophilic non-woven to absorb fluids fast
3. Snug fit
4. Breathable cover

The non-woven fabric is 18-20 GSM and accounts for around 11-12% by weight of the sanitary napkin i.e. around 0.95 to 1 grams per napkin.

Market dynamics and key growth drivers

The penetration of sanitary napkins is around 20% of the target population. The potential market (females in the age group of 15 years to 50 years) for sanitary napkins is in excess of 94 million (*Source: Census India 2008 estimates)* which is around 17% of the total female population.

The sale of feminine hygiene products is low due to various factors, primary being:

1. Lack of awareness, especially in rural India
2. Lack of information on the products
3. Availability of substitutes

The price per unit varies from Rs. 3 to Rs 12 (average price Rs 3.5 per unit) and the Indian feminine protection market is pegged at around Rs.800 crore. The market is expected to increase with increased awareness and hence, adoption level amongst women. Attempts are being made to indigenise manufacturing machines to lower the cost of production.

At present, the sanitary napkin market in India is growing at the rate of 10%-15% year on year.

Key manufacturers

The sanitary napkins market in India is dominated by Procter and Gamble, Johnson and Johnson and Kimberley Clark Lever. Johnson & Johnson brand Stayfree and Procter & Gamble brand Whisper cover close to 85-90% of sanitary napkins market. The remaining market is shared by Kimberley Clark Lever's Kotex, Gufic Biosciences brand Shapers and other domestic brands. The other smaller players in the market are Prime Hygiene Care Pvt. Ltd., Actifit India Pvt. Ltd., Dima Poducts, Donisi International, Hindustan Latex and Kaul Impex Pvt. Ltd. The non-woven technical textile raw material is primarily imported as there are few non-woven producers in India.

Johnson & Johnson (J&J) sold 1,666 million pieces of sanitary napkins in 2005-06. Dima Products sold 1.54 million pieces in 2005-06.

Consumption norms and the market size

The non-woven fabric is 18-20 GSM and accounts for around 11-12% by weight of the sanitary napkin i.e. around 0.95 grams per napkin.

Non-woven consumption norms (sanitary napkin industry)

Sanitary napkin usage – approx. (million pieces)	2250
Amount of non-woven per napkin (grams)	0.95
% of non-woven by weight (average)	11-12%
Total non-woven used (MT)	**2150**

Source:Capitaline, The Indian Textile Journal, Industry survey, IMaCS Analysis

Average weight of sanitary napkin is 8-10 grams; the total tonnage of sanitary napkin market in India is 20,000 MT (assuming average weight of sanitary napkin to be 9 grams).

At present, the sanitary napkin market in India is growing at the rate of 10%-15% year on year.

The current and future forecast of non-woven consumption in the sanitary napkin industry is given below:-

Non-woven usage in sanitary napkins industry Domestic usage	2007-08	2012-13
Non-woven fabric Quantity	2,150 MT	3,800 MT
Non-woven fabric Value	Rs 25 crore	Rs 44 crore

Source: Industry survey, IMaCS Analysis

The potential market for non-woven fabric in the sanitary napkin industry in 2012-13 is estimated at Rs. 44 crore up from Rs. 25 crore in 2007-08 (E). No inflationary increase has been assumed for the price of non-woven fabric. In volume terms, the usage of non-woven fabric in the sanitary napkin industry is expected to grow from 2,250 MT in 2007-08 to 4,000 MT in 2012-13.

Imports and Exports of sanitary napkins

The direct import figures for sanitary napkins are as given below:-

HS Code	Description	Imports	Imports
		2007-08(E)	2007-08(E)
48184090*	SANITARY NAPKINS	**Around 250 million pieces**	**Rs 40 crore approx.**

Source: IBIS, IMaCS Analysis

** In addition, sanitary napkins are also imported in very small quantities under HS code 48189000*

Thailand accounts for around 45-50% of direct imports of sanitary napkins in India followed by Slovakia (around 30% share), China (around 15% share), Tunisia (with 5-10% share) and Japan (with less than 5% share).

The direct imports of sanitary napkins are very small compared to domestic production. The exports too are small at present and would increase only if big marketers utilise India as sourcing hub.

The direct export figures for sanitary napkins are as given below:-

HS Code	Description	Exports	Exports
		2007-08(E)	2007-08(E)
48184090, 48189000, 48181000*	SANITARY NAPKINS	**Around 0.5 million pieces**	**Rs 1 crore approx.**

Source: IBIS, IMaCS Analysis

The direct exports of sanitary napkins are limited to countries like Liberia, Myanmar, Maldives, Sri Lanka, Russia, and Bangladesh. Exports of sanitary napkins are expected to grow marginally to Rs 1.1 crore by 2012-13.

Based on the current market and import export figures, India is a manufacturer and consumer of sanitary napkins. The growth in sanitary napkins industry depends upon the penetration of these hygiene products in the Indian households.

Surgical Disposables

The surgical disposables primarily consist of masks, caps, drapes, gowns, covers and shoe covers made of polypropylene spunbond fabric (non-woven) with or without polyethylene film. Surgical disposables are used in hospitals and pharmaceutical companies to maintain hygienic and sterile operations. These are called as surgical disposables as these are for one time use and disposed off after one time usage.

In India, the majority of hospitals use cotton reusable surgical wear which needs to be sterilised after every use. The peril of re-usage is cross contamination which should be avoided. The disposable medical items are gradually replacing the reusable cotton cloth based surgical gear. With growth in the multi-specialty hospitals, medical tourism and improvement in general hygiene level at the hospitals, the demand for medical disposables is experiencing positive growth. However, the price sensitive nature of the hospital purchase managers has resulted in the low penetration of surgical disposables.

Product characteristics

The functional characteristics of surgical disposables are:

1. Good bacteria filtration efficiency
2. Breathing resistance
3. Splash resistance

The surgical disposable masks and caps are made from polypropylene (PP) spunbond fabric, spunlace fabric and Spunbond melt blown fabric and spunlace fabric (SMS) fabric. The weight of the fabric for caps is typically in the range of 12-25 GSM and for masks it is in the range of 25-40 GSM. The disposable drapes, gowns and covers are made of polypropylene (PP) spunbond fabric and Spunbond melt blown fabric and spunlace fabric (SMS). The weight of the fabric is typically 25-40 GSM for spunbond fabric for gowns and around 35-50 GSM for SMS fabric for drapes and covers.

These products are manufactured in sterilised environment and packed in PP bags and dispenser boxes before dispatch.

Market dynamics and key growth drivers

The growth of medical textile products is tied with the growth of the healthcare industry in India. The healthcare consumption in India is expected to grow to $195 billion from current $25 billion (*Source:*

Moneycontrol, Mckinsey 2007 – The Bird of Gold-The rise of India's consumer market). The rural India is expected to follow the increasing healthcare spend trend of urban India. The demand for disposables is expected to increase with the emergence of new tertiary care hospitals with international accreditations and improvement of service levels off the existing hospitals. In addition, the growth in pharmaceutical, biomedical and biotechnological companies would augment the demand for medical textiles especially disposables.

Consumption norms and the market size

The penetration of surgical disposable products is limited primarily to the hospitals in metro and cosmopolitan cities and tertiary care hospitals. The larger hospitals in the major cosmopolitan cities in India (Delhi, Mumbai, Kolkata, Chennai, Bangalore and Hyderabad) account for nearly 5.5-6% of total beds in India. Almost all of these hospitals are using surgical disposables. The penetration of surgical disposables in the remaining hospitals is estimated to be around 15%. The penetration of technical textile surgical disposables is low due to the lack of awareness and usage experience. In addition, the usage of surgical disposables (masks and caps) in pharmaceutical companies has been assumed as 15% of the usage in hospitals based on the industry survey

The average price of surgical disposables like caps, masks and shoe-covers is around 70 to 90 paisa per piece while that of drapes is Rs 300 per units and of gowns and covers is around Rs 50 per unit.

The medical disposables like caps, masks and shoe covers are 100% technical textile products made-up from PP spunbond or SMS non-woven fabric. The consumption of Polypropylene (PP) spunbond material and SMS fabric varies with size of the product. The product used for drapes and gowns is typically 25 GSM and 80 GSM. The average size of spunbond fabric per material is around 2 square metres. The typical weight of these products varies from 50 grams to 160 grams. Spunlace material is also used in this manufacture of surgical disposables. The caps and masks require approximately 3 grams of PP spun bond fabric while shoe-covers require 6 grams of PP spun bond fabric per unit. The raw materials account for 80-90% of the cost.

Non-woven consumption norms (surgical disposables industry)

Usage caps, masks & shoe covers per month in 300 bed hospital (pieces)	7,000 to10,000
Usage drapes, gowns & covers per month in 300 bed hospital (pieces)	150 to 200
Amount of non-woven per cap/mask	3 g
Amount of non-woven per show-cover	6 g
Amount of non-woven per drape, gown & cover	50 to 150 g
Average price per cap / mask / shoe cover	Rs 0.7 to 0.9*
Average price per drape	Rs 300
Average price per gown / cover	Rs 50

** The average price of surgical disposables has reduced from around Rs.3 to Rs.5per disposable around 3 years back to around 70-90 paise*

Source: Industry survey, IMaCS Analysis

The domestic usage of the surgical disposables – caps, masks & shoe covers in India is estimated at around 70 million pieces annually. The domestic usage of the surgical disposables – drapes, gowns & covers in India is estimated at around 1.5 to 2 million pieces annually. The usage estimates for drapes and gowns are based on industry survey. Based on industry survey, the industry is expected to grow at around 10% y-o-y.

The current and future forecast of non-woven consumption in the surgical disposables market is given below:-

Non-woven usage in surgical disposables market Domestic usage	**2007-08**	**2012-13**
Non-woven fabric Quantity	890 MT	1446 MT
Non-woven fabric Value	Rs 32.3 crore	Rs 61 crore

Source: Industry survey, IMaCS Analysis

In volume terms, the usage of non-woven in the surgical disposables industry is expected to grow from 890 MT in 2007-08 to 1446 MT in 2012-13. The potential market for surgical disposable industry in

2012-13 is estimated at Rs. 61 crore up from Rs. 32.3 crore in 2007-08 (E). No inflationary increase has been assumed for the price of the material as the prices have fallen over the last 3 years.

Key manufacturers

The surgical disposables market in India is in its infancy stage. There are very few manufacturers of surgical disposable items in India. The imported surgical disposables from China are also available in the market. The major producers of surgical disposables are:-

1. Thea-Tex Healthcare Pvt. Ltd.
2. Mediklin Healthcare Ltd.
3. Magnum Medicare Pvt. Ltd.
4. Surgiwear India
5. Dispoline
    a. Production – 60,000 caps, masks and gown per annum
    b. Production – 24,000 aprons per annum

The key raw material supplier for surgical disposables in India is Ahlstom Fibre Composites Pvt. Limited. Ahlstom sales in 2006-07 were estimated to be 200 MT and expected to increase to 300-400 MT in 2007-08. DuPont is another multinational company which supplies raw material fabric to surgical disposable converters in India.

Imports & Exports of surgical disposables

The import figures for surgical disposables are as given below:-

HS Code	Description	Imports (Quantity)	Imports (Value)
		2007-08(E)	2007-08(E)
63079090*	SURGICAL DRAPES	Around 25,000 nos.	Rs 0.75 crore
63079090*	SURGICAL GOWNS	Around 0.1 million nos.	Rs 0.5 crore
63079090*	SURGICAL MASKS	Around 10 million nos.	Rs 0.75 crore
63079090*	SURGICAL CAPS	Around 13 million nos.	Rs 1 crore
62101000	SURGICAL SHOE COVERS	Around 0.3 million nos.	Rs 0.03 crore

Source: DGCIS, IBIS, IMaCS Analysis

In addition to the imports listed above, based on the information from the industry survey, additional imports of converted products is Rs. 18.3 crore which results in total imports for Rs. 21.6. The overall imports is approximately 450 MT.

China accounts for over 60% of the imports of surgical disposables of India followed by Singapore with 20-25% share. USA, Germany, Australia, Denmark & UK account for the remaining imports.

The raw material for surgical disposables is sourced under the HS code 5603. The import figures for raw-material (non-woven) for surgical disposables are as given below:-

HS Code	Description	Imports	Imports
		2007-08(E)	2007-08(E)
56031100, 56031200, 56039400	NON-WOVEN FABRIC (SMS/SPUNMELT) FOR MEDICAL USE / FACE MASK MEDIA	**Around 100 MT**	**Rs 1.35 crore approx.***

Source: IBIS, IMaCS Analysis

** Most of the fabric import is for caps, masks, etc and not for drapes. Hence, the share of imports is high in terms of volume but low in terms of value*

In addition to the imports listed above, based on the information based on the information from the industry survey, additional imports of fabrics is Rs. 5.85 crore which results in total fabric imports of Rs. 7.2 crore. Around 95% of the imports of non-woven fabric for surgical disposables are from Saudi Arabia. The remaining imports are from USA.

India exports disposable non-woven shoe covers to USA as given below:-

HS Code	Description	Imports	Imports
		2007-08(E)	2007-08(E)
63079090	DISPOSABLE NON-WOVEN SHOE COVERS	**Around 15 million pieces**	**Rs 3 crore approx.**

Source: IBIS, IMaCS Analysis

The exports are approximately 60 MT. These exports will grow at a CAGR of 9% for the next five years and reach a size of around Rs 4.5 crore in 2012-13

Raw-materials and machineries

The raw material for the medical disposables is PP spunbond non-woven fabric. These products are made on Taiwanese or Chinese fully automatic machines. The machines are made by companies in China and Taiwan under the tag of *non-woven converting machine manufacturers.* The leading non-woven converting machine manufacturers are:

1. NCM Non-woven Converting Machinery Co. Ltd.
2. Chang Hong Machinery Co. Ltd.
3. Dong Guan PNL Non-woven Converting Machinery Co. Ltd
4. BroadFair Non-woven Converting Machinery Co. Ltd.

Quality Control and Standards – There are no Indian standards. The products manufactured in India are along the European lines. For the mask products - ASTM F2101-01 is used as standard for the bacteria filtration efficiency. The Delta-P standard is used to set the breathing resistance and ASTM 1862 is used to set the splash resistance.

Surgical Sutures

The surgical suture is used for stitching together skin deformations, open wounds, organs and blood vessels. The surgical sutures are classified into two categories –

- Absorbable suture - These get dissolved in the body and do not require removal
- Non-absorbable suture - These are sterilised sutures which need to be removed after a specified time

The type of suture used depends upon the location of the required surgical intervention. The raw material for sutures ranges from bovine intestine tissues to Poly glycolic acid (PGA), collagen, mono filament polyester / polypropylene and multifilament nylon/polypropylene/polyamide.

Product characteristics

The type of suture used varies based on the area of application and type of medical intervention. They could be either monofilament, multifilament or braided. Generally, absorbable sutures are used for sewing internal body organs, while non-absorbable sutures are used for external injuries. However, absorbable sutures are used in case of external injuries as well.

The general characteristics of sutures are given below:

- Sterilised (non-toxic)
- Hypoallergenic
- High tensile strength
- High knot security
- Flexible and smooth passage through tissues
- Good pliability
- Minimum tissue reaction

Market dynamics and key growth drivers

The growth of medical textile products is tied with the growth of the healthcare industry in India. The healthcare consumption in India is expected to grow to $195 billion from current $25 billion (*Source: Moneycontrol, Mckinsey 2007 – The Bird of Gold-The rise of India's consumer market*). The rural India is expected to follow the increasing healthcare spend trend of urban India.

The key purchase decision makers for surgical sutures are medical institutions and doctors. The companies invest heavily on promotion of their products amongst surgeons, nurses and hospital administrators to promote the usage and establish trust for the brand amongst these professionals. These relationships translate into product sales going forward.

Consumption norms and the market size

The surgical suture is a 100% technical textile material except for the needle portion at one end of the suture. The size of the needle and suture depend upon the wound and area of application. The surgical sutures industry is expected to grow at 5% y-o-y.

The current and future forecast of surgical suture industry is given below:-

Surgical sutures usage in India	2007-08	2012-13
Surgical sutures (Quantity)	4 – 4.5 million dozens	5 – 5.5 million dozens
Surgical sutures (Value)	Rs 325 crore approx.	Rs 415 crore approx.

Source: Industry survey, IMaCS Analysis

The potential market for surgical suture industry in 2012-13 is estimated at Rs. 415 crore up from Rs. 325 crore in 2007-08 (E). No inflationary increase has been assumed for the price of the sutures. In volume terms, the usage of surgical suture industry is expected to grow from 4 – 4.5 million dozens in 2007-08 to 5 – 5.5 million dozens in 2012-13.

Key manufacturers

The surgical sutures market in India is dominated by Johnson and Johnson with its flagship Vicryl brand, which has world market share of 60-65% and an India market share of approximately 80-85%. The remaining 15-20% of the market share is distributed across various domestic producers including Centennial Surgical Suture Limited and Futura Surgicare Pvt. Ltd. amongst others.

Manufacturer	Year	Quantity (million dozens)	Value (Rs crore)	Unit Price (Rs / dozen)	Installed capacity (million dozens)
Johnson and Johnson	2006-07	3.08	236	766	10.53
Centennial Surgical Suture Ltd.	2006-07	0.48	37	765	0.5

Source: Capitaline

Ethicon, a franchise of Johnson & Johnson Medical, India, is the largest manufacturer of surgical sutures with a wide variety of suture materials and needle sizes to meet the requirement of every surgical speciality. In India, Ethicon is the largest producer of absorbable and non-absorbable surgical sutures and a market leader in wound closure business. Ethicon has recently introduced Vicryl Plus which offers protection against bacterial colonization. This is the world's first Antibacterial suture

Imports & Exports of surgical sutures

The import figures for surgical sutures are as given below:-

HS Code	Description	Imports (Quantity)	Imports (Value)
		2007-08(E)	2007-08(E)
54011000, 54026990, 54049090, 54023990, 54049010	SURGICAL SUTURES, SURGICAL SUTURE STRANDS, THREAD FOR SURGICAL SUTURES	Around 33 million meters	Rs 28 crore approx
30061010	SURGICAL SUTURES, SUTURE THREADS, ATRAUMATIC NEELDE & SUTURES	Around 1.25 million meters and 2.5 million nos.	Rs 3 crore approx
30061010	CARDIOVASCULAR SUTURES, STERNUM SUTURES	Around 1.5 million meters	Rs 3.5 crore approx
39089090, 39269099	SURGICAL SUTURES, SURGICAL SUTURE STRANDS, THREAD FOR SURGICAL SUTURES	Around 1 million meters	Rs 0.85 crore approx

Source: IBIS, IMaCS Analysis

USA accounts for over 50 - 60% of the imports of surgical sutures of India followed by Korea with 30-40% share and 5 – 10% each from China, Germany and Japan. Marginal imports also take place from UK, Italy, Singapore, Dominican Republic & Belgium.

The export figures for surgical sutures are as given below:-

HS Code	Description	Exports (Quantity)	Exports (Value)
		2007-08(E)	2007-08(E)
40151100	SURGICAL SUTURES	Around 0.15 million dozens	Rs 4 crore
30061010	SURGICAL SUTURES	Around 1 million dozens	Rs 37 crore

Source: IBIS, IMaCS Analysis

Under the HS code 30X, Bangladesh accounts for around 40 - 50% of the exports of surgical sutures from India followed by Russia & Philippines with 15 - 20% shares each. India also exports surgical sutures to Hungary, Netherlands, Spain, Zambia, Sudan, Uganda, Morocco, Kuwait, Egypt, China, Thailand, Taiwan, Sri Lanka, Singapore, Malaysia, Indonesia, Maldives, etc.

Under HS code 40X, Afghanistan & Russia account for around 30 - 40% each of the Indian exports of surgical sutures followed by Sri Lanka & Netherlands with 10 - 15% share each. India also exports surgical sutures to Canada, Madagascar and Bangladesh.

Exports of surgical sutures are expected to reach a size of Rs 72.3 crore by the year 2012-13 by growing at a CAGR of 12%.

Raw-materials for surgical suture

The surgical sutures are 100% technical textile except for the needle portion. The raw material used for surgical suture includes bovine intestine tissues, PGA, monofilament nylon, monofilament polyethylene and silk.

Quality Control and Standards – No BIS standard, manufacturers follow USP, European and American Foods and Drugs Authority (FDA) standards.

Surgical Dressing Material

Surgical dressing material is applied on the wound to expedite the process of healing and prevent further harm due to wound exposure.

The dressing material can be primarily divided as

- Wound care layer and
- Bandage

Bandage holds the wound care layer in place. Wound care products which are adhesive in nature are also available in the market. The bandage can also be used on standalone basis in case of orthopaedic cases (e.g. crepe bandage). The type of dressing used varies based on the type of wound and location of the wound.

Typically, the wound care products consist of:-

- Absorbent pad
- Non-adhering/dressing
- Adhering pads or adhesive plaster

The wound contact material is available in both woven and non-woven forms.

The bandage products consist of:-

- Rolled Bandage
- Gauze bandage
- Elastic/Non-elastic bandage
- Light support bandage

Product characteristics

The materials included under surgical dressings are: Rolled bandages, Crepe bandages, Plaster-of-Paris bandages, Absorbent gauze pack, plaster, absorbent pads and surgical pads.

The raw materials for surgical dressings are cotton fibre, viscose and acrylic. The functional properties like absorbency are improved for dressing material. Additionally, these products could be sterilised or non-sterilised. The wound contact layer is either woven medicated layer or non-woven medicated layer. The wound contact layer is non-adherent and allows new tissue to develop easily. Non-adherent hypoallergenic, gamma sterile dressing allows easy wound-drainage. It is soothing, enhances healing in burns, skin grafts, skin loss and lacerated wounds.

The bandages provide support to the dressing material and function as compression material. Cotton gauze cloth is generally used for holding wound contact layer in place which is tied at the ends or joints using adhesive tape. Bandages are also made from polyester yarns. The bandages have a basis weight in the range of 55-60 GSM.

Crepe bandages / compression bandages are knitted bandages made from thick woven polyester fabric which have an elastic behaviour and porous nature for skin breathing. These bandages are used on limbs to create resting pressure and working pressure for the treatment. The crepe bandages are manufactured by weaving and warping the yarn and then processed to give properties like stretch ability. The crepe bandages are available is various sizes like 5, 7.5, 15 centimeter x 3 meter.

Plaster-of-Paris (POP) bandages are made of cotton gauze of leno weave cloth with Plaster-of-Paris impregnated. The leno weave holds the POP material in the fabric. The bandage is dipped in water and applied on the limb which would graduate into a hard cast once dried. The POP bandages are available is various sizes like ~10, 15, 20 centimeter x 3 meter.

Dressing pads and absorbent gauze generally have basis weight of around 30 GSM. These pads and absorbents are available across various sizes.

Cohesive bandages stick to themselves and not to the user's skin. Hence, they are suited for skin protection applications. Adhesive plaster (medicated or not medicated) is available in various lengths and shapes.

The wound dressing material should be sterile, breathable and should provide a moist healing environment. The healing environment then reduces the risk of infection and helps the wound heal more quickly.
All the surgical dressing items are expected to be ISI, USP or BP compliant.

Key manufacturers

The industry is primarily unorganised with units in various states / areas of India including Tamil Nadu, Mumbai, Uttar Pradesh and Ichalkaranji, amongst others. According to the Ministry of Health and Family Welfare report, there are around 638 licensed units manufacturing surgical dressing material. The organised producers of the surgical dressings are as follows:-

- Johnson and Johnson India
- Lavino Kapoor – Absorbent cotton – 100% EOU
- Dr. Sabharwal Laboratories
- Ramanathan Surgicals Private Limited
- KOB textile – Dressing Material - 100% EOU (Export Oriented Unit)
- Ramaraju Surgical Cotton Limited
- Shanti Surgicals
- Jajoo Surgicals Private Limited

The production figures for some of the key manufacturers are given below:-

1. Dr. Sabharwal Laboratories
    a. Adhesive tapes – Production – 815139 pieces; Sales – 834445 pieces ; Sales (value) – 1.7 Crore; Capacity – 5.46 lakh sq. meter
    b. Elastic adhesive bandage – Sales – 23996 nos.; Sales (value) – 0.12 Crore
    c. Surgical tape – Production – 129273 pieces
2. Datt Mediproducts
    a. Surgical tape – Production – 1 lakh dozens; Capacity – 1.55 lakh dozens
    b. Gauze swab - Production – 180 million nos.; Capacity – 250 million nos.
    c. Cotton crepe bandage – Production – 125 lakh nos.; Capacity – 180 lakh nos.
3. Ramanathan Surgicals Private Limited – Production capacity: 1 million meters/annum
4. Ramaraju Surgical Cotton Limited – Bandages Volume: 130000 kilograms/annum; Value: 3.5 Crore/annum

Market for surgical dressing material and future forecast

The demand for surgical dressing material is primarily driven by boom in the healthcare sector and increase in hospital beds in the country. In addition to the domestic market, Indian dressing materials are

also exported to several countries. The industry is primarily unorganised with units in across Tamil Nadu, Mumbai, Uttar Pradesh, Ichalkaranji, amongst others. According to the ministry of health and family welfare report, there are around 638 licensed units manufacturing surgical dressing material. The market for dressing material is primarily institutional with a share of around 60% of sales and the remainder is retail. From the manufacturers perspective there is no difference between the retail and institutional sales. However margins are attached along the distribution chain.

Usage norms per bed of surgical dressings (OPD adjusted)

Rolled bandage	Around 100 units of 14 cm * 6 m (or equivalent)
Crepe bandage	Around 15 units of 10cm * 4 m (or equivalent)
POP bandage	Around 10 units of 10 cm width (or equivalent)
Elastic adhesive bandage	Around 1.5 units
Band-aid / adhesive tape	Around 20 units
Absorbent cotton wool	Around 10 units of 500 g
Absorbent gauze	Around 20 units
Surgical pad	Around 2.5 units

Source: Industry survey, IMaCS Analysis

The surgical dressings industry has been growing at 4-5% y-o-y.

The current and future forecast of surgical dressing material industry is given below:-

Surgical dressings usage in India	**2007-08**	**2012-13**
Surgical dressings (bandages)	Rs 450 crore approx.	Rs 500 crore approx.
Surgical dressings (wound care products)	Rs 375 crore approx.	Rs 450 crore approx.
Surgical dressings (Total)	**Rs 825 crore**	**Rs 1,000 crore**

Source: Industry survey, IMaCS Analysis

The potential market for surgical dressings in 2012-13 is estimated at Rs. 1,000 crore up from Rs 825 crore in 2007-08 (E). No inflationary increase has been assumed for the price of surgical dressings. Bandages constitute around 55% of the market whereas other wound care products account for the remaining 45% share.

Imports and Exports of surgical dressing material

The estimated import figures for surgical dressing material are as given below:-

HS Code	Description	Imports (Value)
		2007-08(E)
30051010, 30051020, 30049029, 30051090, 30059010, 30059030, 30059040, 30059060, 30059090, 30065000, 30069040, 30069060	Surgical Dressing material	**Rs 31 crore approx.**

Source: IBIS, IMaCS Analysis

The imports arrive primarily from USA, China, Korea, Singapore and Hong Kong.

The estimated export figures for surgical dressing material are as given below:-

HS Code	Description	Exports (Value)
		2007-08(E)
30039015, 30049011, 30049099, 30049079, 30049099, 30051010, 30051090, 30059040, 30059070, 30059090, 58031020, 58039090, 58109900	Surgical Dressing material	**Rs 93 crore approx.**

Source: IBIS, IMaCS Analysis

The products are primarily exported to the following countries UK, Netherlands, South Africa, Maldives, USA, Belgium, UAE, China and many others. These exports are expected to reach a level of Rs 150 crore by 2012-13 growing at 10% year on year.

Quality Control and Standards – The products require approval for usage by the medical authority. For handloom cotton bandages, the applicable standard is IS863 and for cotton gauze absorbents, the applicable standard is IS758. Several manufacturers also have ISI mark and ISO certification for their products and units respectively. All the surgical dressing items are expected to be ISI, United States Pharmacopoeia (USP) or British Pharmacopoeia (BP) compliant.

Contact Lenses

The contact lenses are typically used to correct vision, although some people wear colored contact lens to enhance or change their eye color. The contact lenses can be classified based on type of material, replacement cycle, wear schedule and special applications:-

- Material types (soft, hard and gas-permeable),
- Replacement schedule (one year, daily, fortnightly, monthly and quarterly),
- Wear schedule (Daily wear and extended wear),
- Special types (torics for astigmatism, UV-blocking contacts, bifocals etc).

Soft Contact Lenses are made from a water absorbing material called HEMA (Hydroxy Ethyl Metha Acrylate) and are very soft to handle and comfortable on the eyes. Within the Spherical category are the conventional and disposable soft lenses. The first comprises a single pair that can be worn for a period of one year on a daily basis during waking hours. Disposables are the most hygienic option as they are replaced after a particular period —daily, fortnightly, monthly or quarterly.

Hard contact lenses are made of some variant of polymethyl methacrylate (PMMA) and are obsolete. RGP lenses are semi-rigid lenses made usually from silicones which allow oxygen through to the eye.

Toric soft lenses are used in cases of high cylindrical power or astigmatism. A comfortable option over semi-soft lenses, it is available as both conventional and disposable. Bifocal contact lenses are prescribed for those who prefer contact lens correction for Presbyopia or difficulty in near vision. These are currently available only in disposable option. Cosmetic contact lenses are available in different colours and tints, in both power and Plano, with conventional and disposable options. These are principally worn to enhance looks.

Contact lens market in India is dominated by soft contact lenses. The market for disposable lenses is growing at a higher rate as they are more hygienic and require lesser maintenance.

Market dynamics and key growth drivers of contact lens market in India

The main competition of contact lens in India is from the spectacles. Fashionable frames and spectacles have hindered the contact lens category from growing in India. The penetration of contact lenses in the category of people using vision care products is very low as compared with developed countries where contact lenses are available as an OTC product. This is account of the higher cost compared to frames and

maintenance issues. Laser corrective procedure does not pose as a challenge to contact lenses as they cater to a niche audience.

The market penetration of contact lenses in India is extremely low (only 5 per cent in SECs A and B of the top six metros who need vision correction). In comparison, the penetration is 22% in Singapore, 25% in Hong Kong and 30% in the US *(source: JJVC)*.

Not too many Indian customers are willing to spend on contact lens because of the perception that contact lenses provide cosmetic appeal, but the price-value equation does not match. In reality, a good pair of spectacles frames costs at least Rs 1,500. The relative price for contact lens has dropped in the past decade. The disposable and semi-soft lens costs between Rs 900 and Rs 8,000 for one year usage.

Also, there are category-related issues. It is far easier to wear and take care of spectacles than contact lens. Further, most potential consumers have the fear of inserting a foreign object in the eye.

Over the years, the age profile of contact lens users has come down. Currently, the average user tries on contact lens for the first time at around 15 years. Around three years ago, a first-time buyer of contact lens was a little over 20 years. In addition, the BPO generation youth for whom appearance is critical is expected to lead the growth of contact lens in India.

Market penetration and size

It is estimated that nearly 30% per cent of the population in India requires vision correction. Though about 30 crore people need glasses, only about 9-10 crore people wear them. The market is around 3 crore pieces per annum. In value terms, the total eyewear market in India is over Rs 1,800 crore and is growing at around 15-20 per cent per year. Of this, only about 10 per cent is in the organised segment.

Contact lenses are slowly making inroads in the spectacles market in India - from 1.5 lakh users in the mid-1990s, there are now over 10 lakh contact lens users in India. The market penetration of contact lenses in India is extremely low (only 5 per cent in SECs A and B of the top six metros who need vision correction). Nearly 8% of the Indian population or one third of Indian urban population belongs to SEC A & B categories. Contact lenses are usually used with a back-up of spectacles and that is how the market is estimated. The industry is expected to grow at 20% (slightly higher than the growth of overall eyewear market) on account of changing lifestyle, higher purchasing power and favourable demography.

Contact lens usage in India

Population requiring vision correction	Around 30 crore
Eyewear market (total)	Around 9 crore users
Eyewear market (per annum)	Around 3 crore pieces per annum
Eyewear users in SECs A & B	Around 2 - 2.5 crore users
Penetration of contact lens in SEC A & B market	5%
Contact lens market (per annum)	Around 12 lakh users (1-1.2 million)
Expected growth rate	**20% (slightly higher than growth-rate of eye-wear market in India)**

Source: Industry survey, Press reports, IMaCS Analysis

Almost 70% of contact lens users are using yearly disposable lenses while the remaining users rely on monthly disposable lenses. The yearly contact lens costs Rs 1200 per pair on an average (though they range from Rs 900 to Rs 9000 per pair). The monthly disposable lenses cost Rs 90 per lens (i.e. Rs 180 for a pair).

Little shift towards monthly disposable contact lens is expected in the next 5 years from 30% in 2007-08 to 40% in 2012-13. The prices of lens are not expected to drop further and are expected to remain stable. No price increase has been assumed for market sizing.

Hence, the current and future forecast of contact lens usage in India is given below:-

Contact lens usage in India	2007-08	2012-13
Contact lens users (million)	1.2	2.99
Contact lens pieces (pairs) (million)*	5.2	16.1
Contact lens value	**Rs 179 crore**	**Rs 473 crore**

Source: Industry survey, IMaCS Analysis

** Contact lens pieces are high because of fair proportion of monthly disposable lens usage*

The potential market for contact lens in 2012-13 is estimated at Rs. 473 crore up from Rs 179 crore in 2007-08 (E). No inflationary increase has been assumed for the price of contact lens. In volume terms, the number of contact lens users is expected to grow from 1.2 million in 2007-08 to 2.99 million in 2012-13. On account of marginal shift from yearly contact lens to monthly disposable lens, the number of contact lens pieces (pairs) is expected to increase from 5.2 million to 16.1 million over the same period.

In the contact lens market in India, Bausch and Lomb is the market leader with 70 per cent market share, followed by Johnson & Johnson Vision Care (Acuvue brand), Ciba Vision (a Novartis product) and Silklens.

The estimated import figures for Contact Lenses are as given below:-

HS Code	Description	Imports (pairs)	Imports (in Rs crore)
		2007-08(E)	2007-08(E)
90013000	CONTACT LENSES*	Approx. 5 - 6 million	~ 30

Source: IBIS, DGCIS, IMaCS Analysis

** Contact Lenses are also imported under the HS codes – 90029000, though rarely*

USA accounts for 40-50% of the Indian imports of contact lenses followed by Ireland which accounts for 25-30% of the imports and Singapore which accounts for around 10% imports. Canada, Korea, Taiwan, UK and Malaysia are the other key source nations of contact lenses in India.

Bausch & Lomb imports multifocal and toric lenses from USA & Brazil from its parent company. They also import blank lenses (lenses with out power) and moulds.

The estimated export figures of contact lens are as given below:-

HS Code	Description	Exports (pairs)	Exports (in Rs crore)
		2007-08(E)	2007-08(E)
90013000	CONTACT LENSES*	Approx. 0.5 - 1 million	~ 15-20

Source: IBIS, DGCIS, IMaCS Analysis

** Apart from these HS codes, Contact Lenses are also exported in nominal amounts under the HS codes – 90029000, 90031100, 90021900, 90014090 & 90015000 (included in Exports value above)*

USA, Canada & UK are the largest export destinations of contact lenses from India accounting for 70-80% of exports from India. India also exports contact lenses to Germany, Netherlands, Syria, Kenya, Middle-east and neighboring countries like Sri Lanka & Nepal.

Raw materials

Soft Contact Lenses are made from a water absorbing polymer called HEMA (Hydroxy Ethyl Metha Acrylate). It has hydrophilic qualities, i.e., it can soak up water and still retain its shape and optic functions. Contact lenses may be produced by cutting a blank on a lathe or by molding process.

Quality Control and Standards

There are no standards for contact lenses in India.

Key machinery manufacturers/suppliers in India

None

Artificial Heart Valves

Artificial heart valves are implanted in the heart of the patients who need treatment for valve related diseases. The natural heart valve needs a replacement when two or more valves stop functioning properly. Generally an open heart surgery is performed to replace the valve.

There are two types of artificial heart valves –

- Mechanical heart valve and
- Tissue heart valve

The mechanical heart valves last almost indefinitely, however, they need continuous treatment with anticoagulants. The tissue valves on the other side do not need anticoagulants, however, they have shorter life span. Typically the tissue valves command 10% or less market in the heart valves market.

Product characteristics

The heart valve has three parts, a metallic housing, a disc or ball which functions as occlude and a sewing ring made of synthetic material. The functional requirement of heart valves are as follows:

1. Minimum regurgitation
2. Minimum trans-vascular pressure gradient
3. Non-thrombogenic
4. Low wear/tear
5. Minimal leakage
6. Appropriate valve orifice to anatomical orifice ratio

The mechanical heart valve consists of Ultra high molecular weight-polyethylene (UHMW-PE) disc, Low density polyethylene plastic with knitted polyester sewing ring and a metallic housing. The Sewing Ring is fabricated from extensively implant tested, 100% polyester material. The Sewing Ring fabric is warp - knitted in a specific pattern using texturized yarn with superb tissue ingrowth and long term blood compatibility. The design and fabrication of the sewing ring gives a firm and secure seating on the frame and also permits rotation in the ring for proper orientation after suturing in place.

Market size of heart valve and future forecast

The heart valve market in India is approximately Rs. 74 crore. The only producer in India is TTK Healthcare. The excess demand is met through imports from Edwards Life Sciences, St. Judes Inc., and Meditronics. TTK Healthcare also exports a small quantity of production (300 valves) to neighbouring countries. TTK Healthcare has been experiencing a growth of around 30% y-o-y for heart valves. Hence, on a conservative side, we have assumed a growth rate of around 20% for the domestic usage.

The technical textile in the heart valve is knitted polyester fabric called sewing ring which is around 1% by value of the heart valve.

The current and future forecast of heart valves consumption is given below:-

Heart valves Domestic usage	2007-08	2012-13
Heart-valves (Quantity)	27,200 nos.	67,500 nos.
Heart-valves value	Rs 70 crore	Rs 175 crore
Fabric Value	Rs 0.7 crore	Rs 1.75 crore

Source: Industry survey, IMaCS Analysis

The potential market for heart valve industry in 2012-13 is estimated at Rs. 175 crore up from Rs.70 crore in 2007-08 (E). In volume terms, the heart valve industry is expected to grow from 27,100 nos. in 2007-08 to 67,500 nos. in 2012-13. No inflationary increase has been assumed for the price of these products as the prices have fallen over the years. The value of technical textile component of heart valves is expected to increase from Rs 0.7 crore in 2007-08 to Rs 1.75 crore in 2012-13.

Key manufacturers of heart valve

TTK Healthcare in collaboration with Sri Chitra Tirunal is the only domestic manufacturer. TTK healthcare had annual sales of around 7,500 valves with around 300 as exports in 2007. TTK has capacity to produce 20,000 heart valves in a year.

Manufacturer	Year	Product	Production quantity	Installed capacity
TTK Healthcare	2007-08	Heart-valves	7,548 nos.	20,000 nos.

Source: Annual report

Imports and Exports of heart valve

The estimated import figures for heart valves are as given below:-

HS Code	Description	Imports (Quantity)	Imports (Value)
		2007-08(E)	2007-08(E)
90181990 90183990 90212900 90213900	Heart Valves	**Around 20,000 nos.**	**Rs 53 crore**

Source: IBIS, IMaCS Analysis

The imports of heart valves arrive primarily from USA, Brazil, Italy and Netherlands. The imports from USA have a share of around 40% followed by Brazil and Italy. The exports are negligible as compared to imports. TTK Healthcare exports around 300 valves to neighbouring countries annually.

Raw-materials and machinery

The mechanical heart valve consists of Ultra high molecular weight-polyethylene (UHMW-PE) disc, Low density polyethylene plastic with knitted polyester sewing ring and a metallic housing. Heart valves are manufactured using warp-knitting process on Double Raschel Warp knitting machines.

Artificial Vascular Grafts

Vascular diseases are characterised by variations to the geometry and structure of the walls of the blood vessels. Variations in the mechanical characteristics of the vessels result in multiple complications like Thrombosis, Aneurysm and Arteriosclerosis.

Product characteristics

In order to function effectively, the grafts need to have special characteristics like – non-thrombogenic surface, elasticity and compliance, long-term tensile strength, bio-compatability, durability, bacteria resistance, etc. The type of fabric used for prostheses is woven fabric or knitted fabric. The knitted fabric is easy to suture and well suited for aortic replacement however not for large diameter vessels. The knitted fabric is porous and needs to be clotted with patient's blood before usage. On the other hand, the woven fabric has the strongest construction but is difficult to suture. Most textile grafts for large and medium artery replacement are made of either PET (polyethylene terephthalate, commercial name Dacron) or PTFE (polytetrafluoro ethylene, commercial name Teflon).

Market size of vascular graft and future forecast

The vascular graft market in India is quite small and the requirement is primarily met through imports. The current usage of grafts is annually around 5,000 units. The price range varies from as low as Rs. 2000 to Rs. 20,000. The average price is around Rs 9,000 per graft. The industry is expected to grow at around 10% y-o-y.

The vascular graft is a 100% technical textile product produced by warp knitting process.

The current and future forecast of vascular grafts consumption is given below:-

Vascular grafts Domestic usage	2007-08	2012-13
Vascular grafts (Quantity)	5,000 nos.	8,000 nos.
Vascular grafts value	Rs 4.5 crore	Rs 7.2 crore

Source: Industry survey, IMaCS Analysis

The potential market for vascular graft industry in 2012-13 is estimated at Rs. 7.2 crore up from Rs. 4.5 crore in 2007-08 (E). In volume terms, the vascular graft industry is expected to grow from 5,000 nos. in

2007-08 to 8,000 nos. in 2012-13. No inflationary increase has been assumed for the price of these products as the prices have fallen over the years.

Key manufacturers

TTK Healthcare in collaboration with Sri Chitra Tirunal is the pioneer of vascular grafts in India. However, products are still under clinical trials. TTK Healthcare is testing indigenously developed grafts with South Indian Textile Research Association (SITRA). The current demand is met through imports.

Imports and Exports of vascular graft

The estimated import figures for vascular grafts are as given below:-

HS Code	Description	Imports (Quantity)	Imports (Value)
		2007-08(E)	2007-08(E)
90181990 90183990 90189099	Vascular Grafts	**5,000 nos.**	**Rs 4.5 crore**

Source: IBIS, IMaCS Analysis

The vascular grafts are primarily imported. 67% of the imports come from USA and the other nations which export include UK, Germany, France, Singapore, Georgia, Denmark and Australia.

Raw-materials and machinery

Vascular grafts are manufactured using warp-knitting process on Double Raschel Warp knitting machines. Most textile grafts for large and medium artery replacement are made of either PET (polyethylene terephthalate, commercial name Dacron) or PTFE (polytetrafluoro ethylene, commercial name Teflon). These grafts can also be woven, though, rarely.

Artificial Tendon (Mesh)

Artificial Tendons or meshes are used in hernia repair and abdominal wall replacement, where mechanical strength and fixation are very important. The long term function of the mesh is optimised by adjusting the porosity and the texture of the mesh.

Product characteristics

The mesh could either be woven or knitted based on the requirement of strength. Polypropylene, Polyester mesh is primarily used in hernia repair as it is resistant to infections. GOR-TEX is also used for making mesh for hernia repair. The size varies from 2''x4'' to 10''x14''.

Market size of artificial tendon and future forecast

Primarily, the requirement of meshes is met through imports. The major domestic producer is TTK Healthcare with production of around 1 lakh square inch annually. TTK Healthcare has an installed capacity of 5 lakh square inches.

The artificial tendon is a 100% technical textile product produced by warp knitting process or weaving process.

The current and future forecast of artificial tendons consumption is given below:-

Artificial tendons Domestic usage	2007-08	2012-13
Artificial tendons (Quantity)	1 – 1.5 lakh nos.	Around 2 lakh nos.
Artificial tendons value	Rs 9 crore	Rs 15 crore

Source: Industry survey, IMaCS Analysis

The potential market for artificial tendon industry in 2012-13 is estimated at Rs. 15 crore up from Rs. 9 crore in 2007-08 (E). In volume terms, the artificial tendon industry is expected to grow from 1 – 1.5 lakh nos. approx. (estimated) in 2007-08 to around 2 lakh nos. in 2012-13. No inflationary increase has been assumed for the price of these products as the prices have fallen over the years.

Key manufacturers

TTK Healthcare in collaboration with Sri Chitra Tirunal is pioneer of artificial tendon in India. TTK Healthcare produces around 1 lakh square inch artificial tendons / hernia repair mesh annually and has an installed capacity of 5 lakh square inch.

Manufacturer	Year	Product	Production quantity	Installed capacity
TTK Healthcare	2007-08	Hernia repair mesh	7,397 nos. Or Around 1 lakh sq. inch	5 lakh sq. inch

Source: Annual report

Imports and Exports of artificial tendon

The estimated import figures for artificial tendon/mesh are as given below:-

HS Code	Description	Imports (Quantity)	Imports (Value)
		2007-08(E)	2007-08(E)
90183990	Artificial tendon / Mesh / Hernia repair mesh	**1 – 1.5 lakh nos.***	**Rs 8 – 9 crore**

Source: IBIS, IMaCS Analysis
** Estimated*

The artificial tendons are primarily imported. Over 50% of the imports are from USA followed by UK, Germany, France, Singapore, Denmark and Hong Kong.

Raw-materials and machinery

Meshes for hernia and other medical requirements are manufactured using warp-knitting process on Double Raschel Warp knitting machines. Most textile grafts for large and medium artery replacement are made of either PET (polyethylene terephthalate, commercial name Dacron) or PTFE (polytetrafluoro ethylene, commercial name Teflon). These grafts can also be woven, though, rarely.

Artificial Kidney / Dialysers

Kidney serves the filtering mechanism of the blood. The kidney has a mechanical substitute in kidney dialysis machine. The kidney dialysis machine is outside the body and purifies the blood using a filter called the haemodialysor. The haemodialysor is made primarily of polysulphone and polyacetate.

The main element in a dialyser is a semipermeable membrane through which small molecules can pass by diffusion. Dialysers are encountered in medical work in renal dialysis where unwanted small molecules (e.g. urea) and water can be removed from the body. Haemodialysers (sometimes called artificial kidneys) take blood from the body and pass it along one side of the dialysing membrane so that unwanted small molecules may diffuse into a special dialysing fluid passing along the other side. Small molecules which need not be removed are included in the dialysate so that there is equal diffusion of these molecules in each direction.

Product characteristics

The primary function of the artificial kidney is to purify the blood. The filtration medium used is hollow viscose or hollow polyester fibre. The typical characteristics of the fabric are:

- Low linting,
- High durability,
- Good capillary action,
- Good absorbency,
- Biodegradability and
- Inert behaviour

Market for artificial kidney and future forecast

The average price of artificial kidneys or dialysers is around of Rs. 300 per unit. The haemodialysor equipment is primarily imported into India and it has an institutional market. The dialysers and other spare parts are also 100% imported.

The artificial kidney membrane or dialysers are 100% technical textile products made primarily of polysulphone and polyacetate.

The current and future forecast of artificial kidney fabric consumption is given below:-

Artificial kidneys Domestic usage	2007-08	2012-13
Artificial kidneys (Quantity)	0.8 million nos.	1.3 million nos.
Artificial kidneys (Value)	Rs 25 crore	Rs 40 crore

Source: Industry survey, IMaCS Analysis

The potential market for artificial kidney industry in 2012-13 is estimated at Rs. 40 crore up from Rs. 25 crore in 2007-08 (E). In volume terms, the artificial kidney industry is expected to grow from 0.8 million nos. in 2007-08 to around 1.3 million nos. in 2012-13. No inflationary increase has been assumed for the price of these products.

Key manufacturers

There are no manufacturers manufacturing the fabric for artificial kidneys in India.

Imports and Exports of Artificial kidney fabric

The estimated import figures for artificial kidney are as given below:-

HS Code	Description	Imports (Quantity)	Imports (Value)
		2007-08(E)	2007-08(E)
90189031, 90189099, 90181990	DIALYZERS FOR HAEMODIALYSORS	**0.8 million nos.**	**Rs 25 crore**

Source: IBIS, IMaCS Analysis

The artificial kidneys are primarily imported from Germany and Japan (35-40% share each) followed by around Egypt with 20-25% share and Thailand with less than 5% share.

Quality Control and Standards – The product is based on international standards.

Artificial Joints

The orthopaedic joints are used for patients suffering from arthritis and accidental damage of joints. The joints are made such that they are compatible with the human body.

Product characteristics

The artificial joints are primarily made of Titanium, Stainless Steel and Chromium Cobalt, materials which exhibit compatibility with the human body. The technical textile component in joints is Ultra High Molecular Weight High Density Polyethylene (UHMWHDPE) material.

Market for artificial joints and future forecast

The approximate market for joints in India is around Rs.4.5 crore. The market is for high end prostheses which are imported and some are manufactured in India. In India around 20,000 to 25,000 joint replacements happen which range from very minor to major implants.

The UHMWHDPE is a technical textile product which varies based on the product or type of joint replacement.

The current and future forecast of artificial joints consumption is given below:-

Artificial joints Domestic usage	2007-08	2012-13
Artificial joints (Quantity)	Around 3,500 to 5,000 nos.	Around 7,000 to 10,000 nos.
Artificial joints (Value)	Rs 5 crore approx.	Rs 10 crore approx.

Source: Industry survey, IMaCS Analysis

The potential market for artificial joint industry in 2012-13 is estimated at Rs. 10 crore up from Rs. 5 crore in 2007-08 (E). The growth the industry is assumed to be 15% based on the industry survey.

Imports and Exports of artificial joints

The estimated import figures for artificial joints are as given below:-

HS Code	Description	Imports (Quantity)	Imports (Value)
		2007-08(E)	2007-08(E)
90189099, 90211000, 90213100, 90189031	ARTIFICIAL JOINTS, KNEE SHAPED COMPONENTS FOR ARTIFICIAL LIMBS, KNEE PROSTHESIS HEADS	**Around 3500 to 5000 nos.**	**Rs 5 crore approx.**

Source: IBIS, IMaCS Analysis

The artificial joints are primarily imported and around ~80% of the imports come from U. K. The remainder is supplied by USA, Germany, Turkey, Ireland and Egypt. The exports primarily go to Turkey which accounts for nearly 45% of exports followed by Egypt and Sri Lanka.

The technical textiles based artificial joints are not exported from India.

Quality Control and Standards – The specifications for joints is given in IS: 5810

Artificial Ligaments

An artificial ligament is medical device for joining ends of two bones. The artificial ligaments are made from man-made fibres like polyester. The usage of the ligament varies based on type of operation. The artificial ligaments are generally subject to lot of wear and tear. They also carry a risk of septic arthritis.

Product characteristics

Ligament is a multilayered or tubular woven structure having intra-articular region, at least one bend region and end regions. Each region is woven so as to possess the required flexibility and strength. Polyethylene Teraphthalate (PET) is primarily used for manufacturing artificial ligaments. The artificial ligament must be bio-compatible with contact blood and tissue and should have good bonding strength.

Market for artificial ligaments and future forecast

The artificial ligaments market in India is small and primarily artificial ligaments are imported. The ligaments are made of polyester which is the technical textile component. The current and future forecast of artificial joints consumption is given below:-

Artificial ligaments Domestic usage	2007-08	2012-13
Artificial ligaments (Quantity)	Around 500 nos.	Around 750 nos.
Artificial ligaments (Value)	Rs 1.25 crore	Rs 1.9 crore

Source: Industry survey, IMaCS Analysis

The potential market for artificial ligaments industry in 2012-13 is estimated at Rs.1.9 crore up from Rs. 1.25 crore in 2007-08 (E). The growth the industry is assumed to be 8-10% based on the industry survey. As of now, the domestic demand is completely satisfied by imports.

Imports and Exports of artificial ligaments

The estimated import figures for artificial joints are as given below:-

HS Code	Description	Imports (Quantity)	Imports (Value)
		2007-08(E)	2007-08(E)
90189019	ARTIFICIAL LIGAMENTS	**Around 500 nos.**	**Rs 1.25 crore**

Source: IBIS, IMaCS Analysis

The artificial ligament imports arrive from Netherlands and USA. The exports of these products is negligible.

Artificial Cornea

The cornea is the transparent front portion of the eye that permits light to enter the eye. Normally crystal clear, it can become cloudy or misshapen, causing gravely reduced vision or blindness. Diseased corneas can be replaced successfully through transplantation (medically termed "keratoplasty") using human donor cornea or artificial cornea (Keratoprosthesis). Human donors are primarily used for transplantation in India. Keratoprosthesis is made of clear plastic with excellent tissue tolerance and optical properties. The polymers used in artificial cornea need to be bio-compatible, flexible, sufficient mechanical strength.

Product characteristics

The Keratoprosthesis or artificial cornea is made using following materials:

1. Poly methyl methacrylate (PMMA)
2. Poly 2-hydroxythyl methacrylate hydrogels (PHEMA)
3. Poly vinyl alcohol (PVA)

The artificial cornea is expected to have the following characteristics:

1. Withstand intraocular pressure
2. Be transparent
3. Have appropriate curvature
4. Have suitable refractive index
5. Sufficient tensile strength to allow surgical manipulation and fixation
6. Scratch resistance

Market for artificial cornea

In India, approximately 30,000 cornea transplants are carried out every year. The usage of artificial cornea has started recently. Less than ten artificial cornea transplants have taken place in India so far. The price of this artificial cornea is around $3000 and the cornea is made available by the supplier on request only. The import of these items is set to increase with increasing medical tourism.

Artificial Skin

Skin grafting is the procedure of replacing dead skin with live skin. There are two primary methods of skin grafting – Autologous skin graft and allograft transfers.

The autologous skin graft transfers skin from one part of the body to another. The allograft transfers skin from the bodies of other people / cadaver. Allografts offer only temporary cover, as they are quickly rejected by a person's immune system.

The artificial skin is used in the skin grafting process. After removing burnt / damaged skin, surgeons blanket the wound with a covering (artificial skin) before applying a skin graft on top of this biomaterial to encourage the growth of new skin to close the wound.

Product characteristics

Artificial skin consists of two layers. The bottom layer, which is designed to regenerate the lower layer of real skin, is composed of a matrix of interwoven bovine collagen (a fibrous cow protein) and a sticky carbohydrate (sugar) molecule called glycosaminoglycan, which mimics the fibrous pattern of the bottom layer of skin. This matrix then sticks to a temporary upper layer: a medical-grade, flexible silicon sheet that mimics the top, epidermal layer of skin. Integra® is major brand in artificial skin grafts. The Integra® skin grafts look somewhat like translucent plastic wrap.

Market for artificial skin

The artificial skin market in India is negligible due to very high costs involved. For example, a four inch by four inch skin patch costs Rs 40 lakh. The Burns Association of India is developing a skin bank to aid its grafting procedures. Indigenous development of artificial skin is already underway, however, there not many cases of clinical trials reported.

Artificial Heart

In India, about 20 million patients suffer from heart failure every year. The number of heart failures is increasing by two million annually. About 20% of these patients die without medical-aid. The artificial heart is intended for use in patients whose hearts have been irreparably damaged left and/or right ventricles, and for whom, existing methods of surgical intervention and/or drug therapy are inadequate. Heart transplantation is limited by availability of donor organs. At present, donor supply limits heart transplantation to about 3,500 hearts globally every year.

There is immense potential for artificial hearts. However, the device is very expensive at Rs 34 lakh and the overall cost of surgery as Rs 40 lakh. The cost of artificial heart is set to fall with improvements in technology.

Artificial Lung

Totally artificial lungs are not completely commercial. However, heart-lung machines are available in the market. The artificial lung device is connected to the heart's right ventricle. It relies on the heart—not a mechanical pump—to send blood through the lung, where it receives oxygen (and offloads carbon dioxide) as it flows through the arrays of microfibers or membrane oxygenators. Oxygen rich blood passes from the device into the left atrium and then to the rest of the body. The microfibers or the membrane oxy-generator are the technical textile component in the device.

Globally there have been less than 300 lung transplants. Cadaver donation or donation from brain dead patients is still the main source of transplants. The artificial lung does not have a market in India as yet and the awareness is low. Also the clinical efficacy of this product is not proven yet.

Artificial Liver

Earlier, artificial support systems were not widely used in cases of liver failure, primarily because hepatic toxins are albumin-bound unlike most uremic toxins and hence cannot be removed by conventional dialysis. Recently, advances have been made for the removal of hepatic toxins making it now possible to support the patient with liver failure till the liver recovers or until liver transplantation is feasible.

The major artificial liver support systems are – Peritoneal dialysis, Haemodialysis, Hemofilteration, Continuous renal replacement therapy, Charcoal Haemoperfusion, Plasma exchange, Biologic – DT sorbent System and Molecular adsorbent recirculating system.

In this system, patient's blood or plasma is pumped into bioreactors, which are hollow fibre devices, seeded on the dialysate side with freshly isolated or cryopreserved porcine hepatocytes or transformed human hepatoma cell line.

Market for artificial liver

India has done less than 300 liver transplantations. The liver transplants are primarily done through two modes in India –

- Cadaveric donation where the liver of a brain dead person is used
- Living Liver donation where half of the liver of patient's relative is given to the patient, the liver then regenerates after some days in both donor and receiver.

There has been no artificial liver transplant in India yet.

MOBILTECH

Mobiltech segment of technical textile products includes applications in automotive and automotive components (including aircrafts and railways). The Mobiltech products can be broadly classified into two categories – Visible components and Concealed components. The visible components include – seat upholstery, carpets, seat belts, headliners, etc. The concealed components include – Noise Vibration and Harness (NVH) components, tyre cords, liners, etc.

The technical textile products covered under mobiltech are as give below:-

- Nylon tyre cord
- Seat belt webbing
- Airbags
- Car body covers
- Seat upholstery/fabric
- Automotive carpets
- Headliners
- Insulation felts (NVH components)
- Sunvisors / sunblinds
- Helmets
- Airline disposables
- Webbings for aircrafts
- Aircraft upholstery
- Railways seating fabrics

Technical textiles consumption under Mobiltech is estimated at around Rs 3,158 crore. Nylon tyre cord accounts for over 60% of the total technical textile consumption in the segment followed by seat upholstery / fabric with a share of around 13%. Insulation felts and helmets have share of around 5-10% each in the total consumption.

The usage of technical textiles in tyres (Nylon tyre cords) is estimated as Rs 2,000 crore approx in 2007-08 which is expected to increase to Rs 2,425 crore by 2012-13. Around 40% of the demand for nylon tyre cord is met through imports. The potential market for seat belts webbing in 2012-13 is estimated at Rs.

22.1 crore up from Rs. 7.04 crore in 2007-08. The potential market for seat covers fabric / upholstery industry in 2012-13 is estimated at Rs. 868 crore up from Rs. 402 crore in 2007-08.

The potential market for insulation felt industry in 2012-13 is estimated at Rs. 494 crore up from Rs. 232 crore in 2007-08. The potential market for automotive interior carpet industry in 2012-13 is estimated at Rs. 290 crore up from Rs. 136 crore in 2007-08 while that for headliners is estimated at Rs. 59.3 crore in 2012-13 up from Rs. 28.7 crore in 2007-08. The potential market for sunvisors industry in 2012-13 is estimated at Rs. 154 crore up from Rs. 74 crore in 2007-08.

The potential market for aircraft disposables is estimated at Rs. 5.3 crore in 2012-13 up from Rs 2.65 crore in 2007-08 while that for aircraft webbings in 2012-13 is estimated at Rs. 5 crore up from Rs 2.5 crore in 2007-08 and aircraft upholstery is estimated at Rs. 0.9 crore in 2012-13 up from Rs 0.45 crore in 2007-08. The potential market for railways seat cover fabric in Railways in 2012-13 is estimated at Rs. 1.54 crore up from Rs 1.3 crore in 2007-08.

Overall, the domestic consumption of technical textiles under mobiltech is expected to increase from around Rs 3,158 crore in 2007-08 to around Rs 5,137 crore by 2012-13.The demand for the mobiltech products is dependent on the passenger cars and commercial vehicles sector growth. The passenger vehicles have grown at 13.4% y-o-y over the last five years while commercial vehicles have grown at 15.5% y-o-y. The passenger cars have grown at a CAGR of 13.8% y-o-y in the last 3 years while utility vehicles and multi-purpose vehicles have grown at 10.4% and 14.4% y-o-y respectively. The industry is expected to maintain similar growth levels over the next 5 years.

The maximum growth is expected in the airbags, seat belt webbings and helmets segment. The usage of these products is driven primarily by the road safety measures enforced by the government. The airbag modules are presently made available through imports. The usage of airbags module is expected to grow at around 25% year on year. Similarly, the helmets and webbings segment are expected to achieve a growth of around 25% y-o-y.

The other Mobiltech products with strong growth potential are - upholstery, automotive interior carpets, headliners and NVH components. The airlines disposables, airlines webbings and airlines seat covers / upholstery are also expected to grow at around 15% y-o-y.

Summary of the market-sizing for Mobiltech

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
Nylon tyre cord	**Quantity**	72,000 MT	47,500 MT	1,500 MT	118,000 MT	142,500 MT	
	Value	Rs 1,222 crore	Rs 800 crore	Rs 22 crore	Rs 2,000 crore	Rs 2,425 crore	Rs 29.5 crore
Seat belt webbing*	**Quantity**		6.25 million meters	-	10.56 million meters	21.3 million meters	-
	Value		Rs 7.75 crore	Rs 0.05 crore	Rs 7.04 crore	Rs 22.1 crore	-
Airbags (TT component)	**Quantity**	-	2.25 lakh nos.	-	2.25 lakh nos.	6.41 lakh nos.	-
	Value	-	Rs 12 crore	-	Rs 12 crore	Rs 35 crore	-
Car body covers	**Quantity**	1.04 lakh nos.	-	-	1.04 lakh nos.	2.1 lakh nos.	-
	Value	Rs 9 crore	-	-	Rs 9 crore	Rs 17.5 crore	-
Seat covers fabric / upholstery	**Quantity**	13.58 million meters	1.1 million meters	-	14.68 million meters	31.56 million meters	-
	Value	Rs 372 crore	Rs 30 crore	-	Rs 402 crore	Rs 868 crore	-
Automotive Interior carpets	**Quantity**	13.6 million sq. m.	-	-	13.6 million sq. m.	29 million sq. m.	-
	Value	Rs 136 crore	-	-	Rs 136 crore	Rs 290 crore	-
Headliners (TT component)	**Quantity**	4.16 million sq. m.	0.25 million sq. m.	-	4.41 million sq. m.	9.13 million sq. m.	-
	Value	Rs 27.18 crore	Rs 1.5 crore	-	Rs 28.68 crore	Rs 59.32 crore	-
Insulation felts	**Quantity**	22,500 MT	-	-	22,500 MT	48,000 MT	-

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
	Value	Rs 232 crore	-	-	Rs 232 crore	Rs 494 crore	-
Sunvisors / sunblinds	Quantity	4.03 million nos.	0.2 million nos.	-	4.23 million nos.	8.83 million nos.	-
	Value	Rs 70.52 crore	Rs 3.5 crore	0.02	Rs 74 crore	Rs 154 crore	-
Helmets	Quantity	16.7 million nos.	-	-	16.7 million nos.	27.6 million nos.	-
	Value	Rs 250 crore	-	-	Rs 250 crore	Rs 759 crore	-
Airlines disposables	Quantity	13 million nos.	3.9 million nos.	-	16.9 million nos.	33.8 million nos.	-
	Value	Rs 2.25 crore	Rs 0.4 crore	-	Rs 2.65 crore	Rs 5.3 crore	-
Webbings for aircrafts	Quantity	-	0.25 million meters	-	0.25 million meters	0.5 million meters	-
	Value	-	Rs 2.5 crore	-	Rs 2.5 crore	Rs 5 crore	-
Aircrafts upholstery	Quantity	-	5,000 meters	-	5,000 meters	10,000 meters	-
	Value	-	Rs 0.45 crore	-	Rs 0.45 crore	Rs 0.9 crore	-
TT usage in Railways	Quantity	0.43 million sq. m.	-	-	0.43 million sq. m.	0.51 million sq. m.	-
	Value	Rs 1.3 crore	-	-	Rs 1.3 crore	Rs 1.54 crore	-
TOTAL	Value	**Rs 2,322 crore**	**Rs 858 crore**	**Rs 22 crore**	**Rs 3,158 crore**	**Rs 5,145 crore**	**Rs 29.5 crore**

** Seat belt webbings estimate of domestic usage is excluding direct imports of seat belts by global auto OEMs; reduction in direct imports of seat belts is possible provided the manufacturing capacity of seat belt webbing and seat belts increases over the next five years*

As per ECTT report, the potential market sizing for 2007-08 was as given below:-

Market size (ECTT report)		2001-02	2007-08 (P)
Nylon tyre cord	**Quantity**	65,000 MT	75,000 MT
	Value	Rs 812 crore	Rs 937 crore
Seat belt webbing	**Quantity**	5.76 million meters	22.35 million meters
	Value	Rs 9.22 crore	Rs 35.76 crore
Airbags (TT component)	**Quantity**	25,000 nos.	14.48 lakh nos.
	Value	Rs 1 crore	Rs 72.4 crore
Car body covers	**Quantity**	50,000 nos.	80,000 nos.
	Value	Rs 3.75 crore	Rs 6 crore
Seat covers / fabric	**Quantity**	2.5 million meters	5.96 million meters
	Value	Rs 68.75 crore	Rs 163.9 crore
Automotive Interior carpets	**Quantity**	2.5 million sq m	8 million sq m
	Value	Rs 25 crore	Rs 80 crore
Headliners (TT component)	**Quantity**	1.34 million sq m	2.9 million sq m
	Value	Rs 8.04 crore	Rs 17.38 crore
Insulation felts	**Quantity**	6.31 lakh nos.	14.48 lakh nos.
	Value	Rs 13.4 crore	Rs 28.96 crore
Helmets	**Quantity**	12.65 lakh nos.	20.3 lakh nos.
	Value	Rs 204.5 crore	Rs 317.55 crore
TOTAL	**Value**	**Rs 1,169.24 crore**	**Rs 1,699.21 crore**

The growth of the mobiltech products industry in India is dependent on the growth of automobiles production in India. The key impediments to growth being faced by the industry are:-

1. Domestic availability of raw materials like Nylon and polyester filaments is low
2. Availability of competitively priced imports from the south-asian countries
3. Low demand of airbags in the country because of which domestic production of airbags is not economical

Key growth driver for the Mobiltech segment (and products)

The passenger vehicles have grown at 13.4% y-o-y over the last five years while CVs have grown at 15.5% y-o-y. The passenger cars have grown at a CAGR of 13.8% y-o-y in the last 3 years while UVs and MPVs have grown at 10.4% and 14.4% y-o-y respectively. The industry is expected to maintain similar growth levels over the next 5 years.

Automobile production trend in India

(Vehicles in '000 numbers)	Production					
Segment	**2002-03**	**2003-04**	**2004-05**	**2005-06**	**2006-07**	**2007-08**
Passenger Vehicles (PVs)						
Passenger Cars	557.4	781.8	960.5	1,045.9	1,238.0	1,416.5
UVs	114.5	146.1	182.0	196.4	222.5	244.6
MPVs	51.4	60.7	67.4	66.7	84.7	101.0
Total Passenger Vehicles	**723.3**	**988.5**	**1,209.9**	**1,308.9**	**1,545.2**	**1,762.1**
Commercial Vehicles (CVs)						
M&HCVs						
Passenger Carriers	21.2	27.6	30.4	29.0	32.8	46.5
Goods Carriers	99.3	138.5	184.4	190.3	261.4	244.6
Total M&HCVs	**120.5**	**166.1**	**214.8**	**219.3**	**294.3**	**291.1**
LCVs						
Passenger Carriers	19.8	21.0	22.6	25.4	29.4	33.9
Goods Carriers	63.4	88.1	116.3	146.4	196.3	220.2
Total LCVs	**83.2**	**109.1**	**138.9**	**171.8**	**225.7**	**254.1**
Total Commercial Vehicles	**203.7**	**275.2**	**353.7**	**391.1**	**520.0**	**545.2**

Source: SIAM

The passenger cars are further classified as given below in 6 categories:-

	Production					
	2002-03	**2003-04**	**2004-05**	**2005-06**	**2006-07**	**2007-08**
A1: Mini - (Upto 3400 mm)	148187	178,364	127175	98047	99400	77039
A2: Compact (3401-4000mm)	310824	443,774	614137	714805	881528	1044848
A3: Mid-size (4001-4500 mm)	93,174	142,016	187345	204179	212662	244670
A4: Executive (4501-4700 mm)	2,039	13,467	26673	23428	39693	43955
A5: Premium (4701-5000 mm)	3,109	4,047	5017	5333	4489	5443
A6: Luxury (5001mm & above)	77	96	140	89	249	525

Source: SIAM

Seat belt webbing

Seat belts function as a safety harnesses which secure the passengers in a vehicle against harmful movements during collision or similar incidents. Seat belts minimise injuries during accidents. Seat belts are woven narrow fabric made from nylon filament yarns or high tensile polyester filament yarn. The load specification is an important criterion for usage in vehicles.

According to the Government Notification under Central Motor Vehicle Regulation (CMVR) all four wheelers have to be equipped with front and rear seat belts. Further, as per the Supreme Court Notification, all State Governments are expected to ensure that the driver and co-driver use the seat belts. The usage and demand for seat belts increased after the above two notifications were implemented.

At present, the seat belts, which are used in the cars, are called three-point which has single continuous length of webbing. They are called three-point because these belts help spread out energy of the moving body in a collision over the chest, pelvis and shoulders.
Seat belts are classified as:-

1. Static belts
2. ELR (Emergency Locking Retractor) belts

Product Characteristics

The seat belts are made from nylon filament yarn or polyester filament yarn which is woven to produce the webbing pattern. The linear density of synthetic yarns should be between 100dtex and 3000dtex, preferably 550-1800dtex. The filament linear density should be between 5dtex and 30dtex, preferably 8-20dtex. A typical seat belt is made of 320 ends of 1,100 dtex polyester each. Most weft yarns made from polyester are 550dtex.The critical characteristics of the webbing are abrasion resistance, resistance to light and heat, capable of being removed and put back in place easily and good retraction behaviour. The load bearing capacity of seat belts is 1500 kilograms. The surface of the webbing (generally smooth) is of particular significance because its structure and properties decisively influence the retraction behaviour.

Key growth drivers of the seat belts market in India

The seat belt usage is mandatory in the four wheeler vehicles and hence, the growth of seat belts is pegged to move in line with the growth in the four wheeler vehicles in India. The overall seat belt market in India is pegged at around Rs. 303 crore assuming an average seat belt price of Rs. 600.

Consumption norms and the market size

The usage of seat belts in vehicles varies from two in LCVs to seven in MUVs & SUVs.

	Unit	UVS	MPV	Passenger cars					
				A1	A2	A3	A4	A5	A6
Seat Belts	*Nos.*	7	4	2	2	2	4	4	5

Source: Industry survey

The seat belt webbing (the strap) is the technical textile in the complete seat belt assembly. The webbing is made of polyester or nylon. The consumption norm for seat belt is around 2.5 to 3 meters webbing per seat belt.

The current and future forecast of seat belt industry is given below:-

Seat belts webbings Effective domestic consumption#	**2007-08**	**2012-13**
Number of seat belts (Domestic consumption + Exports)	5.1 million number	10.34 million number
Seat belt webbings Quantity (Domestic usage - effective)*	13.9 million meters	28.1 million meters
Seat belt webbings Quantity (Domestic usage - actual)	10.56 million meters	21.3 million meters
Value (Domestic usage - actual)	Rs 7.04 crore	Rs 22.1 crore

Source: Industry survey, IMaCS Analysis

** including webbings as direct imports of seat-belts*

 # Effective domestic consumption includes seat belt webbings used in direct exports of seat belts

The potential market for seat belts webbing in 2012-13 is estimated at Rs. 22.1 crore up from Rs. 7.04 crore in 2007-08 (E). No inflationary increase has also been assumed for the price of the webbing material. In volume terms, the domestic usage of seat belt webbing is expected to grow from 10.6 million meters in 2007-08 to 21.3 million meters in 2012-13. The growth in the seat belts usage is expected to be more than the overall growth in passenger cars/UVs/MPVs due to the stronger growth of the high-end cars with more seat-belts.

The direct imports of seat-belts account for around 1.23 million seat-belts out of 5.1 million seat-belts (approx 24%). Hence, the webbings usage for automotive seat-belts is around 10.6 million meters. Imports account for around 60% of webbings usage for seat-belts. The domestic production of seat belt webbings is around 4.3 million meters.

Key manufacturers and exporters

Some of the major seat belt global players have presence in India through JVs. The major manufacturers of seat belts in India are IFB Autoliv India, Abhishek Auto Industries, Bond Safety Belt and Rane TRW.

IFB Autoliv has its main facility for seatbelt assembly in Bangalore. The company's is today the clear leader in the Indian seatbelt market with a market share of more than 50%. Major customers include Suzuki, Telco and Hyundai and sales totalled approximately Rs 200 crore in 2006-07.

Seat belt Manufacturers	Year	Capacity	Production Quantity	Sales Value
IFB Autoliv	2006-07			Rs 200 crore (seat-belts)
Rane TRW	2006-07	1 million numbers	0.686 million seat belts	Rs 27.7 crore
Bond Safety Belts	2005-06		0.3 million seat belts	Rs 6.5 crore

Source: Industry Survey, Company web-sites, Capitaline

The source of seat belt webbing in India is domestic production and imports. The domestic manufacturers for seat belt webbing are small in size like Shivam Narrow Fabrics, D.I. Plast India Pvt. Limited, UP Filaments and others of similar size.

Manufacturer	Year	Production Quantity
Shivam Narrow Fabrics *	2007-08	2.5 million meters
UP Filaments**	2007-08	1200 MT

Source: Industry Survey

** Includes only seat-belt webbing for automobiles*

*** Includes webbings for all applications*

Rane TRW utilised 1.647 million meters seat-belt webbings (Rs 2.3 crore at Rs 13.97 per meter) in 2006-07 for manufacturing 0.686 million seat-belts (i.e. 2.4 meter webbing per seat-belt).

Auto component manufacturer NK Minda Group has announced the formation of a joint venture (JV) with Japan's Tokai Rika to manufacture automotive seat belts in Bangalore.

Imports & Exports of webbings for seat-belts (four-wheelers)

The import figures for webbings with application in four wheelers seat belts manufacture are as given below:-

HS Code	Description	Imports	Imports
		2007-08(E)	2007-08(E)
58063200	SEAT BELT WEBBINGS*	**Around 2.25 million meters**	**Rs 2.5 crore approx.**
59119090**	SEAT BELT WEBBINGS	**Around 4 million meters**	**Rs 5.25 crore approx.**

Source: IBIS, IMaCS Analysis

** These webbings find usage in automotive belts and host of other applications; non-webbing products under this HS code have been excluded*

*** In addition, seat belt webbings are also imported under HS code 59111000 in very small amounts*

Under the HS code 59X, Thailand accounts for two-thirds of automotive seat-belt webbings imports while Japan accounts for one-third of the imports, China accounts for 2-3% and Malaysia, Turkey & Phillipenes account for around 1% of the seat-belts webbings imports approximately.

Under the HS code 58X, Korea accounts for over 90% imports of automotive seat-belt webbings imports while Thailand accounts for the remaining imports.

The exports of seat belt webbing from India are almost negligible.

In addition to the webbings, the direct imports and exports of seat belts is as given below. The import figures for seat belt are as given below:-

HS Code	Description	Imports (in Rs crore)			Imports (Quantity)			
		2005-06	2006-07	2007-08(E)	Unit	2005-06	2006-07	2007-08(E)
87082100	SAFETY SEAT BELTS	**346**	**389**	**456**	**Million Nos.**	**1.267**	**1.074**	**1.228**

Source: DGCIS, IMaCS Analysis

The direct export figures for seat belts are as given below:-

HS Code	Description	Exports (in Rs crore)		Exports (Quantity)		
		2005-06	2006-07	Unit	2005-06	2006-07
87082100	SAFETY SEAT BELTS	**14**	**19**	**Million Nos.**	**0.055**	**0.053**

Source: DGCIS, IMaCS Analysis

India is a net importer of seat belts.

Raw-materials and machinery

The seat belts are woven using nylon or polyester yarn on needle looms. The machinery used for webbing is primarily imported. The yarn formation machine is supplied by Muller (Germany) and the webbing formation machine by Bonus (England).

Quality Control and Standards

The manufacturer of the seat belt webbing usually follows the load specification given by the seat belt manufacturer. There is no standard at this level. However the overall seat belt assembly follows AIS 2005/2000 safety assembly specification of Automotive Research Association of India (ARAI).

Law on Use of Seatbelt: As per the provisions of sub-rule (3) of Rule 138 of the Central Motor Vehicle Rules, 1989 'in a motor vehicle, in which seat-belts have been provided under sub-rule (1) or sub-rule (1A) of rule 125 or rule 125A, as the case may be, it shall be ensured that the driver, and the person seated in the front seat or the persons occupying front facing rear seats, as the case may be, wear the seat belts while the vehicle is in motion.

Rule 125 (1) requires the manufacturer of every motor vehicle other than motor cycles and three-wheelers of engine capacity not exceeding 500 cc, shall equip every such vehicle with a seat belt for the driver and for the person occupying the front seat.

Rule 125 (1A) requires the manufacturer of every motor vehicle that is used for carriage of passengers and their luggage and comprising no more than 8 seats in addition to the driver's seat, shall equip it with a seat belt for a person occupying the front facing rear seat.

Car upholstery: Seat cover fabrics

Woven seat cover is one of the important contributors of technical textile in an automobile. With gradual improvement in vehicle models and increased emphasis on luxury and comfort, the seat cover market has witnessed uptrend in the market. Seat covers are made from cotton, vinyl, velvet and leather.

Product characteristics

The fabric used for the manufacture of seat covers is woven on looms. The desired product characteristics are durability, ultra-violet fade and wear resistance, water-proofing, flexibility and stretchableness. The type of seat cover used varies based on the automobile model and desired styling of the upholstery. The yarn required for the seat covers is in the range of 500 deniers to 1300 deniers.

Market dynamics and key growth drivers

The primary growth driver for seat cover fabrics is the sales of passenger cars, MUVs and SUVs (explained in the beginning of the Mobiltech segment). The commercial vehicles (buses and trucks) as well as two-wheelers use PVC / PU / resin for manufacturing seat covers.

Key manufacturers of seat covers

The major producers of seat covers include Faze Three Limited, Shamken Multifab and Bhilwara Melba Limited. The production figures of the key producers of seat covers are as given below:-

Manufacturer	Product	Year	Quantity (million meters)	Value (Rs crore)	Unit Price (Rs / meter)	Installed capacity (million meters)
Faze Three	Made-ups	2006-07	1.77	117	Rs 403	3.0
Shamken Multifab	Plush fabrics	2006-07	0.29	5.77	Rs 218	~1.97

Source: Capitaline

Bharat Seats and Krishna Maruti Ltd are the major manufacturers of automotive seats. Bharat Seats produces 3.18 lakh seats in 2007-08 with value of Rs 221 crore (for the seat including cover). In addition to the large producers, a large number of small producers are also supplying to the Indian market.

Consumption norms, market size and future forecast of seat covers

The seat cover requirement in vehicles varies from two meters in small cars to eleven meters in multi utility vehicles and luxury end cars.

	Unit	UVS	MPV	Passenger cars						Value (Rs/meter)
				A1	A2	A3	A4	A5	A6	
Seat Cover	*meters*	11	5	3	5	7	8	9	11	275
	sq m	16	8	5	7	10	12	14	16	

Average life of seat covers (adjusted for customers who rarely change their seat covers) is estimated as 5 years.

The current and future forecast of passenger car seat covers industry is given below:-

Seat upholstery Domestic usage	***Market***	**2007-08**	**2012-13**
Seat upholstery (in million meters)	New car sales	9.91	20.44
	Replacement market	4.7	11.12
	Total	**14.68**	**31.56**
Seat upholstery Value (in Rs. crore)	New car sales	272.6	562.1
	Replacement market	129.4	305.9
	Total	**402.0**	**868.0**

Source: Industry survey, IMaCS Analysis

The potential market for seat cover industry in 2012-13 is estimated at Rs. 868 crore up from Rs. 402 crore in 2007-08 (E). No inflationary increase has also been assumed for the price of the seat-cover material. In volume terms, the usage of seat cover (including the replacement market) is expected to grow from 14.68 million meters in 2007-08 to 31.56 million meters in 2012-13.

Imports & Exports of car-seat fabrics

The import figures for car seat fabrics are as given below:-

HS Code	Description	Imports	Imports
		2007-08(E)	2007-08(E)
59039090*	PU LAMINATING FABRICS FOR CAR SEAT	**Around 1.1 million meters**	**Rs 30 crore approx.**

Source: IBIS, IMaCS Analysis

**Imports of fabric for car seat covers under the HS code 58110090 and car seat covers under HS code 63049990 account for less than 1% share*

Korea accounts for two-third of the imports of the car-seats fabrics followed by China with one-third of the share.

The exports of car seat fabrics from India are almost negligible.

The direct import figures for passenger car seats (fully-built) are as given below:-

HS Code	Description	Imports (in MT)	Imports (in Rs crore)
		2007-08(E)	2007-08(E)
94012000, 94019000	PASSNGER CAR SEATS (FRONT/REAR)	**0.22 million**	**Rs 120 crore**

Source: IBIS, IMaCS Analysis

Almost 85% of the direct seat exports to India are from Czech Republic and the remaining from Mexico, Sweden and Germany.

Raw-materials and Machinery

Seat covers are made from cotton, vinyl, velvet and leather. The cotton or synthetic yarn is woven on power looms to produce fabric which is further sentered on sentering machine to smoothen out the fabric (remove bumps). The fabric is further laminated to provide desired protection characteristics. The fabric is further finished as per the deisred specifications of automobile original equipement manufacturer (OEM).

Quality Control and Standards

The manufacturers of seat covers adhere to the specifications given by the automobile OEMs.

Car upholstery: Car Body Covers

Car body covers are used to cover the car if no covered space for parking (parking garage) is available.

Product characteristics

The car body cover is a 100% technical textile product based on the raw material used. The car body covers are made of a variety of fabrics including canvas covers, HDPE, PVC reinforced cotton material and Nylon.

Consumption norms and the market size

The penetration of car body covers is very low in India. These covers are required only if covered parking garage is not available. Even in the absence of covered parking space, most of the car owners do not use car body covers. The penetration of car body covers is around 4-5%.

Car body covers

Number of cars on road at the start of 2007-08	9.5 million
Additional cars on road in 2007-08	1.76 million
Penetration	4-5%
Life of car body covers	5 to 7 years
Demand for car body covers	**1.04 lakh**

Source: Industry survey, IMaCS Analysis

The car body cover prices range from Rs 600 to Rs 1100. The average price of car body cover is Rs 850. The prices have seen a drop over the years. The substitute of car body cover is a layer of protective coating laid over the car surface. This surface treatment costs about Rs. 3000 to Rs. 4000. The penetration of car body covers is expected to drop marginally because of the surface treatment substitute.

The current and future forecast of car body covers domestic usage is given below:-

Car body covers Domestic usage	2007-08	2012-13
Quantity	1.04 lakh nos.	2.1 lakh nos.
Value	Rs 9 crore	Rs 17.5 crore

Source: Industry survey, IMaCS Analysis

The potential market for car body covers industry in 2012-13 is estimated at Rs.17.5 crore up from Rs. 9 crore in 2007-08 (E). The volume of car body covers is expected to grow to 2.2 lakh covers by 2012-13 from 1.04 lakh covers in 2007-08. No change in the price of covers has been assumed for market sizing.

Key players manufacturing car body covers

Car body covers are typically unbranded and are made by several small local players. Maruti Suzuki sells branded car body covers, however, in very limited numbers. One of the first manufacturers of covers in organised market is Polco in Mumbai.

Quality Control and Standards – No available standards

Automobile interior carpets

All passenger cars have company fitted carpets. The carpets are laid in the cabin and parcel shelf at the back. The carpets are primarily non-woven textile material. The usage of carpets varies based on the interior designs which vary across car models. Usage of carpets in buses and other M&HCVs is minimal.

Product characteristics

The automotive interior carpets are non-woven technical textiles, made primarily from polypropylene fibres. The carpet is laid on the vehicle floor above which rubber mats are placed. The desired characteristics of automobile interior carpets typically are as given below:

1. High durability
2. High abrasion resistance
3. Tensile strength – warp around 50 KGF and weft around 45 KGF
4. Low in-flammability
5. Good compression recovery

The fabric is around 500 GSM with a thickness of about 3mm.

Key growth drivers of Automobile interior carpets industry

The primary growth driver for automobile interior carpets is the sales of passenger cars, MUVs and SUVs (explained in the beginning of the Mobiltech segment).

Consumption norms, market size and future forecast

The automobile interior carpet is a 100% technical textile product. The usage varies based on the dimensions of the cabin floor and parcel shelf. The usage varies from 6.25 square meters to 9 square meters across models.

	Unit	UVS	MPV	Passenger cars						Value (Rs/sq. m)
				A1	A2	A3	A4	A5	A6	
Interior Carpets	*sq. m.*	9	9	6.25	7.25	8.25	8.25	8.25	8.25	100

Source: Industry survey

The current and future forecast of automobile interior carpet industry is given below:-

Automotive interior carpets Domestic consumption	2007-08	2012-13
Quantity	13.6 million sq. m.	29 million sq. m.
Value	Rs 136 crore	Rs 290 crore

Source: Industry survey, IMaCS Analysis

The potential market for automotive interior carpet industry in 2012-13 is estimated at Rs. 290 crore up from Rs. 136 crore in 2007-08 (E). No inflationary increase has been assumed for the price of the interior carpet material. In volume terms, the usage of carpet is expected to grow from 13.6 million square meters in 2007-08 to 29 million square meters in 2012-13.

Key producers of automotive interior carpets

The major producers of carpets in India include Uniproducts India, Bajaj Carpets, Hitkari Fibres and Supreme Non-wovens. The automobile carpet industry would follow the vehicle manufacturing trend.

The production figures of major interior carpet manufacturers are as given below:-

Manufacturer	Year	Quantity (million Sq m)	Value (Rs crore)	Unit Price (Rs)	Installed capacity (million Sq m)
Uniproducts	2007-08	3.61	69	191	2.6
Hitkari Fibres	2007-08	1.29	7	54	NA
Bajaj Carpet Industries Ltd	2005-06	1.74*	24.23*		

** Bajaj carpet Industries Ltd production quantity and value are for automotive interior carpets and felts*

Source: Industry survey, Capitaline, Ministry of Textiles

The other major automotive carpet manufacturers are Jeevan Non-Wovens and Entremonde Polycoaters. In addition to these manufacturers there are other small players catering to the domestic demand.

Raw-materials and Machinery

The automotive interior carpets are non-woven (needle-punched) technical textiles, made primarily from polypropylene fibres.

The needle punching machine is imported from Austria, Taiwan and China

1. Oerlikon Neumag GmbH, Austria – Fehrer needle punching technology
2. Shoou Shyng, Taiwan- SPL-03+SVP

Quality Control and Standards - The manufacturers of automotive interior carpet adhere to the specifications given by the automobile OEMs.

Headliners

Headliners are used in passenger cars and multi/sports utility vehicles as non-woven light weight roofing material. The cars were earlier fitted with knitted/woven fabric with hard cardboard type of backing. The trend has changed and increasingly non-woven headliners are being used in vehicles.

Product characteristics

A headliner is a composite material that consists of a face fabric with nonwoven or foam backing that is adhered to the inside roof of automobiles. Most headliners consist of a tricot knit fabric that is knapped to provide a soft touch and uniform appearance. The fabric is adhered with melted polyurethane foam. This fabric-foam composite is glued to the interior fiberglass roof of the automobile.

Headliners non-woven fabrics have GSM in the range of 185-220 GSM. The desired characteristics of headliners are good sound damping properties and good aesthetics. The manufacturing process and material used varies across manufacturers and as per OEM specifications.

Key growth drivers of Headliners industry

The primary growth driver for the headliners is the sales of passenger cars, MUVs and SUVs (explained in the beginning of the Mobiltech segment).

Consumption norms and the market size

The headliner is a 100% polyester non-woven technical textile product. The usage varies based on the dimensions of the roof. The usage varies from 2 square meters in small cars to 4 square meters in large cars.

	Unit	UVS	MPV	Passenger cars						Value (Rs/sq. m)
				A1	A2	A3	A4	A5	A6	
Headliners	*sq. m.*	4	3	2	2	3	3	3.5	4	65

Source: Industry survey

The current and future forecast of headliners fabric domestic usage is given below:-

Headliner fabrics domestic usage	2007-08	2012-13
Quantity	4.41 million sq m	9.13 million sq m
Value	Rs 28.7 crore	Rs 59.3 crore

Source: Industry survey, IMaCS Analysis

The potential market for headliners industry in 2012-13 is estimated at Rs. 59.3 crore up from Rs. 28.7 crore in 2007-08 (E). No inflationary increase has been assumed for the price of the headliner fabric. In volume terms, the usage of headliner is expected to grow from 4.41 million square meters in 2007-08 to 9.13 million square meters in 2012-13.

Key manufacturers of automobile headliners

The production figures of major headliners manufacturers are as given below:-

Manufacturer	Year	Production Quantity (million Nos)	Quantity (million Nos)
Krishna Maruti	2007-08	~0.6	~0.6
Multivac India	2007-08	~0.2	~0.2
Total	**2007-08**	**~0.8**	**~0.8**

Source: Krishna Maruti, MultivacIndia

Krishna Maruti has around 12-14% market share in the headliners market (indicating total headliners market of around 4.5 million headliners per annum).

Uniproducts (I) Ltd and Supreme Non-woven Pvt Ltd are the key manufacturers of headliner fabric in India. The production of Uniproducts (I) and Supreme Non-woven are as given below:-

Manufacturer	Product	Year	Production Quantity	Installed capacity
Uniproducts*	Non-woven light weight	2007-08	214 MT	650 MT
Supreme Non-woven**	Non-woven fabrics	2005-06	2.45 million meters	15,000 MT
	Non-woven fabrics	2007-08	15,000 MT	25,000 MT

Source: Capitaline, Ministry of Textiles

** Includes moulded carpets, chemical & thermo bond nonwovens and roof liners*

*** Includes other non-woven products as well*

Automobile products account for around 50% of Supreme Non-woven production. The estimated capacity utilisation of Supreme Non-woven is around 60%. Supreme non-woven has increased its capacity from 15,000 MT in 2005-06 to 25,000 MT in 2007-08 and is expected to increase to 40,000 MT by the end of 2008-09.

Imports and Exports of Headliner fabrics

The estimated import figures for headliners are as given below:-

HS Code	Description	Imports Quantity	Imports (in Rs crore)
		2007-08(E)	**2007-08(E)**
56039400	HEADLINER NON-WOVEN FABRICS*	Approx. 0.25 million sq m	**Rs 1.5 crore approx**

Source: IBIS, DGCIS, IMaCS Analysis

The contribution of imports in the overall headliner fabrics consumption in India is very low. Almost 100% of the Indian imports of Headliner fabrics are from Italy.

The exports of headliner fabrics from India are negligible.

Raw-materials and machinery

Typically the headliners are non-woven technical textiles made of PSF, polypropylene or polyurethane core sprayed between two reinforcing layers. Needle loom is the key machinery for manufacturing headliners non-wovens. The needle looms are generally imported. One of the most famous needle punch machine manufacturers in the world is Dilo (Germany).

Insulation Felts

Insulation felts, often known as NVH products (Noise, Vibration, and Harshness parts) are used for acoustic and thermal insulation in the automobiles. These are Bonnet liner, Outer dash, Wheelhouse, and Outer floor under shield. These parts not only provide noise protection inside the car but also a reduction in the noise emission outside. Uses of NVH parts in automobiles started after introduction of EURO norms in the sector.

Product characteristics

The NVH products or insulation felts are 100% polyester non-woven technical textile products. These products are classified based on the manufacturing process as needle-punched, phenolic resin bonded and thermoplastic. The felts are generally soft and used with or without harder backing. The thermal insulation products provide dissipation of heat at high temperature areas in the engine and under car body. The NVH products combine noise and heat protection function into the integrated comfort system.

Key growth drivers of Insulation felts industry

The primary growth driver for the insulation felts is the sales of passenger cars, MUVs and SUVs (explained in the beginning of the Mobiltech segment). The insulation felt industry is expected grow in line with the automotive market.

Consumption norms, market size and future forecast

The insulation felt is a 100% polyester non-woven technical textile product. The usage varies based on the location and technical requirement. The usage varies typically from 12 kilograms in small cars to 15 kilograms in large vehicles.

	Unit	UVS	MPV	Passenger cars						Value (Rs/kg)
				A1	A2	A3	A4	A5	A6	
Insulation felts	*kg*	15	15	12	12	13	14	15	15	103

Source: Industry survey

The current and future forecast of insulation felts domestic usage is given below:-

Insulation felts domestic usage	2007-08	2012-13
Quantity	22,500 MT	48,000 MT
Value	Rs 232 crore	Rs 494 crore

Source: Industry survey, IMaCS Analysis

The potential market for insulation felt industry in 2012-13 is estimated at Rs. 494 crore up from Rs. 232 crore in 2007-08 (E). No inflationary increase has been assumed for the price of the material. In volume terms, the usage of insulation felt is expected to grow from 22,500 MT in 2007-08 to 48,000 MT in 2012-13.

Key manufacturers of insulation felts

The major producers of insulation felts are Uniproducts India and Supreme Non-woven sister concern Supreme Treves Pvt. Limited. Uniproducts India has an installed capacity of 4.2 million kilograms and has annual sale of 4.1 million kilograms. The annual sales turnover from NVH products is around Rs. 42.57 crore.

Manufacturer		Year	Production Quantity	Sales Value (Rs crore)	Unit Price (Rs per kg)	Installed capacity
Supreme Non-woven*	Non-woven products	2007-08	15,000 MT			25,000 MT
Uniproducts	NVH products	2006-07	3,510 MT	39.22	111.66	2,800 MT
		2007-08	4,136 MT	42.57	102.82	4,200 MT

Source: Uniproducts India

** Includes other non-woven products as well*

Automobile products account for around 50% of Supreme Non-woven production. The estimated capacity utilisation of Supreme Non-woven is around 60%. Supreme non-woven has increased its capacity from 15,000 MT in 2005-06 to 25,000 MT in 2007-08 and is expected to increase to 40,000 MT by the end of 2008-09.

Uniproducts increased its capacity of NVH products from 2,800 MT to 4,200 MT in 2006-07.

Imports and Exports of Insulation Felts

The Indian imports and exports of insulation felts for automobile usage are negligible.

Raw-materials and machinery

The manufacturing process for NVH products is based on the raw materials used. The two broad manufacturing processes are for Non-Polyurethane based NVH (Non-PU) and Polyurethane based NVH products.

The machinery used for manufacturing NVH components is primarily imported. The details are as given below:

1. Opening and Blending machine – (Key supplier - Reisky and Schlese)
2. Needle Loom – (Key supplier - Dilo (Germany))
3. Foaming and Moulding machine
4. Lamination machine
5. Resin felt manufacturing machine
6. Thermo-bond interlining manufacturing machine

Sunvisors / Sunblinds

The sunvisors are located in the interiors of a four-wheeler just above the windshield. The sunvisors are used to block the light from the sun from entering through the windshield. The blinds can also be turned to the front side window to reduce lateral sun exposure. There are two sunvisors in a car, one for driver and the other for the co-passenger. However, the high end car models have up to four sunvisors.

Product characteristics

Sunvisor needs to effectively reduce the sun obstruction to the driver and passenger. Nowadays, a small mirror is also fitted on one of the two sunvisors (on one side). The blinds are primarily made of three parts, the synthetic backbone made of polypropylene or kenaf fibres, scrim – coarse woven reinforcement fabric and upholstery – typically artificial leather.

Key manufacturers of sunvisors in India

The key manufacturers of automobile sun blinds are:

1. Krishna Grupo Antolin Pvt. Ltd., Pune
2. Mayur Industries Ltd., Haryana
3. The Krishna Polymer Technologies, Noida

Consumption norms, market size and future forecast

The usage of sunvisors varies from 2-4 sunvisors per car based on vehicle model.

	Unit	UVS	MPV	Passenger cars						Value (Rs/unit)
				A1	A2	A3	A4	A5	A6	
Sun blinds	*Nos*	4	4	2	2	2	2	4	4	175

Source: Industry survey

The current and future forecast of sunvisors domestic usage is given below:-

Sunvisors Domestic usage	**2007-08**	**2012-13**
Quantity	4.23 million nos.	8.83 million nos.
Value	Rs 74 crore	Rs 154 crore

Source: Industry survey, IMaCS Analysis

The potential market for sunvisors industry in 2012-13 is estimated at Rs. 154 crore up from Rs. 74 crore in 2007-08 (E). No inflationary increase has been assumed for the price of the sunvisor material. The potential market for sunvisors in volume terms is expected to grow from 4.23 million nos. in 2007-08 to 8.83 million nos. in 2012-13.

Imports and Exports of sunvisors

The estimated import figures for sunvisors are as given below:-

HS Code	Description	Imports Quantity	Imports (in Rs crore)
		2007-08(E)	**2007-08(E)**
87089900	Sun visors RH/LH	Approx. 0.2 million nos.	**Rs 3.5 crore approx**

Source: IBIS, DGCIS, IMaCS Analysis

Over 75% of sunvisors imports are from Korea followed by Czeck, Thailand, Sweden and Japan accounting for the remaining.

The import and usage of sunscreens and sunblinds is very low (around Rs 25 lakhs per annum).

The estimated export figures for sunvisors are as given below:-

HS Code	Description	Exports Quantity	Exports (in Rs crore)
		2007-08(E)	**2007-08(E)**
87089900	Sun visors RH/LH	Approx. 0.0005 million nos.	**Rs 0.02 crore approx**

Source: IBIS, DGCIS, IMaCS Analysis

The export of sunvisor is negligible however most of the automobile sunvisor exports from India are to Spain, Ethiopia and UAE.

Raw materials

The fibres of polypropylene, kenaf and polyethylene tetra fluoride or blend of these is used for formation of the core. The core is further reinforced with scrim fabric and then the unit is upholstered to for the sunvisor unit.

Quality Control and standards in India/other countries

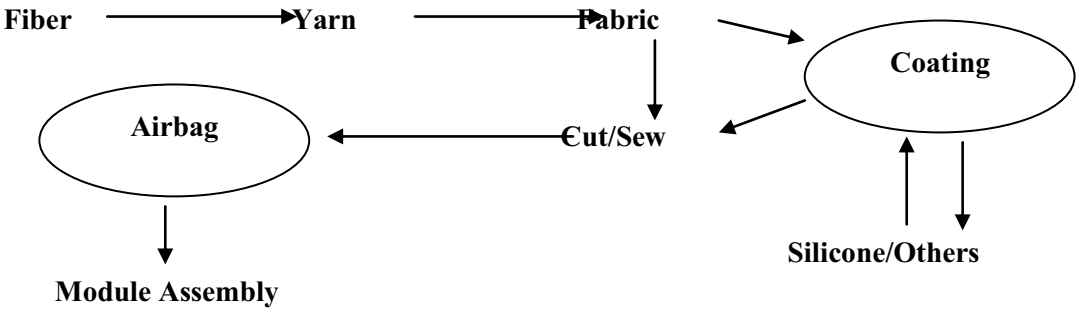
The sunvisors are manufactured as per the specifications given by original equipment manufacturers. There is no set standard for this product.

Automotive Airbags

Airbags are inflatable protective equipment which reduces injuries during an accident or impact in co-ordination with the seat belt.

Product characteristics

The airbags are manufactured in the following manner:-



The yarn / fabric is primarily nylon 66 or polyamide 66, lighter denier, lower dpf and silicone coated. Approximately, 1.8 square meter of fabric is used per airbag module.

Key growth drivers

Airbag installation in Indian cars is not mandatory in India. The airbags are typically fitted only in the high-end cars. The low-end cars and M&HCV / LCV commercial vehicles do not have airbags. The high cost of airbags is the key reason behind lower usage of airbags. The airbag installation costs around Rs. 5000 per piece in addition to airbag sensor and installation cost of over Rs 5000 per piece. In addition, airbags, once inflated in case of any accident, have to be replaced.

However, with increasing exports of passenger cars and increasing emphasis on safety, most of the car manufacturers have initialised installation of airbags for driver and co-passenger in the high end car models. In some cases, the installation of airbags is optional for the customer. The installations are set to increase with enforcement of the rules making airbags mandatory.

Key airbag manufacturers

There is no domestic manufacturer of automotive airbags in India and the requirement is primarily met through imports.

Autoliv is global leader in airbag modules followed by TRW, Takata / Petri and Delphi. India's leading seat belt assembly manufacturer Abhishek Auto Industries is entering into a joint venture with Key Safety Systems (KSS) to manufacture airbag modules and steering wheel modules.

Consumption norms and the market size

Around 50% of the car exports have airbags fitted, depending upon the geography of exports. Approximately, 1.8 square meter of fabric is used per airbag module. The installations of airbags in cars are expected to increase due to increase in awareness about safety.

Automotive airbags

Cars export in 2007-08	0.22 million growing at 25% y-o-y
Cars production (Total) for domestic usage	1.76 million
Cars production (A4 – A6) for domestic usage	49,923 (nos.)
Penetration of airbags	Around 50% of exports and 7-8% of cars for domestic usage
Demand for automotive airbags	**2.25 lakh nos.**
Fabric usage per airbag	1.8 sq. m.
Usage of airbag fabric	**0.4 million sq. m.**

Source: SIAM, Industry survey, IMaCS Analysis

The current and future forecast of airbags domestic usage is given below:-

Automotive airbags Domestic usage	**2007-08**	**2012-13**
Automotive airbag volume	2.25 lakh nos.	6.5 million nos.
Automotive airbag fabric Volume	0.4 million sq. m.	1.15 million sq. m.
Automotive airbag fabric Value	Rs 12 crore	Rs 35 crore

Source: Industry survey, IMaCS Analysis

The potential market for airbag fabric industry in 2012-13 is estimated at Rs. 35 crore up from Rs. 12 crore in 2007-08 (E). No inflationary increase has been assumed for the price of the material. In volume terms, the installation of airbag modules is expected to grow from 2.25 lakh modules in 2007-08 to 6.5 lakh modules in 2012-13.

Imports and Exports of airbags

The estimated import figures for airbags are as given below:-

HS Code	Description	Imports Quantity	Imports (in Rs crore)
		2007-08(E)	**2007-08(E)**
87082900, 87089900, 87089500	AIRBAG MODULE	Approx. 0.75 lakh nos.	**Rs 15 crore approx**
87082900, 87089900, 87089500, 87089400	AIRBAGS, AIRBAG ASSEMBLY UNITS	Approx. 1.5 lakh nos.	**Rs 50 crore approx**

Source: IBIS, IMaCS Analysis

Almost 80% of the imports of Airbag assembly units and airbag modules are from Korea followed by around 10-15% from Czech and marginally from Germany & Mexico.

Quality Control and Standards – There are no Indian standards.

Helmets

Helmets are used as protective headgear for two wheelers. The typical motorcycle helmet has an inner layer of polystyrene or polypropylene foam and an outer layer made of plastic, glass, and other synthetic fibres. The chief purpose of a helmet is to absorb the impact of a crash and thus prevent primary injury to the brain, rather than preventing skull and face fractures. The outer shell prevents sharp objects from puncturing the skull and also protects the inner liner upon contact with the road. The inner foam lining is crushed following impact, thereby increasing the stopping time and distance of the helmet. This, in turn, limits the accelerative forces on the brain, reducing the chance of primary brain injury.

Product characteristics

The two types of helmets available are:

1. Full face helmet
2. Open face helmet

The critical characteristics of the helmets are -- protection of head, clear vision through the visor, quick release chin strap and appropriate ventilation (in case of full face helmets). The outer shell is made from Acrylonitrile-Butadiene-Styrene (ABS) or Polypropylene or glass fibre plastic which is hard in nature. The inner side of the shell is expected to provide cushion to the rider and is made from regulated density concussion padding.

Market dynamics and key growth drivers

The sales of helmets are primarily driven by growth in the two-wheeler sales. The trend of the two-wheeler market is described below:

Number of two wheeler sales in India

(in million nos)	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08
Domestic Sales	4.8	5.36	6.21	7.05	7.87	7.25
Exports	0.18	0.27	0.37	0.51	0.62	0.82
Total Sales	**4.99**	**5.63**	**6.58**	**7.57**	**8.49**	**8.07**

Source: SIAM

In the last five years, the sale of two wheelers in the domestic market has increased by 8.5% CAGR and a similar growth of around 8% is expected for the next five years as well.

The following cities account for around 20% of the two-wheelers on road.

(in million numbers)		
Sno	**City**	**Number of on-road Two Wheelers in 2003-04**
1	Mumbai & Suburbs	1.11
2	Pune	0.60
3	Ahemdabad	0.75
4	Chennai	1.01
5	Bangalore	0.75
6	Hyderabad	0.73
7	Vizag	0.20
8	Delhi	1.84
9	Lucknow	0.39
10	Ludhiana	0.41
11	Indore	0.36
12	Jamshedpur	0.21

Source: Dept of road transport and highways, IMaCS Analysis

The total estimated on-road two-wheelers and future projections are as given below:-

(in million nos)	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
Total TW vehicle park	40.7	46.5	52.9	58.5	64.9	72.0	79.9	88.7	98.5

Source: SIAM, IMaCS Analysis

Though the actual sales/vehicle-park might differ from projections on a year-to-year basis, over the long term, the projections are expected to hold true.

Wearing helmets has been made compulsory across several states. The growth in helmet demand is expected to be more than the growth in two wheelers as more and more states/cities implement usage of helmets for riders and pillions compulsorily. In addition to the new helmets, considerable demand from the replacement market is expected as well.

Existing market size and future forecast

The current and future forecast of Helmet market in India is given below:-

Helmets market - Domestic usage	2007-08	2012-13
Quantity	16.7 million nos.	27.6 million nos.
Value	Rs 250 crore	Rs 759 crore

Source: Industry survey, IMaCS Analysis

The helmet market in India is estimated as Rs. 250 crore in 2007-08. By 2012-13, the average price of a branded helmet is expected to increase from Rs 300 at present to around Rs 500. Thus, the total market size is expected to increase to around Rs 759 crore by 2012-13.

Key players manufacturing helmets

The size of the helmets industry in India was only around Rs 50 crore in 1997. The market was pegged at around Rs 100 crore in 2003-04 by the industry experts, of which only 20% was organised. The existing capacity of helmet manufacturers in India is around 18 million helmets per year. Of these, the 28 large players (BIS certified) account for around 50% of the market. The existing market of helmets is estimated as 16.7 million units and Rs 250 crore approx. The sharp increase in the helmets market size has been due to regulations forcing use of helmets.

Consumers are shifting from low end to high end helmets. Therefore, various international players like KBC (price range from Rs 3,600 to Rs 11,500) and Sparx (price range from Rs. 3,600 to 5,600) are launching their helmets in India. The famous Indian brands of helmets are Spark, Wrangler, Steelbird etc.

Quality Control and Standards

The Bureau of Indian Standards (BIS) has made quality control mandatory for all helmets across India, although non-BIS-approved helmets are also available in the market. Now, all helmets sold across India are required to have an ISI mark — IS: 4151 — to meet BIS standards.

Certain internationally followed standards are:

- Economic Commission for Europe (ECE) is one of four regional economic commissions set up by the United Nations and not limited to the EU.

- The Federal Government's Department of Transportation (DOT) sets minimum standards that all helmets sold for motorcycling must meet. The standard, developed in 1974, is the Federal Motor Vehicle Safety Standard 218, but is commonly known as the DOT standard.
- The Snell Memorial Foundation was founded in 1957 for William "Pete" Snell after he died from massive head trauma he sustained in a race car accident. It is a non-profit organization that is focused on learning more about head injuries and how to prevent them. Snell standards are updated and tested every five years, forcing helmet makers to continually improve their products so that they will be approved by Snell standards. They have standards that apply to motorcycle, bike and automobile racing helmets, along with other protective headgear.

Nylon tyre cord fabric

Nylon tyre cord fabric provides strength to a tyre. The tyre industry consumes nearly 98% of the total nylon tyre consumption. The nylon tyre cord fabric is 100% technical textile. Nylon tyre cord fabric gradually replaced the usage of rayon and polyester cords in the tyre industry.

Product characteristics

Nylon 6 grey and dipped tyre cord fabrics having high strength, fatigue resistance, impact resistance, high adhesion characteristics, are mainly used as reinforcements of bias tyres. The tyre cords are generally available with the fabric characteristics of 930dtex, 1400dtex, 1870dtex, 2100dtex. The critical specifications drive the characteristics such as Breaking strength, elongation, adhesion, ply twists and hot-air shrinkage.

Market dynamics and growth drivers

Tyre production in India (in '000 numbers) (including the replacement market for tyres)

(in '000 numbers)	2000 - 01	2001 - 02	2002 - 03	2003 – 04	2004 - 05	2005 - 06	2006 - 07	2007-08
Truck & Bus	8612	8474	9863	10821	11092	11941	12367	13137
Passenger Car	6813	7481	8544	9959	11862	13605	14264	16437
Jeep	1155	1247	1384	1440	1462	1272	1368	1467
LCV	2108	2352	2844	3271	3945	4529	4820	5320
Tractor Front	1186	1150	1125	1148	1311	1383	1754	1814
Tractor Rear	852	785	825	842	1096	1134	1296	1234
Tractor Trailer	277	320	470	415	408	596	823	886
Animal Drawn Vehicle	511	488	456	295	197	325	381	409
Scooter/Moped	9504	8682	10060	9442	10116	9574	9643	11604
Motor Cycle	11196	12275	15654	16688	18127	21053	26079	27921
Industrial	219	214	309	295	377	514	635	733
Off the Road (OTR)	38	46	51	74	89	106	115	141
Aero	0	0	0	0	0	0	0	0
TOTAL	**42471**	**43514**	**515585**	**54690**	**60082**	**66032**	**73545**	**81103**

Source: Automotive Tyre Manufacturers Association

The tyre industry in India has been growing at around 12% CAGR for the last five years and is expected to grow at around 10% yoy in the future.

Tyre Industry is witnessing a shift to radial tyres

Current level of radialisation in the tyre industry is around 20%. 95% of all passenger cars have radial tyres while 12% of LCVs have radial tyres and only 3% of M&HCV vehicles have radial tyres. In future, tyre manufacturers are expected to shift further from nylon tyre cord based tyres to radial tyres which do not need nylon fabric. In the next 5 years, the radialisation is expected to increase from 20% to around 40% in the next 5 years.

Consumption norms and the market size

Nylon tyre cord fabric constitutes 18% of the raw material cost and around 12-14% by weight of a tyre.

Nylon tyre cord consumption norms (Tyre industry)

Tyre production (MT)	11,35,000
No of tyres produced (million)	81.1
% of nylon tyre cord by weight	12-14%
Market share of Nylon tyre cord	80%
Total nylon tyre cord (MT)	**118,000**

Source: Automotive Tyre Manufacturers Association, Industry survey, IMaCS Analysis

The current and future forecast of tyre cord consumption is given below:-

Nylon Tyre Cord Domestic usage	2007-08	2012-13
Quantity	118,000 MT	142,500 MT
Value	Rs 2,000 crore	Rs 2,425 crore

Source: Industry survey, IMaCS Analysis

The potential market for nylon tyre cord fabric in 2012-13 is estimated at Rs. 2,425 crore up from Rs 2,000 crore in 2007-08 (E). No inflationary increase has been assumed for the price of nylon tyre cord. In weight terms, the market is expected to grow from 118,000 MT in 2007-08 to 142,500 MT in 2012-13.

Key manufacturers of nylon tyre cord

The production of nylon tyre fabric in India is limited to very few producers like SRF and Century Enka. India is a net importer of nylon tyre fabric. Around one-third of nylon tyre fabric consumption is met through imports. The total shortfall of nylon tyre cord fabric in India is around 40,000-50,000 MT in 2007-08.

The production figures for major nylon tyre cord manufacturers Century Enka and SRF limited is as given below:-

Manufacturer	Year	Quantity (MT)	Value (Rs crore)	Unit Price (Rs)	Installed capacity (MT)
Century Enka	2007-08	21,076	392	1,94,245	22000
SRF	2007-08	48,248*	957	1,98,342	52880
NRC Ltd	2006-07	8,078	148	1,87,631	12000

Source: Capitaline

** including Industrial yarn fabric*

SRF is setting up a new manufacturing unit to produce polyester yarns to be used for radial tyres. It will have a capacity of 14,500 MT a year and is expected to commence production by April 2009.

Imports and Exports of nylon tyre cord fabric

The import figures for nylon tyre cord / nylon tyre cord fabric is as given below:-

HS Code	Description	Imports Quantity	Imports (in Rs crore)
		2007-08(E)	2007-08(E)
59021010, 59021090	NYLON TYRE CORD FABRIC / WARPSHEET	Approx. 45,000 - 50,000 MT	**Rs 750 - 850 crore approx**
59022010, 59022090, 59029090	POLYESTER OR RAYON TYRE CORD FABRIC	Approx. 5,000 MT	**Rs 55 crore approx**

Source: IBIS, IMaCS Analysis

China accounts for 35-40% of the imports of nylon tyre cord fabric while Thailand, Indonesia and Taiwan for 15-20% each. Egypt, UAE & Belarus account for around 10% of the imports.

The export figures for nylon tyre cord / nylon tyre cord fabric is as given below:-

HS Code	Description	Exports Quantity	Exports (in Rs crore)
		2007-08(E)	2007-08(E)
59021010, 59021090	NYLON TYRE CORD FABRIC / WARPSHEET	Approx. 1,500 MT	**Rs 22 crore approx**
59022010, 59022090, 59029090	RAYON TYRE CORD FABRIC	Approx. 4,000 MT	**Rs 80 crore approx**

Source: IBIS, DGCIS, IMaCS Analysis

Indonesia accounts for over 80% of the exports of nylon tyre cord fabric while Thailand, Phillipines and Iran account for the rest. Japan accounts for around 60-70% of the exports of Rayon tyre cord fabric while Italy accounts for the rest.

The exports of nylon tyre cord fabric are estimated to be Rs 29.4 crore in 2012-13.

Usage of technical textiles in airlines industry

The Indian Aviation Industry

The Indian aviation industry was stagnant until a few years back due to excessive regulation, limited private participation, no service delivery innovation and higher travel costs. However, with the removal of regulatory barriers, growing proportion of consuming class of population, growth in tourism & business travel and entry of low-cost carriers (LCC), the growth in the sector has accelerated. The entry of LCC led fall in air travel fares and the demand soared. The number of players in the aviation sector grew from just 2-3 to more than 10. The domestic traffic grew to about 70 million in 2006-07 at a CAGR of 30% over the period 2004 to 2007.

Air passenger traffic	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Domestic	26.4	28.9	32.1	39.9	51.0	70.6
International	13.6	14.8	16.6	19.4	22.4	25.8

Source: The Aviation Arena, way2Wealth, DGCA

Over the last one year, due to increasing prices of air turbine fuel (ATF), the air fares have been rising steadily. The rise in air fares has resulted in the slow-down of passenger growth. According to Directorate General Civil Aviation (DGCA), the domestic air passenger growth has slowed down from around 43% in 2007 to 11% in March 2008. As a result, there is a lot of overcapacity in the overall market and airline operators are suffering from huge losses. Plagued with falling yields and excess capacity, airlines have initiated route rationalisation and consolidation.

The fleet size and market share of the major domestic airlines is as given below:

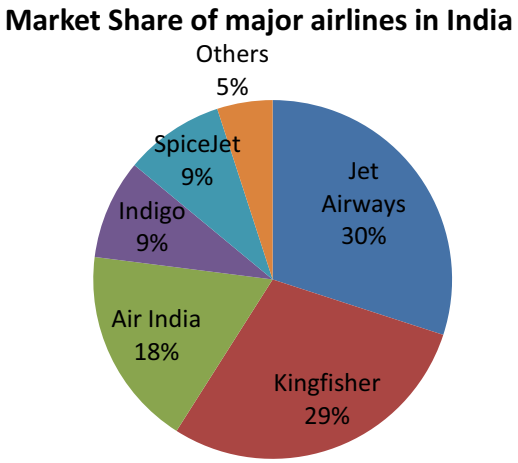
Airline Operator	Fleet size (in FY08)	Market share (July 2008)
Jet Airways	52	23.5%
Kingfisher Airlines	42	15.4%
Indian Airlines	76	18.3%
Jet Lite	24	8.3%
Air Deccan	41	11.3%
Indigo	17	10.5%
SpiceJet	15	8.4%
Paramount	12	1.6%
Go Air	6	2.5%
MDLR		0.2%
TOTAL	**285**	

Source: Edelweiss Aviation Report, Karvy Aviation Sector Update

The fleet size and market share of the major Indian airlines operating international flights is as given below:

Airline Operator	Fleet size
Jet Airways	20
Air India	72

Source: Air India, Jet Airways, Edelweiss Aviation Report, Karvy Aviation Sector Update



Source: DGCA

As a result, of the slowdown, the airlines have reduced capacity in the recent past – Kingfisher Airlines reduced 20% of domestic capacity, Jet Airways reduced around 13% of domestic capacity and SpiceJet reduced 5 aircrafts from the fleet. The airlines are gradually shedding excess capacity in the domestics market. With current overcapacity, the there are no expansion plans for 2009 and several existing orders are being rescheduled or cancelled.

Product characteristics of technical textiles used in Aircrafts

Item	Specifications
Tea pot cover	100% Polypropylene Spunbonded 70 GSM, 16 cms by 14 cms
Disposable Headrest cover	100% Polypropylene Spunbonded 40-50 GSM for domestic flights and 60-90 GSM for international flights
Headphone bag (premier)	100% Polypropylene Spunbonded 40 GSM, 22 cms by 24 cms

Consumption norms and market sizing of aircraft disposables

The market size of Aircraft disposables have been estimated based on discussion with industry players and annual tender documents of Jet Airways. Though the industry has witnessed 25-30% growth, the growth in 2008 has slowed down to around 10%. We have assumed a growth rate of 15% for the future projections.

The current and future forecast of aircraft disposables is given below:-

Aircraft disposables Domestic usage	2007-08	2012-13
Disposable Headrest covers Quantity	Around 15 million nos.	Around 30 million nos.
Disposable Headrest covers Value	Rs 2 crore	Rs 4 crore
Tea pot covers Quantity	Around 1.5 million nos.	Around 3 million nos.
Tea pot covers Value	Rs 0.25 crore	Rs 0.5 crore
Premier headphone bags Quantity	Around 0.3 million nos.	Around 0.6 million nos.
Premier headphone bags Value	Rs 0.4 crore	Rs 0.8 crore

Source: Industry survey, IMaCS Analysis

The potential market for aircraft disposable headrest covers in 2012-13 is estimated at Rs. 4 crore up from Rs 2 crore in 2007-08 (E). No inflationary increase has been assumed for the price of the items. In volume terms, the market is expected to grow from 15 million nos. of in 2007-08 to 30 million nos. in 2012-13.

The potential market for aircraft teapot covers in 2012-13 is estimated at Rs. 0.5 crore up from Rs 0.25 crore in 2007-08 (E). No inflationary increase has been assumed for the price of the items. In volume terms, the market is expected to grow from 1.5 million nos. of tea-pot covers in 2007-08 to 3 million nos. in 2012-13.

The potential market for premier headphone bags in 2012-13 is estimated at Rs. 0.8 crore up from Rs 0.4 crore in 2007-08 (E). No inflationary increase has been assumed for the price of the items. In volume terms, the market is expected to grow from 0.3 million nos. of premier headphone bags in 2007-08 to 0.6 million nos. in 2012-13.

The current and future forecast of other usages of technical textiles for aircrafts is given below:-

Aircraft disposables Domestic usage	2007-08	2012-13
Aircraft webbings Quantity	Around 0.25 million meters	Around 0.5 million meters
Aircraft webbings Value	Rs 2.5 crore	Rs 5 crore
Aircraft upholstery Quantity	Around 5,000 meters	Around 10,000 meters
Aircraft upholstery Value	Rs 0.45 crore	Rs 0.9 crore

Source: Industry survey, IMaCS Analysis

The potential market for aircraft webbings in 2012-13 is estimated at Rs. 5 crore up from Rs 2.5 crore in 2007-08 (E). No inflationary increase has been assumed for the price of webbing. In volume terms, the market is expected to grow from 0.25 million meters of aircraft webbings in 2007-08 to 0.5 million meters in 2012-13.

The potential market for aircraft upholstery in 2012-13 is estimated at Rs. 0.45 crore up from Rs 0.9 crore in 2007-08 (E). No inflationary increase has been assumed for the price of aircraft upholstery. In volume terms, the market is expected to grow from 5,000 meters of aircraft upholstery in 2007-08 to 10,000 meters in 2012-13.

Key players manufacturing airline disposables in India

Chaitanya fibres and JMDI Group are the two key manufacturers of airline disposables. Due to strong margin pressure, Chaitanya Fibres, which was supplying around 0.5 million headrest covers has discontinued the supply.

Imports & Exports of webbings for aircraft seat belts

The import figures for webbings with application in aircrafts are as given below:-

HS Code	Description	Imports	Exports
		2007-08	2007-08
54073090	WEBBINGS - PARTS FOR AIRCRAFTS	**Around 0.15 million meters**	**Rs 1.5 crore approx.**
59022090	WEBBINGS - PARTS FOR AIRCRAFTS	**Around 0.1 million meters**	**Rs 1 crore approx.**

Source: IBIS, IMaCS Analysis

All the imports of these webbings are from USA. The exports of aircraft seat belt webbing from India are almost negligible.

Imports & Exports of upholstery for aircrafts

The import figures for Aircrafts upholstery are as given below:-

HS Code	Description	Imports	Imports
		2007-08(E)	2007-08(E)
54034990	UPHOLSTERY – AIRCRAFT MATERIAL	**Around 4,000 meters**	**Rs 0.35 crore approx.**
54034990	AIRCRAFT SEAT COVERS	**Around 2,000 numbers**	**Rs 0.10 crore approx.**

Source: IBIS, IMaCS Analysis

UK accounts for over 50% of the imports of the upholstery for aircrafts followed by Germany with 30-35% share, USA with 10% share. Indonesia and Singapore account for the remaining imports (around 5%).

The exports of aircraft upholstery from India are almost negligible.

The direct import figures for aircraft seats (fully built) are as given below:-

HS Code	Description	Exports (in MT)	Exports (in Rs crore)
		2007-08	2007-08
94011000	AIRCRAFT SEATS	**1200 seats**	**Rs 16 crore**

Source: IBIS, IMaCS Analysis

Almost 85% of the direct seat exports to India are from Czech Republic and the remaining from Mexico, Sweden and Germany.

Imports & Exports of disposable headrest covers for aircrafts

The import figures for Aircrafts disposable headrest covers are as given below:-

HS Code	Description	Imports	Imports
		2007-08(E)	2007-08(E)
48114100, 48189000	HEADREST COVERS	**Around 1.5 million nos.**	**Rs 0.19 crore approx.**
63022200, 63049300, 63049230, 63029900	HEADREST COVERS	**Around 2.4 million nos.**	**Rs 0.21 crore approx.**

Source: IBIS, IMaCS Analysis

China and Thailand account for most of the imports of Headrest covers followed by UK. The exports of Headrest covers from India are almost negligible.

Usage of technical textiles in Railways

The Indian Railways

The Indian Railways is an over than 150 years old, one of the largest rail networks in the world, has contributed significantly to the economic growth and the transport needs of the country. The developmental role of the railways is particularly important in the context of both passenger and freight sectors. In 2007, Indian Railways carried 17 million passengers and two million tonnes of freight traffic daily over its ~63,327 kilometre network.

The key Indian Railways statistics are as given below:

Particulars	2007 Figures
Route Length	63,327 kms
Locomotives	8,153
Passenger Service Vehicles	45,350
Other coaching vehicles	5,905
Wagons	207,719
Railway Stations	6,909

Source: Indian Railways Year Book 2007

Around 2,000 to 3,000 passenger coaches were added in each of the last 3 years to the Railways network.

Railways – Passenger coaches addition	2005-06	2006-07	2007-08
Central Railway	92	103	156
Eastern Railway	129	141	175
East Central Railway	169	167	309
East Coast Railway	97	107	82
Northern Railway	270	372	304
North Central Railway	27	34	75
North Eastern Railway	59	74	201
Northeast Frontier Railway	108	123	155
North Western Railway	132	48	208
Southern Railway	225	300	198
South Central Railway	157	112	173
South Eastern Railway	153	45	213
South East Central Railway	86	78	50
South Western Railway	109	186	223
Western Railway	134	236	203
West Central Railway	75	30	97
Total	**2022**	**2156**	**2822**

Source: Indiastat

The annual growth of passenger coaches is around 3-4%. Approximately there are 72 berths in non air conditioned coaches and around 64 in air conditioned coaches.

Railways seat cover fabric

In Railways, the material for seat berths fabric is the key technical textile usage. Material used in the berths is polyurethane foam and rexine cloth.

Product characteristics

Rexine material is used in railway seat covers. The rexine material is constructed from single or multiple poly vinyl film layers with choice of backing cloth. Synthetic cloth like polyester and rayon is used. The rexine material is fire retardant coated fabric.

Consumption norms and market size

The typical usage of the material usage in a berth is as given below:

1. Rexine packing – 272x515 sq. cm.(1unit)
2. Rexine packing – 235x515 sq. cm. (4units)
3. Side rexine – 150x600 sq. cm.(2 units)
4. Top rexine – 1450x1900 sq. cm.(1 unit)
5. Rexine – 500x1750 sq. cm. (1 unit)

The coach construction data and hence, rexine requirement of Railway Coach Factory (RCF) is as given below:

RCF Data	Berths/Coach	2004-05	2006-05	2006-07	2007-08
Non-AC	72	879	923	780	998
AC	55	322	340	486	482
Total Coaches	-	**1201**	**1263**	**1266**	**1480**
Non-AC Berths	-	63288	66456	56160	71856
AC Berths	-	17710	18700	26730	26510
Total Berths	-	**80998**	**85156**	**82890**	**98366**
Rexine (Quantity sq. m.)	4.4 sq.m/berth	**359160**	**377597**	**367549**	**436173**
Rexine (Value in Rs crore)	Rs. 30/sq. m.	**1.08**	**1.13**	**1.10**	**1.31**

Source: Rail Coach Factory (RCF), IMaCS Analysis

The annual growth of passenger coaches is around 3-4%.

The current and future forecast of rexine consumption for Railway coaches berth covers is given below:-

Seat covers - Railways Domestic usage	2007-08	2012-13
Quantity	0.43 million sq. m.	0.51 million sq. m.
Value	Rs 1.3 crore	Rs 1.54 crore

Source: Industry survey, IMaCS Analysis

The potential market for railways seat cover fabric in Railways in 2012-13 is estimated at Rs. 1.3 crore up from Rs 1.54 crore in 2007-08 (E). No inflationary increase has been assumed for the price of the fabric. In volume terms, the market is expected to grow from 0.43 million sq. m. in 2007-08 to 0.51 million sq. m. in 2012-13.

Key Suppliers of Rexine

The suppliers to RCF are primarily domestic manufactures as given below:

1. Aurora Vinyl Pvt. Ltd., New Delhi
2. Premier Polyfilms Ltd., Ghaziabad - Capacity of 16200 MT
3. Delkon Textile Pvt. Ltd., Haryana
4. Prabhat Industries, Gujarat

Quality control and standards in India

The material follows the standard set by Research Design and Standards Organisation (RDSO). The standards followed for the railway seat material is RDSO spec. C-9503 and RDSO spec. C-9901.

PACKTECH

Packtech includes several flexible packing material made of textile used for packing various goods for industrial, agricultural, consumer and other goods. It ranges from polymer based bags used for industrial packing to jute based sacks used for packaging food grains and packaging used for tea. This packaging (excluding jute) is also referred to as flexible packaging materials.

The technical textile products covered under Packtech are as give below:-

- Polyolefin Woven Sacks (excluding FIBC)
- FIBC
- Leno bags
- Wrapping fabric
- Jute Hessian and Sacks (including Food grade jute bags)
- Soft luggage products (TT component)
- Tea-bags (filter paper)

Technical textiles consumption under Packtech is estimated at around Rs 14,067 crore. Woven sacks (excluding FIBC) account for around 50% of the technical textiles consumption under Packtech followed by Jute hessian and sacks (including Food grade jute bags) with around 30% share. FIBC and wrapping fabrics account for around 20% of the total usage. Usage of technical textiles in soft luggage products, leno bags and tea-bags is less than 5% of the total usage in Packtech.

Most of the demand for these products is satisfied by domestic production with imports of only around Rs 86 crore. Exports of Packtech products (technical textiles component) from India has been estimated as Rs 563 crore.

The domestic consumption of technical textiles under Packtech is expected to increase from around Rs 14,067 crore in 2007-08 to around Rs 25,913 crore by 2012-13.The demand for the packaging products is dependent on the industrial growth. In the medium term (next 5 years), the packaging industry is expected to achieve growth at the rate of 13% year on year. The polymer based segment containing products like woven sacks, FIBC, leno bags and wrapping fabric are expected to grow at a CAGR of 17% till 2012-13.

The maximum growth is expected in the FIBC segment which is used for bulk packaging segment. Use of FIBC will also increase with the increase in exports. The share of FIBC in the total Packtech market is expected to double over the next 5 years. Moreover, the Leno bags which are mainly used for packaging

onion and potato are very effective medium for packaging and their application is expected to increase in the packaging of various other fruits and vegetables.

Soft goods industry also has high growth potential and has been growing at around 25%.

Summary of the market-sizing for Packtech

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
Polyolefin Woven Sacks (excluding FIBC)	**Quantity**	0.641 million MT	-	-	0.641 million MT	1.127 million MT	
	Value	Rs 6,725 crore	-	-	Rs 6,725 crore	Rs 12,950 crore	-
FIBC	**Quantity**	0.175 million MT	-	0.025 million MT	0.15 million MT	0.45 million MT	
	Value	Rs 1,750 crore	-	Rs 250 crore	Rs 1,500 crore	Rs 5,000 crore	Rs 441 crore
Leno bags	**Quantity**	5,400 MT			5,400 MT	10,800 MT	
	Value	Rs 57 crore	Rs 0.5 crore	Rs 0.5 crore	Rs 57 crore	Rs 125 crore	Rs 0.7 crore
Wrapping fabric	**Quantity**	0.128 million MT	-	-	0.128 million MT	0.256 million MT	
	Value	Rs 1,350 crore	-	-	Rs 1,350 crore	Rs 2,950 crore	-
Jute Hessian and Sacks (including Food grade jute bags)	**Quantity**	1.33 million MT	0.01 million MT	0.05 million MT	1.291 million MT	1.1 million MT	
	Value	Rs 4,325 crore	Rs 50 crore	Rs 300 crore	Rs 4,075 crore	Rs 3,947 crore	Rs 383 crore
Soft luggage products (TT component)	**Quantity**	11 million sq m	2.5 million sq m	1 million sq m	12.5 million sq m	38 million sq m	
	Value	Rs 142 crore	Rs 30 crore	Rs 12 crore	Rs 160 crore	Rs 500 crore	Rs 15.3 crore
Tea-bags filter paper	**Quantity**	7,100 MT	800 MT	-	7,900 MT	17,650 MT	
	Value	Rs 195 crore	Rs 5 crore	-	Rs 200 crore	Rs 441 crore	-
TOTAL	**Value**	**Rs 14,544 crore**	**Rs 86 crore**	**Rs 563 crore**	**Rs 14,067 crore**	**Rs 25,913 crore**	**Rs 840 crore**

As per ECTT report, the potential market sizing for 2007-08 was as given below:-

Market size (ECTT report)		2001-02	2007-08 (P)
Polyolefin woven sacks including FIBC	**Quantity**	0.45 million MT	0.91 million MT
	Value	Rs 2,925 crore	Rs 5,915 crore
Soft Luggage products (TT component)	**Quantity**	5 million meters	11.5 million meters
	Value	Rs 60 crore	Rs 138 crore
Food grade jute bags	**Quantity**	5,118 MT	12,650 MT
	Value	Rs 17.96 crore	Rs 44.28 crore
Jute sacks and hessian	**Quantity**	53,700 MT	112,000 MT
	Value	Rs 194.72 crore	Rs 400 crore
TOTAL	**Value**	**Rs 3,197.68 crore**	**Rs 6,497.28 crore**

Impediments to growth

The usage of jute hessian and sacks is expected to decline marginally over the next 5 years. Due to the South Asian Free Trade Agreement (SAFTA), import of jute goods in India from Bangladesh has gone up considerably because of complete withdrawal of import duty effective from 1st January, 2008 which is posing a severe threat to Indian jute goods market. Discontinuance of External Market Assistance is also negatively impacting the jute exports. Moreover, there is a continuous threat from the substitute synthetic packaging industry as the trend is shifting towards synthetic counterparts.

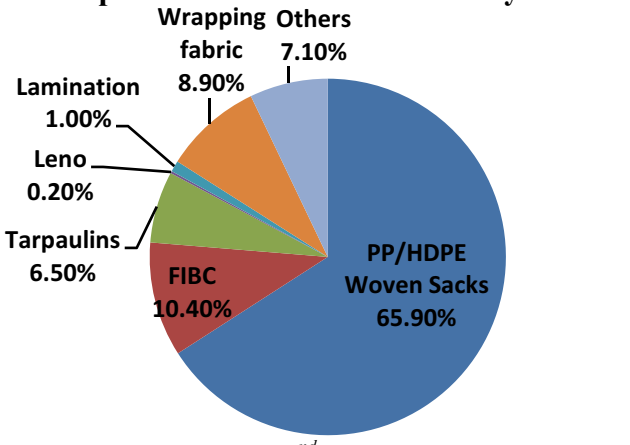
Further, the smaller players are also hindered by their inability to cope with the volatility in raw-material prices as the raw material (HDPE, PP) costs form a significant percentage of total costs.

Indian Raffia Industry

The Raffia Industry can be categorized into six main categories depending upon the type of woven bag made. They are namely:

- Polyolefin Woven Sacks (excluding FIBC)
- Flexible Intermediate Bulk Containers (FIBC)
- Tarpaulins
- Leno bags
- Lamination
- Wrapping fabric
- Others

Break-up of the Indian Raffia Industry in 2006



Source: AIFTMA –32nd Annual session Report, IMaCS Analysis

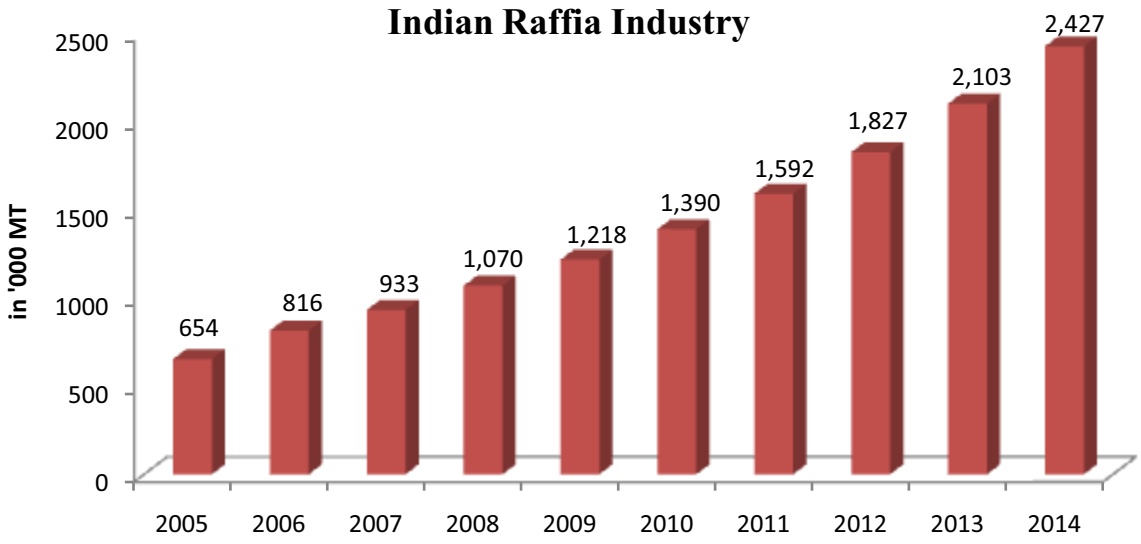
For around 50% of the applications above, Polypropylene (PP) is used exclusively (cement, etc.). For around 7.5% applications, (Polymer, lamination etc.), Poly Ethylene (PE) is used. The remaining 42% is an overlap of PP & PE where either can be used (Fertilizer, wrapping fabric, chemicals, cattle feed, food grains, sugar etc).

Expected Growth rates

Category	Expected Growth	Category	Expected Growth
PP/HDPE Woven Sacks	11%	**Leno**	15%
FIBC	25%	**Lamination**	12%
Tarpaulins	12%	**Wrapping fabric**	25%
Others	12%		

Source: Industry survey, IMaCS Analysis

The Indian Raffia industry has crossed the 1 million MT mark. This industry is expected to grow at a CAGR of 15%. The maximum growth potential is seen in the FIBC, woven sacks exports, leno bags & wrapping fabric. The future expected size of the industry is shown in the chart below.



Source: Industry survey, IMaCS Analysis

The current and future forecast of Raffia industry is given below:-

Raffia industry size	2007-08	2012-13
Quantity	1.07 million MT	2.1 million MT
Value	Rs 11,250 crore	Rs 24,200 crore

Source: Industry survey, IMaCS Analysis

The average price of one kg of the output has increased to Rs 105 from Rs 65 three years back. This is due to the higher petroleum prices. The price rise is expected to slow down in the coming years. We have considered 2% y-o-y price increase as the prices in the last few years have shown an increasing trend.

Key manufacturers

Though the Raffia industry is spread all over India, it is mainly concentrated around the region which has major fertilizer and cement players like the states of Gujarat, Maharashtra, Punjab, Rajasthan, Karnataka, MP and Tamil Nadu. Though there are several small scale units, there are a few big players with capacity as high as 36,000 MT per annum. Thus the player size ranges from 200 MTPA to 36,000 MTPA.

Manufacturer	Year	Quantity	Value (Rs crore)	Unit Price	Installed capacity
Texplast Inds.	2007-08	1,849.42 MT	16.85	Rs 91.11/kg	2,836 MT
Tulsyan NEC	2007-08	11,109 MT	104.15	Rs 93.75/kg	20,541 MT
Shankar Package	2006-07	6,139 MT	99.12	Rs 123.32/kg	
Rishi Packers	2006-07	1,909 MT	16.35	Rs 85.64/kg	4,200 MT
Neo Corp Intern	2006-07	7,612 MT	86.68	Rs 113.87/kg	5,200 MT
Ashok Polymers	2006-07	7,309 TPA (Production)	NA	NA	9,060 TPA
Bajaj Steel Inds	2007-08	795.46 MT	7.52	Rs 94.53/kg	11,250 MT
Deccan Polypacks	2006-07	NA	30.38	NA	3,243 MT
KG Petrochem	2007-08	NA	12.38	NA	NA
Marvel Inds.	2005-06	6,709.21 MT	49.7	Rs 70.07/kg	5,820 MT
Mewar Polytex	2007-08	2,797.45 MT	NA	NA	NA
Narendra Plastic	2006-07	6,928.83 MT	57.94	Rs 83.62/kg	12,000 MT
Pankaj Polymers	2007-08	2,298.54 MT	22.05	Rs 95.93/kg	6,695 MT
Polyspin Exports	2007-08	3,144.49 MT	34.52	Rs 109.77/kg	NA
Promact Plastics	2006-07	NA	NA	NA	6,750 MT
Karnavati Alfa (Sacks)	2006-07	41.72 million pcs	2.52	Rs 6.04/pc	NA
Karnavati Alfa (Other products)	2006-07	1,247 MT	5.47	Rs 43.85/kg	NA
Jai Corp Ltd.	2007-08	13,148 MT	132.06	Rs 100.44/kg	57,380 MT
Sah Polymers	2006-07				2,280 MT
Sh. Jagdamba Pol	2006-07	180.56 MT	2.33	Rs 129.04/kg	NA
Virgo Polymers	2006-07	3,424 MT	33.02	Rs 96.42/kg	4,960 MT
Ultramarine Pig.	2007-08	710 MT	6.93	Rs 97.6/kg	1,500 MT
Gujarat Raffia	2006-07	1,750 MT	16	Rs 92.6/kg	4,440MT
Gujarat Craft	2006-07	73 MT	0.63	Rs 86.3/kg	1,800 MT
Veer Group	2007-08				36,000 MT
Gopala Polyplast	2007-08	158.4 mn pcs (Production 12,140 MT)			12,500 MT
Oswal Agloimpex	2007-08				24,000 MT
Daman Polyfabs					6,900 MT
Arwin Tex Industries					3,900 MT
PVN Plastics Ind					4,920 MT
Kandoi Fabrics Pvt.Ltd					3,480 MT
Kandoi Polytex Pvt.Ltd					1,020 MT
Wopolin Plastics	2005-06	6,838 MT	58.54	Rs 85.61/kg	11,000 MT

Source: Capitaline, Annual reports, Company Websites, Industry survey

Other players in the Raffia industry are:

- Flexituff International Limited, Pithampur
- Bardanwala Plastics Pvt. Ltd., Jamnagar
- Dura Syntex Ltd, Ahmedabad
- Gujarat Dyestuff Ind P Ltd, Ahmedabad
- Garrison Polysacks, Baroda
- Eastern Synpacks
- Kanpur Plastipack, Kanpur
- Dhoot Compack, Ahmednagar
- Pet Fiber, Daman
- Lamifab Industries
- Jakhotia Plastics Pvt. Ltd., Hyderabad
- Texplast Industries Ltd, Mumbai
- TPI India Ltd., Mumbai
- J B Packaging, Ahmedabad
- India Packaging, Bangalore
- Supreme Polymer, Jaipur.
- Commercial Syn Bag, Indore
- Svar Polymers, Ahmedabad
- Vindhya Polymers, Ahmedabad
- Times Pack, Kolkata
- Bajaj Plastics Ltd., Nagpur
- SPL Inds.
- Victory Lamin.
- Suniti Commerc.
- Mayur Extrusion, Ahmedabad
- Mayur Polypacks Pvt. Ltd., Ahmedabad

Besides the ones mentioned above, there are various other players spread across the country.

Polyolefin Woven Sacks (excluding FIBC)

Product Characteristics

HDPE Bag Capacity	Weight of the HDPE Bag (100% TT)
50 kgs	110 – 116 grams

Source: Industry survey, IMaCS Analysis

Cement bags on an average weigh 70g and fertilizer bags 130g.

WOVEN BAG FABRIC DETAILS	
Material	PP / HDPE
Fabric Weave	5x5 to 14x14 per sq. in. OR 20x20 to 56x56 per sq. dm.
Tape Specification	Standard 2.5 mm. width. Denier: 500 D to 2000 D
Fabric Colour	Natural, Milky or coloured
Additives	Ultra Voilet Stabilized. TiO2, CaCO3 or antislip coated or as specified.
Lamination	Laminated or Unlaminated
APPLICATIONS	Fertilizers, Cement, Sugar, Food grains, Salt, Flour, Cattle Feed, Seeds, Sand, Chemicals

The various advantages that HDPE/PP bags have conventional packing materials are:

- Higher Strength
- Light Weight
- Minimal Seepage
- Moisture Proof
- Long Lasting (Durable)
- Cheaper (as it can be reused)

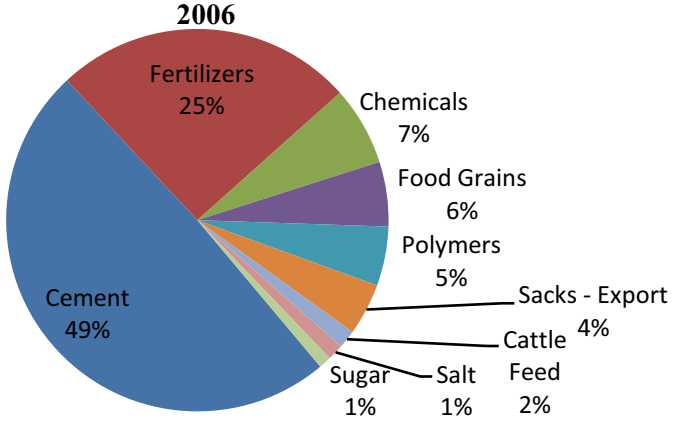
Market dynamics and key growth drivers

Polyolefin (HDPE/PP) woven sacks are versatile packing materials used extensively in the packing of cement, fertilizers, thermo plastic raw materials, food grains, sugar etc. The list of user-industries where they are used is:

1. Cement
2. Fertilizers
3. Chemicals
4. Food Grains
5. Cattle Feed
6. Salt

7. Sugar
8. Polymers
9. Sacks - Export
10. Others

End user industries of PP/HDPE Woven sacks in India in 2006



Source: AIFTMA –32nd Annual session Report, IMaCS Analysis

Expected Growth rates of end-user industries

Category	Expected Growth	Category	Expected Growth
Cement	12%	**Polymers**	4%
Fertilizers	10%	**Cattle Feed**	8%
Chemicals	10%	**Salt**	5%
Food Grains	6%	**Sugar**	4%
Sacks - Export	25%		

Source: Industry survey, IMaCS Analysis

PP/HDPE printed sandwich bags are made by sandwiching PP and HDPE. They have a very good appearance and are used for packaging costlier products like pesticides, seeds, wheat flour, high-end chemicals, etc. They may also be used for secondary packaging of smaller 1kg bags.

Market Size

The HDPE bags manufactured in India are used for domestic consumption as well as exported to Europe and US. The Woven sacks industry in India is expected to grow at a CAGR of 11% and reach a size of almost 1.127 million MT in the year 2012-13 from 0.641 million MT in 2007-08.

The current and future forecast of woven sacks consumption is given below:-

Market size for woven sacks	2007-08	2012-13
Quantity	0.641 million MT	1.127 million MT
Value	Rs 6,725 crore	Rs 12,950 crore

Source: Industry survey, IMaCS Analysis

Exports of woven sacks

The estimated export figures for woven sacks are as given below:-

HS Code	Description*	Exports Quantity	Exports (in Rs crore)
		2007-08(E)	2007-08(E)
63053900	PP Nonwoven Sacks	53,200 pcs	Less than Rs 0.1 crore

Source: IBIS, DGCIS, IMaCS Analysis

** Other woven sack exports are included in FIBC exports*

The HDPE bags manufactured in India are used for domestic consumption as well as exported to Europe and US. The key exports destinations are Germany and Netherlands.

Key raw-material suppliers

The major raw material (polymer granules) suppliers in India are:

1. Reliance Industries Ltd.(including IPCL)
2. GAIL (India) Ltd.
3. Haldia
4. Others

Reliance is the largest player for PP.

The prices of all the players for raw material are more or less similar so the customers are usually flexible in their choice, depending upon who is able to provide with regular supply. The industry is facing a raw material shortage due to which it is not able to reach its true potential.

Key machinery suppliers for manufacturing woven sacks in India

The main machine required for woven sacks manufacturing is the Shuttle Loom. The main suppliers of these looms in India are:

- Lohia Starlinger Limited
- J. P. Industries
- Kabra Extrusiontechnik Ltd. (KET) – Kolsite
- Windsor Machines Limited

Quality Control and Standards

- IS 6899:1997 Textiles - High density polyethylene (HDPE) woven fabrics
- IS 8069:1989 High density polyethylene (HDPE) woven sacks for May packing pesticides [amalgamating IS 8069(Part 2):1981]
- IS 9755:2003 Textiles - High density polyethylene (HDPE)/Polypropylene (PP) woven sacks for packing fertilizers
- 9 IS 11652:2000 Textiles - Woven sacks for packing cement - High density polyethylene/ Polypropylene
- IS 12100:1987 High density polyethylene (HDPE) woven sacks for packing flour
- IS 14252:2003 Textiles -High Density Polyethylene (HDPE)/Polypropylene (PP) woven bags for filling sand
- IS 14887:2000 Textiles - High density polyethylene (HDPE)/ polypropylene (PP) woven sacks for packing food grains
- IS 14968:2001 Textiles - High density polyethylene (HDPE)/polypropylene (PP) woven sacks for packing 50 kg/25 kg sugar

Flexible Intermediate Bulk Containers (FIBC)

Flexible Intermediate Bulk Containers (FIBC), popularly known as "Jumbo Bags", is similar to the HDPE/PP bags but that of a larger size. FIBC's are one of the most cost effective and ideal types of packaging for shipping and storing dry bulk products. They can be produced from either tubular or flat polypropylene (PP) woven fabrics. These fabrics can be coated or uncoated and vary in terms of weights depending upon the requirements of the Safe Working Load (SWL), or Safety Factor (SF).

There are three types of FIBC bags

- Panel Type
- Circular woven
- Baffle type (Square bags)

The general bag specifications used in the industry are as follows:

Capacity (cubic feet)	Empty size width (inches) X depth (inches)	Filled diameter (inches)	Applications
5 to 20	29 X 29 to 31 X 31	38	For higher bulk density products or smaller weight requirements
21 to 75	35 X 35 to 37 X 37	46	Most common sizes for all products. Used in truck shipments and export containers
76 and above	41 X 41 to 43 X 43	53	For smaller bulk density products or where height restrictions occur. Used for rail shipments

In general the approximate weight of FIBCs is as follows:

Type of bag	Weight in grams
Builder bag	900-1200
Technical bag	1800-2200
Speciality bag	1800-2400

FIBC Bag Capacity	Weight of the FIBC Bag (100% TT)
500 kgs	1-2 kg

Source: Industry survey, IMaCS Analysis

These bags have capacities ranging from 500-4000 kgs. The weight of fabric varies from 180-275 gsm. FIBCs can vary from 900 gms to 3 kgs in weight depending upon the bag properties and weight to be carried.

Advantages of FIBC:

- Low cost of material handling from the manufacturer to the end user, inclusive of wastage of material
- Easy filling and discharge
- Savings in loading/unloading time due to ease of handling
- Low weight packing for transport
- Built in safety factor of at least 5:1 on nominal load
- Transportation of empty FIBCs is cheap and space saving
- No requirement of pallets when compared to small bags – self supporting
- Good chemical and organic resistance
- Eco-friendly, since product is recyclable
- Can be used for storage in open air (if UV stabilised)

Market dynamics and key growth drivers

It is used in bulk packaging of

- Polymers, such as PET and PVC
- Petrochemicals, such as DMT, PTA and polyester chips
- Minerals, such as bentonite, alumina, ebonite, magnesite, mineral ores like nickel
- Agro-products, such as wheat, rice, starch, lactose and sugar
- Chemicals, such as carbon black, dyes and intermediates and fertilisers
- Oil cakes (powder form)
- Detergents
- Oat meal
- Clay, mica and feldspar
- Cement
- Pharmaceuticals
- Fish meal

The bulk packaging is done usually for long distance transportation like exports. As the exports of the above mentioned items increasing from India, the demand for FIBC will also increase. Moreover FIBC is also directly exported, the exports of which are growing sharply.

Market Size and future forecast

The market for these FIBC Jumbo bags is estimated as around Rs. 1,500 crore in 2007-08 and is expected to cross Rs 5,000 crore by 2012-13. We have considered 2% y-o-y price increase as the prices in the last few years have shown an increasing trend. Due to the high awareness about its advantages and higher exports, the FIBC production in India is expected to grow at over 20% y-o-y. Many of the existing regular HDPE/PP bag manufacturers are now moving to Jumbo bags. Currently, FIBC produced in India is primarily exported. The key exports markets are USA and Europe, which comprise approximately 2/3rd of the global demand. There is a small market in Australia as well. The requirement of FIBC in India is primarily in West Bengal by Mitsubishi PTA and South Asian Petrochemicals with a combined requirement of 675,000 pieces per year. With Mitsubishi gearing up for a new PTA plant in Haldia by end of 2008, the requirement is likely to go up to 1 million pieces of FIBC per year. The other consumers of FIBC in India are large chemical companies like Birla Cellulosic, Lion Chemicals, Gujarat Heavy Chemicals, etc. their combined annual requirement will be of the order of 100,000 pieces per year. The domestic demand for FIBC in India is likely to grow at 7-8% p.a. in line with industrial growth rate.

The current and future forecast of FIBC consumption is given below:-

Market size for FIBC	2007-08	2012-13
Quantity	0.15 million MT	0.45 million MT
Value	Rs 1,500 crore	Rs 5,000 crore

Source: Industry survey, IMaCS Analysis

Imports & Exports of FIBC

The estimated import figures for FIBC are as given below:-

HS Code	Description	Imports Quantity	Imports (in Rs crore)
		2007-08(E)	2007-08(E)
63053200, 63053300	FIBC	1700 - 1800 pieces	Rs 0.30 crore

Source: IBIS, DGCIS, IMaCS Analysis

** Note: It also includes woven sacks*

The imports of FIBC are very few. Around 90% of the imports are from Germany and the rest from China.

The estimated export figures for FIBC are as given below:-

HS Code	Description	Exports Quantity	Exports (in Rs crore)
		2007-08(E)	2007-08(E)
63053200, 63053300	FIBC	13 million pieces	Rs 250 crore approx.

Source: IBIS, DGCIS, IMaCS Analysis

** Note: It also includes woven sacks*

Around 15% of the exports take place to USA and Germany. Spain, UK, France & Italy each have a share of around 10% in the exports of FIBC from India. Small quantities are also exported to various other countries like Australia, Canada, Belgium, Egypt etc. The exports of FIBC are estimated to grow at 12% CAGR to reach a size of Rs 441 crore by 2012-13.

Key machinery suppliers for manufacturing FIBC in India

The main machine required for FIBC manufacturing is the Shuttle Loom. The main suppliers of these looms in India are:

- Lohia Starlinger Limited
- J. P. Industries
- Kabra Extrusiontechnik Ltd. (KET) – Kolsite
- Windsor Machines Limited

Quality Control and Standards

FIBCs are usually issued with individual test certificates to the Safe Working Load and Safety Factor. There are specified standards for performance evaluation of FIBCs. These include the following:

- Cyclic top lift test
- Compression / stack test
- Drop and topple test
- Tear test
- Vibration test
- Righting test
- UV stability test

Leno Bags

Leno bags are excellent for packing & preserving vegetables like potato, onion, ginger, garlic, cabbage etc. and fruits like pineapple, citrus fruits, raw mango, coconut etc.

Product Characteristics

The Leno bags have widths between 20cm to 72cm. The length also varies as per the customer's requirements. The mesh again is as per requirement with a maximum of 574 tapes in the warp in different colours. Leno bags on an average weigh 50g (or less).

Size (In cm) Width x height	Application
56.0 x 105.0	50 Kg Potato/ Onion
45.8 x 84.0	25 Kg Potato/ Onion
30.5 x 66.0	10 Kg Potato / Onion

The Leno Bag is made of netted fabric of virgin Polypropylene (PP) with colour Masterbatch.

Advantages of a Leno Bag

- Superior aesthetics
- Excellent mechanical properties
- Chemically Inert
- Ease in handling & storage
- Reuse & recyclable
- Cost Effective

Market dynamics and key growth drivers

There is great potential for the leno bags in India and few reasons of the same are mentioned below:

- Suitable for dry skin vegetables (Potato (3rd biggest producer), Onion, Garlic etc.)
- India is the 2nd biggest producer of fruit and vegetables in the world, which has still not been captured by Leno bags

- Suitable for cold storage
- High output from a single loom: Output of single loom = 3.3 MT/month

Market Size and future forecast

The current and future forecast of Leno bags consumption is given below:-

Market size for Leno bags	2007-08	2012-13
Quantity in '000s	5.4 MT	10.8 MT
Value	Rs 57 crore	Rs 125 crore

Source: Industry survey, IMaCS Analysis

The size of the Leno bags industry today is very small - around Rs 57 crore, but, is expected to grow at over 12% CAGR and reach a size of Rs 125 crore by 2012-13. In India, there are about 1000 Leno looms.

Imports & Exports of Leno Bag

The estimated import figures for Leno Bag are as given below:-

HS Code	Description	Imports Quantity	Imports Value
		2007-08(E)	2007-08(E)
63053300	Leno Bag	4 million pieces	**Rs 0.5 crore approx**

Source: IBIS, DGCIS, IMaCS Analysis

Most of the leno bags imports are from China.

The estimated export figures for leno bag are as given below:-

HS Code	Description	Exports Quantity	Exports Value
		2007-08(E)	2007-08(E)
63053900	Leno Fabric	1.5 million meters	**Rs 0.5 crore approx**

Source: IBIS, DGCIS, IMaCS Analysis

Most of the exports of leno fabric are to Uruguay.

Exports of Leno bag are estimated to grow to Rs 0.7 crore by 2012-13.

Key machinery suppliers for manufacturing Leno bags in India

The Leno Bags are made of netted fabric of virgin Polypropylene (PP) with colour Masterbatch.

The main machine required for leno bags manufacturing is the Loom. The main suppliers of these looms in India are:

- Lohia Starlinger Limited
- J. P. Industries
- Kabra Extrusiontechnik Ltd. (KET) – Kolsite
- Windsor Machines Limited

Quality Control and Standards

DOC.TXD 23(906) Textiles- Polypropylene (PP)/ High Density Polyethylene (HDPE) Woven Leno Sacks for Packing of Fruits and Vegetables

Future Opportunities in Leno bags industry:

- Suitable for dry skin vegetables (Potato (3rd biggest producer), Onion, Garlic etc.)
- India is the 2nd biggest producer of Fruit and Vegetables in the world, which has still not been captured by Leno
- Suitable for cold storage
- High output from a single loom: Output of single loom = 3.3 MT/month

Wrapping Fabric

Wrapping fabric is made out of HDPE/PP, cotton canvas, etc. Unlaminated PP/HDPE Woven Fabric is mainly used for wrapping of paper rolls, paper bundles, steel coils, tyres, yarn cones etc.

Product Characteristics

Wrapping fabric weighs 50 to 200 gsm and its size varies from 20 to 210 cms. The fabric is generally packed in roll form and can be run on automatic cutting and stitching machines.

Clear Woven Sheets (Natural Woven Laminated Sheets) are used for packing of used clothes etc. These sheets are see through and are mainly used as a wrapping material. The most common size is 40" * 54" with side lamination and weighs up to 100 grams.

Lumber Cloth is a wide width fabric used to cover huge logs of wood. It can either be one side or both side laminated. It can be printed or non-printed as is available in roll form.

Market dynamics and key growth drivers

These fabrics are widely used in industries such as paper bundles, wrapping of paper rolls, steel coils, yarn cones, tyres etc. These fabrics can be utilized with automatic cutting & stitching machines for manufacturing bags too.

The current and future forecast of Wrapping fabric consumption is given below:-

Market size for Wrapping fabric	2007-08	2012-13
Quantity	0.128 million MT	0.256 million MT
Value	Rs 1350 crore	Rs 2950 crore

Source: Industry survey, IMaCS Analysis

The current size of the wrapping fabric industry in India is around Rs 1,350 crore and is expected to be almost Rs. 2950 crore by 2012-13 growing at a rate of 15% pa.

Quality Control and Standards

IS 6899:1997 Textiles - High density polyethylene (HDPE) woven fabrics

Soft Luggage

The luggage industry is classified into hard and soft luggage. Hard luggage are mainly the large travel bags made from moudled plastic. Soft luggage is made out of woven fabrics like nylon and polyester. It comprises of uprights, totes, duffle and sky bags which can be with or without wheels and handles. The soft luggage today is becoming very popular due to the ease of carry as it is light and flexible. It includes handbags, military backpacks, athletic backpacks, wallets, briefcases and other soft sided luggage items.

Product Characteristics

Outer dimensions of a soft luggage bag vary from 460mmX340mmX160mm to 790mmX620mmX280mm. The size of a small soft suitcase can vary from 20" to 31". A standard 64" fabric used for soft luggage weighs around 350 grams.

Market dynamics and key growth drivers

Out of the total luggage industry, 40% is hard luggage while 60% belongs to the soft goods. Due to increasing pressure from input costs in recent months, prices of moulded luggage are on an upward spiral. Prices of polypropylene, the primary raw material, have shot up by over 100% in the past one year. Polypropylene makes up around 75% of the raw material pie for hard luggage. Hence, more and more people are shifting from hard luggage to soft goods. In the soft goods market, around 60% of the market belongs to the unorganised sector. The price of a soft luggage in the organized market ranges from Rs 800 to Rs. 9,000 depending upon its size, raw material, etc.

Most luggage and travel bags companies in India are following international trends and designs closely because they are aware that the buyer is becoming more conscious of design and exclusive patterns looking luggage/baggage. With more and more people travelling, manufacturers, exporters and suppliers of handbags, bags, luggage and travel accessories ensure that each and every luggage item are given away with ample safety features, theft-proof, sturdy and strong.

The current and future forecast of Soft Luggage is given below:-

Particulars	
% of soft luggage industry in total luggage	60%
Value of textile in the total value of soft goods	15%
Average price of fabric used in soft luggage	Rs 130 per sq m
Share of organised sector in soft luggage industry	40%
Expected growth rate of the organised segment	23%
Expected growth rate of the unorganised segment	28%

The size of the soft luggage industry in India today is estimated as Rs 1080 crore. The soft luggage industry in India is expected to grow at a rate of around 25% to reach a size of over Rs 3300 crore by 2012-13. Higher growth is expected from the unorganised sector as compared to the organised in the initial 2-3 years due to the high price differential. Later, the quality conscious customers will switch from the unorganised to the organised segment.

Market size for soft luggage	2007-08	2012-13
Value	Rs 1,080 crore	Rs 3,300 crore
Quantity of Technical Textile	12.5 million sq m	38 million sq m
Value of Technical Textile	Rs 160 crore	Rs 500 crore

Source: Industry survey, IMaCS Analysis

Key manufacturers

Manufacturer	Year	Quantity (million pieces)	Value* (Rs crore)	Price (Rs per unit)	Installed capacity
VIP industries	2007-08	NA	552	NA	NA
Universal Luggage	2006-07	NA	77.40	NA	NA
Safari Industries	2007-08	NA	62.45	NA	NA

Source: Capitaline, Company Annual Reports, Company websites, Industry Survey

**These are Net Sales figures which includes hard luggage and other goods as well.*
Universal luggage (Aristocrat) has now been amalgamated with VIP

Soft goods market is highly unorganised. In the organised segment, the leading players are VIP, Samsonite and Safari. VIP's portfolio of brands includes V.I.P., Aristocrat, Alfa, Skybags and Delsey. During the fiscal year ended March 31, 2008, Aristocrat Luggage Limited and Quality Plastics Limited were amalgamated with the company. In the organised sector, VIP is the market leader with almost 60% of the market share whereas Samsonite leads in the premium segment. Samsonite's global revenues in the year 2006-2007 were US$ 1,070 million, out of which 7% were from India. More than the competition amongst each other like VIP, Samsonite, Safari face bigger competition from unorganised players due to cost advantage.

Imports & Exports of soft luggage

The estimated import figures for soft luggage are as given below:-

HS Code*	Description	Imports Quantity	Imports (in Rs crore)
		2007-08(E)	2007-08(E)
42021110/20/30/40/50/60/90, 42022210/20/30/90, 42022910/90, 42021910/20/30/40/60/90, 42021190, 42022110/20/90, 42021210/20/30/40/50/60/80/90, 42023110/20/90, 42023290, 42029900, 42029200	Soft goods	2.5 million pieces	**Rs 200 crore (TT component of around Rs 30 crore)**

Source: IBIS, DGCIS, IMaCS Analysis

**The above codes constitute over 95% of imports*

*** These are the imports under the 4202 HS code only, but the industry believes the imports of these goods are much higher than the number mentioned above.*

Maximum imports (over one third) are under the HS code of 42021290. Over 62% of the total imports take place from China, next highest contributor is Hongkong around 14% and France with 12% share. Imports also take place from countries like Italy, Singapore, Vietnam, Malaysia, UK etc.

About 20% of the fabric used for manufacturing soft luggage in India is also imported primarily from China. These fabrics are mainly of polyester 600D.

The estimated export figures for soft luggage are as given below:-

HS Code	Description	Exports Quantity	Exports (in Rs crore)
		2007-08(E)	2007-08(E)
42021110/20/30/40/50/60/90, 42022210/20/30/90, 42022910/90, 42021910/20/30/40/60/90, 42021190, 42022110/20/90, 42021210/20/30/40/50/60/80/90, 42023110/20/90, 42023290, 42029900, 42029200	Soft Goods	1.75 million pieces	**Rs 85 crore (TT component of around Rs 12 crore)**

Source: IBIS, DGCIS, IMaCS Analysis

UK and USA each have a share of around 25% in the exports of soft goods from India. Other major countries to which the exports are around 5% each are UAE, France, Italy, Australia, Germany and Israel. In the year 2012-13 the soft luggage exports are estimated to be Rs 15.3 crore.

Raw Material

Synthetic fabrics made out of nylon (70, 42, 840, 1680 D) / polyester (600, 1200, 1800D) filament yarns are the major raw material for this industry. There are various variants of fabric which are used like ballistic proof, abrasion resistant or fire retardant material, these special kinds of fabrics usually cost higher and thus the end products are expensive. Nylon though more expensive than polyester it has proved to be more durable and hence is more popular. Other fabrics like canvas and coated fabrics (artificial leather) are also used.

Jute Hessian and Sacks (including Food grade jute bags)

Jute Hessian

Jute Hessian also termed as Burlap is a finer quality jute fabric that has been long used as the most preferred packaging material for all kinds of goods. Hessian is used for bags and many other coarse fabric uses, such as wrappers, wall coverings, etc. Presently, shopping bags are being made out of hessian fabrics. It is also used in the upholstery and home furniture. Also available in "dyed" or "bleached" form and treated with vegetable oil, Burlap meets the latest international standards for food safety.

Product characteristics

A plain weave cloth made wholly of Jute with single warp and weft interwoven, weighing not more than 576 g/m^2. Hessian fabrics are lighter than sacking fabrics.

Jute Sacks

A range of heavy jute fabrics either in plain or twill weaves manufactured by using coarse jute fibre in larger percentage than used for manufacturing tarpaulin, hessian or such light fabrics.

Sacking refers to the coarser and heavier cloth, used primarily for sacks for packing materials, which do not need special protection, but has higher weight.

Jute bagging material is in demand because of the openness of the weave, which allows air to circulate while protecting the contents.

Sacking bags, specifically used for the purpose of storing agro-based products, are known as Hydro carbon free bags that have been treated with vegetable oils to destroy the harmful effect of hydrocarbons. Thus sacking bags have great demand not just in the cement industry but also in the agro-based industries.

Different categories of sacking are:-

- A-Twill
- B-Twill
- L-Twill
- D.W. Flour
- D.W. Salt

- D. W. Nitrates
- Heavy Cees
- Light Cees
- Sydney Woolpacks
- Australian Woolpacks
- Australian Cornsacks
- New Zealand Cornsacks
- New Zealand Woolpacks
- Fine Twill Cloth
- Cement Bags

Product characteristics

Either plain or twill weave cloth made wholly of jute, inter-woven and weighing not less than 407 g/m^2.

Twill	The weave that produces diagonal patterns on the surface of the cloth. In the Jute industry, generally 2 x 1 simple twill weave is used.
A-Twill Cloth	A double warp, 2/1-twill weave sacking jute cloth weighing 750 g/m^2
B- Twill Cloth	A double warp 2/1-twill weave sacking jute cloth weighing 643 g/m^2
L- Twill Cloth	A double warp twill weave sacking cloth weighing approx. 716 g/m^2
Oslo Twill Cloth	A twill sacking cloth for making bags of about 108 cm width weighing about 534 g/m^2
Brattice Cloth	Hessian fabrics, which after rot and fireproofing is used in mines as windscreens and for ventilation purposes.
Heavy Cee	A double warp plain weave sacking jute cloth having 68 ends/dm and 35 picks/dm and weighing 673 g/m^2

The difference between hessian and sacking is in the quality of the cloth and the jute used for its production, the difference being primarily one of fineness, the former being made of finer grade jute, the latter of coarser qualities. Hessian can be available in cloth lengths while the mills usually convert sacking cloth into bags and sacks.

Food Grade Jute Bags

Food grade jute bags are jute sacks which comply with the IJO Standard 98/01. The Government of India has maintained the compulsory packing of food grains and sugar at 100% under Jute Packaging Materials (Compulsory use for Packing Commodities) Act, 1987 (JPMA).

Key manufacturers of Jute packaging materials

Manufacturer	Year	Quantity (MT)	Value (Rs crore)	Unit Price	Installed capacity
Cheviot Co Ltd	2007-08	46,448 MT	176.36	Rs 37.96/kg	64,034 MT
Gloster Jute Mills Ltd	2006-07	36,066 MT	126.29	Rs 35.01/kg	906+13,408**
Birla Corp Ltd	2007-08	33,317 MT	113.94	Rs 34.19/kg	32 +822***
Champdany Inds.	2004-05	50,898 MT	177.46	Rs 34.86/kg	64,457 MT
Caledonian Jute (Hessian)	2006-07	8,482 MT	31.05	Rs 36.61/kg	NA
Caledonian Jute (Sacking)	2006-07	14,925 MT	42.06	Rs 28.18/kg	NA
AI Champdany	2007-08	67,429 MT	246.29	Rs 36.53/kg	108451 MT
Auckland Intern.	2006-07	20,187 MT	64.78	Rs 32.09/kg	25820 MT
Budge Budge & Co	2005-06	11,685 MT	36.29	Rs 31.05/kg	32,906 MT
East India Comm	2006-07	42,940 MT	155.31	Rs 36.16/kg	NA
Ganges Mfg. Co.	2005-06	50,207 MT	150.44	Rs 29.96/kg	14080 *
Howrah Mills Co	2006-07	31,861 MT	100.78	Rs 31.63/kg	40,000 MT
Kamarhatty Co.	2005-06	28,233 MT	92.38	Rs 32.72/kg	NA
Kanknarrah Co.	2005-06	24,963 MT	83.22	Rs 33.34/kg	35,394 MT
Reliance Jute	2007-08	51,055 MT	165.06	Rs 32.33/kg	916 Looms
New Central Jute	2006-07	31,506 MT	103.89	Rs 32.97/kg	58,109 MT
Ludlow Jute	2007-08	46360 MT	155.21	Rs 33.48/kg	57,500 MT
Prabartak Jute	2006-07	12,538 MT	41.87	Rs 33.39/kg	17,500 MT
Nellimarla Jute	2006-07	11,111 MT	36.68	Rs 33.01/kg	33,000 MT
Sri Bajrang Jute	2006-07	17,958 MT	54.74	Rs 30.48/kg	22,000 MT

** Spindles*

*** Looms + Spindles*

****Broad Looms + Narrow Looms*

Source: Capitaline, Company Annual Reports

Market size of Jute products and future forecast

The current and future forecast of Jute hessian and sacks industry size is given below:-

Jute Goods industry	2007-08	2012-13
Jute Hessian Quantity	0.338 million MT	0.373 million MT
Jute Hessian Value	Rs 1,216 crore	Rs 1,492 crore
Jute Sacks Quantity	0.953 million MT	0.737 million MT
Jute Sacks Value*	Rs 2,859 crore	Rs 2,455 crore

Source: Industry survey, IMaCS Analysis

** Sacks including food grade bags*

The current production of the jute hessian and sacks in India is around 1.291 million MT valuing Rs 4,075 crore. There is not much growth expected in the next five years as sacking segment faces threat from the polymer sacks, though hessian is expected to grow moderately by around 2%.

Imports & Exports of Jute Goods

The estimated import figures for Jute goods are as given below:-

HS Code	Description	Imports Quantity	Imports (in Rs crore)
		2007-08(E)	2007-08(E)
53101012-4, 53101019, 53101091/2/9	JUTE GOODS*	Approx. 15 million sq m	**Rs 50 crore**

Source: DGCIS, IMaCS Analysis

** This includes Hessian, Sacks, Wrapping fabric of jute, woven fabric of jute and jute & hessian canvas cloth*

The estimated import figures for Jute goods are as given below:-

HS Code	Description	Imports Quantity	Imports Value
		2007-08(E)	2007-08(E)
53101013, 53101092/9	JUTE GOODS*	125 - 150 MT	**Rs 0.5 crore approx**

Source: IBIS, IMaCS Analysis

** This includes Hessian, Sacks, Wrapping fabric of jute, woven fabric of jute and jute & hessian canvas cloth*

The imports of Jute goods are very low in India as compared to its exports. The imports happen from countries like China, Indonesia and Bangladesh.

The estimated export figures for Jute goods are as given below:-

HS Code	Description	Exports Quantity	Exports Value
		2007-08(E)	2007-08(E)
53101011-4, 53101019, 53109010/20, 53101091/2/9	JUTE GOODS*	50,000 MT	**Rs 300 crore**

Source: IBIS, DGCIS, IMaCS Analysis

** This includes Hessian, Sacks, Wrapping fabric of jute, woven fabric of jute and jute & hessian canvas cloth*

Hessian cloth comprises of more than 90% of the overall jute goods exported. The major destinations of exports are USA, Egypt, UAE, Germany, Saudi and Japan. These countries totally constitute over 50% of total exports. The exports of jute goods will grow and reach a size of Rs 383 crore by the year 2012-13.

Type of Raw materials

Jute yarn is the main raw material required to make the jute fabric. This is sourced locally from various suppliers in India.

Key machinery manufacturers/suppliers in India

One of the key suppliers of machinery in India is Lagaan Engineering Company Ltd. situated in Kolkata.

Laws governing usage of Food grade jute bags

The Government of India has maintained the compulsory packing of food grains and sugar at 100% under Jute Packaging Materials (Compulsory use for Packing Commodities) Act, 1987 (JPMA). However, the

Hon'ble High Court of Gujarat has stayed the notification and diluted the Jute Packaging Materials (Compulsory use for Packing Commodities) Act, 1987 (JPMA) by 25% in sugar and 20% in food grains which is being contested by the Government of India.

The Cabinet Committee on Economic Affairs has given its approval for compulsory packing of 100% of food grains and sugar in jute bags, for the Jute Year 2008-09 (July-June).

Following exemptions will be prescribed in the order under the JPM Act:

- In case of any shortage or disruption in supply of jute packaging material, the Ministry of Textiles will, in consultation with the user Ministries concerned, relax these provisions up to a maximum of 20% for food grains and sugar respectively;
- Sugar fortified with vitamins will be exempted from the purview of this order;
- Packaging for export of the commodities will be exempted;
- Small consumer packs of 25-kg and below will be exempted; and

Bulk packaging of more than 100 kg will be exempted.

Quality Control and standards in India / other countries

The various standards applicable to Jute goods in India are listed below:

- IS 1943:1995 A-twill jute bags
- IS 2566:1993 B-twill jute bags for packing
- IS 2580:1995 Jute sacking bags for packing cement
- IS 2818(Part 1):1990 Indian hessian
- IS 2818(Part 2):1971 Indian hessian
- IS 2818(Part 3):1971 Indian hessian
- IS 2818(Part 4):1971 Indian hessian
- IS 2818(Part 5):1974 Indian hessian
- IS 2818(Part 6):1977 Indian hessian
- IS 2873:1991 Packaging of jute products in bales
- IS 2874:1993 Heavy cee jute bags
- IS 2875:1993 Jute corn bags
- IS 3667:1993 B-twill jute cloth
- IS 3750:1993 Jute corn sack cloth
- IS 3751:1993 Heavy cee jute cloth
- IS 3790:1991 Hessian bags

- IS 3966:1967 DW-Flour jute cloth
- IS 3984:2002 DW-Flour bags
- IS 4436:1989 Jute bagging for wrapping cotton bales
- IS 7406(Part 1):1984 Jute bags for packing fertilizers
- IS 8569:1977 Jute fabrics used in the packing of textile products
- IS 9113:1993 Jute sacking - General requirements
- IS 9685:2002 Sand bag
- IS 7406(Part 2):1986 Jute bags for packing fertilizers
- IS 10036(Part 1):1982 Jute canvas
- IS 10036(Part 2):1982 Jute canvas
- IS 11193:1984 Jute canvas postal bags
- IS 12001:1987 Jute Sacking cloth for cement bag
- IS 12154:1987 Light weight jute bags for packing cement
- IS 12174:1987 Jute synthetic union bags for packing cement
- IS 12493:1988 Specification for jute bags for packing sugar
- IS 12494:1988 Specification for jute bags for packing urea
- IS 12626:1989 Specification for laminated jute bags for packing milk
- IS 12650:2003 Jute bags for packing 50 kg. foodgrains
- IS 13649:1993 Polyethylene lined jute bags for packing tea
- IS 14342:1996 Jute yarn/twine - Packaging code
- IS 15138:2002 Jute bags for packing 50 kg sugar

Standards set for food grade jute bags in India and internationally are:

- IJO Standard 98/01
- Sacks for the Transport of food aid, European Standard EN 766
- Erstwhile British Standard 3845:1990

Besides the above mentioned established standards the draft standards are listed below:

- DOC.TXD 3(687) Jute sacking - General requirements
- 2 DOC.TXD 3(688) Jute bags for packing 50 kg sugar
- DOC.TXD 3(9001) Food grade jute packaging materials

Tea Bags

Tea bags are sold by organised tea producers to the high-end consumers. Tea bags consist of a filter paper pouch with a thread, which holds the tea powder and a tag. The tea bag is dipped in hot water / milk to produce the beverage. The two major marketers of tea bags in India are Hindustan Unilever Limited (HUL) and Tata Tea Limited.

Product characteristics

Tea bag filter paper is made with a blend of wood and vegetable fibers. The vegetable fiber is bleached pulp abaca hemp, a small plantation tree grown for the fiber, mostly in the Philippines and Colombia. Heat-sealed tea bag paper usually has a heat-sealable thermoplastic such as PVC or polypropylene, as a component fiber (100% non-woven technical textile) on inner side of the teabag surface. The filter paper used for making tea-bags is a 12-17 GSM non-woven material. The heat-sealing type tea-bag paper is of 16.5 to 17 GSM approx while the non-heat sealed tea-bag paper is around 12 – 13 GSM.

Organised Tea market in India

The domestic consumption of tea in India is in excess of 800 million kilograms with a per capita consumption of around 750-800 grams per annum. Around 45-50% of the tea industry in India is organised.

Tea Bags market in India

The total size of the organised tea market in India is around 400 million kilograms. The penetration of tea bags in the country is around 1.5-2% of the organised tea market. Hence, the size of the domestic tea (sold as tea-bags) market is around 6,900 MT. HUL and Tata Tea are the leading manufacturers of tea bags in India.

Most of the tea-bags contain 2 grams of tea though some of the bags contain up to 4 grams of tea. Hence, the total number of tea-bags used in India is estimated as around 3 – 3.5 billion.

Market size of tea-bags filter and future forecast

The consumption of filter paper is around 1.05 kilograms to 1.25 kilograms per kilogram of tea packed or around 2.1 to 2.3 grams per tea-bag. The price of tea-bag filters has been assumed as Rs 250 per kg.

The market size of tea-bag filter has been estimated as given below:-

Tea-bags filter usage in India

Tea sold as tea-bags in India	Approx. 6,900 MT (3 – 3.5 billion tea-bags)
Filter paper used per kg of tea	1.05 kg to 1.25 kg (2.1 to 2.3 grams per tea bag)
Total Filter paper usage for tea-bags	**7,900 MT** **Rs 200 crore**

Source: Industry survey, PIB, IMaCS Analysis

The current and future forecast of tea bags filter industry is given below:-

Tea-bags filter	2007-08	2012-13
Tea sold as tea-bags	6,900 MT	15,400 MT
Tea bag filter paper volume (in MT)	7,900 MT	17,650 MT
Tea bag filter paper value (in Rs. crore)	Rs 200 crore	Rs 441 crore

Source: Industry survey, IMaCS Analysis

The potential market for tea bag industry in 2012-13 is estimated at Rs. 441 crore up from Rs. 200 crore in 2007-08 (E). No inflationary increase has been assumed for the price of the tea-bags filters. In volume terms, the usage of filter paper in tea bags industry is expected to grow from 7,900 tonnes in 2007-08 to 17,650 tonnes in 2012-13. The tea-bags industry in India is expected to grow at 15-20% per annum. We have assumed the growth rate of the industry as 17.5% per annum over the next five years.

Imports of Tea-bags filter

The estimated import figures for tea-bags filter are as given below:-

HS Code	Description	Imports Quantity	Imports (in Rs crore)
		2007-08(E)	2007-08(E)
48054000, 48232000	TEA-BAG FILTER PAPER*	Approx. 800 MT	**Rs 5 – 5.5 crore approx.**

Source: IBIS, DGCIS, IMaCS Analysis

Germany, UK & USA account for over 95% of tea-bag filter paper imports of India. 2-3% of tea-bags filters are imported from China as well.

Exports of Tea-bags filter

The estimated export figures for Tea-bags filter paper from India are negligible.

Manufacturing process and Type of Raw materials

Heat-sealed tea bag paper usually has a heat-sealable thermoplastic such as PVC or polypropylene, as a component fiber (100% non-woven technical textile) on inner side of the teabag surface. The filter paper used for making tea-bags is a 12-17 GSM non-woven material. The heat-sealing type tea-bag paper is of 16.5 to 17 GSM approx while the non-heat sealed tea-bag paper is around 12 – 13 GSM.

Key machinery manufacturers/suppliers in India

Chandy John, based at Bangalore, is a key supplier and exporter of machinery for manufacturing tea-bags in India. It supplies two kinds of machines:-

1. Tea Bag with Tag and String Packing Machine
2. Tea Bag with Tag, String and Envelope Packing Machine

Quality Control and Standards – There are no Indian standards.

SPORTECH

Sportech segment comprises of technical textile products used in sports and leisure. The technical textile products covered under Sportech are as give below:-

- Sports Composites
- Artificial turf
- Parachute Fabrics
- Ballooning fabrics
- Sail cloth
- Sleeping bags
- Sport nets
- Sport shoes components
- Tents
- Swimwear

The technical textiles usage in the Sportech segment is valued at Rs 2,632 crore in 2007-08.The sports footwear components account for around 85% of the total segment value followed by technical textiles usage in sports composites with around 11% share.

The sports footwear components are valued at Rs 2,250 crore and are expected to grow at around 11% y-o-y over the next 5 years. The technical textiles usage in sports composites is valued at Rs 293 crore. Sport composites include inflatable balls (footballs, volleyball, basketballs, etc), cricket protective equipments and boxing equipments. Around 30% of the sports composites are exported.

Artificial turfs are valued at Rs 26 crore and account for about 1% of the segment only. The artificial turfs are not manufactured in India and the demand is met through imports.

The usage of technical textiles in parachute fabrics, sleeping bags and hot air balloon fabrics is estimated as Rs 18.4 crore in 2007-08 which is expected to increase to Rs 28 crore by 2012-13. The consumption of sail cloth in India is negligible.

Sports nets, high performance swimwear and tents account for the remaining technical textiles consumption in Sportech with market size of Rs 5 crore, Rs 0.84 crore and Rs 39 crore respectively in 2007-08. India exports around 40% of its sports nets production and around 25% of its tents production. The usage of technical textiles in sports nets and tents is expected to increase to Rs 30 crore and Rs 49.8 crore respectively by 2012-13.

Overall, the usage of technical textiles in the Sportech segment is expected to increase from Rs 2,632 croire in 2007-08 to around Rs 4,358 crore by 2012-13, growing at a CAGR of just below 11%.

Summary of the market-sizing for Sportech

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
Sports composites (TT component)	**Quantity**	-	-	-	-	-	
	Value	Rs 455 crore	Rs 13 crore	Rs 175 crore	Rs 293 crore	Rs 410 crore	Rs 352 crore
Artificial turf	**Quantity**	-	140 MT	-	140 MT	280 MT	
	Value	-	Rs 26 crore	-	Rs 26 crore	Rs 52 crore	-
Parachute fabrics	**Quantity**		24,320 sq m		4 lakh meters	5 lakh meters	
	Value	Rs 7.4 crore	Rs 0.35 crore	Rs 1.5 crore	Rs 6.25 crore	Rs 7.75 crore	Rs 1.7 crore
Hot air balloons fabric	**Quantity**			-	7,000 sq m	10,000 sq m	
	Value	Rs 0.11 crore	Rs 0.07 crore	-	Rs 0.18 crore	Rs 0.25 crore	-
Sleeping bags	**Quantity**	2 lakh nos.	0.5 lakh nos.	6 lakh nos.	1.5 lakh nos.	2.5 lakh nos.	
	Value	Rs 27 crore	Rs 3 crore	Rs 18crore	Rs 12 crore	Rs 20 crore	Rs 20 crore
Sports Nets	**Quantity**		-	4 lakh nos.	80 MT	107 MT	
	Value	Rs 18 crore	-	Rs 13 crore	Rs 5 crore	Rs 6.7 crore	Rs 17.4 crore
Sports Footwear components	**Quantity**		1.8 million meters	-	166 million sq m	280 million sq m	

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
	Value	Rs 2,230 crore	Rs 20 crore	-	Rs 2,250 crore	Rs 3,810 crore	-
Sail cloth	Quantity	-	-	-	< 1 MT	< 1 MT	
	Value	-	-	-	< Rs 1 lakh	< Rs 1 lakh	-
Swimwear	Quantity		1.42 lakh pieces	24.47 lakh pieces	1050 pieces*	1350 pieces*	
	Value	Rs 60 crore	Rs 1.86 crore	Rs 54.62 crore	Rs 0.84 crore*	Rs 1.08 crore*	-
Tents	Quantity	2,125 MT	65 MT	640 MT	1,550 MT	1983 MT	
	Value	Rs 47 crore	Rs 3 crore	Rs 11 crore	Rs 39 crore	Rs 49.8 crore	Rs 12 crore
TOTAL	Value	**Rs 2,845 crore**	**Rs 67 crore**	**Rs 273 crore**	**Rs 2,632 crore**	**Rs 4,358 crore**	**Rs 403 crore**

* This size only constitutes of high performance swimwear market in India and not any fashion swimwear available in the market

As per ECTT report, the potential market sizing for 2007-08 was as given below:-

Market size (ECTT report)		2001-02	2007-08 (P)
Sports footwear (TT component)	Quantity	105 million meters	140 million meters
	Value	Rs 1,020 crore	Rs 1,600 crore
Sports composites	Quantity		
	Value	Rs 275 crore	Rs 415 crore
Sleeping bags	Quantity	25,000 nos.	50,000 nos.
	Value	Rs 6.25 crore	Rs 12.5 crore
Artificial turf	Quantity		
	Value	Rs 3.5 crore	Rs 12.45 crore
Ballooning fabrics	Quantity		

Market size (ECTT report)		2001-02	2007-08 (P)
	Value	Rs 0.5 crore	0.89 crore
Parachute fabrics	**Quantity**		
	Value	Rs 4.5 crore	Rs 10.67 crore
TOTAL	**Value**	**Rs 1,309.75 crore**	**Rs 2,049.51 crore**

The key impediments to growth of Sportech products are:-

1. Inadequate domestic demand
2. The raw materials and machinery for products like Ballooning fabric and Artificial turfs is not available in India which render these products expensive as compared to other manufacturing countries
3. Demand for products like parachute fabrics, tents, etc is driven primarily by the defence sector only
4. Sportech products are typically labour intensive; availability of skilled labour is a major impediment to growth
5. Licenses and clearances required for products like Ballooning fabric are a major impediment as well

Sports Composites Market

Sports composites usage in India includes boxing equipments, inflatable balls and protective equipments for cricket.

Product characteristics

Boxing equipments consist of Boxing Gloves, Boxing Punching Gloves, Boxing Head Guards, Boxing Punching Pads, Abdominal Guard, Speed Ball, Punching Bag etc.

Inflatable balls consist of football, volleyball, basketball, handball etc. Footballs account for 50% of the market of inflatable balls. Footballs have varying sizes i.e. Size-3, Size-4 and Size-5. Circumference for size 5 is 68.5cm to 69.5cm. Official weight of the football is 420~445 grams with ball pressure of 0.8 bar.

Protective equipments for cricket comprise of leg-guards, batting gloves, wicket keeping gloves, thigh pads, helmets, caps & hats, cricket kit bags etc

Market dynamics

Indian sporting goods industry is concentrated primarily in the cottage and small-scale sector. It is a highly labour intensive industry and also employs a large number of women as well. Most of the units work on a job work basis for the major manufacturers/exporters and also sell their produce to wholesalers who in turn sell these equipments to sports goods retailers.

The consumption of these products is dependent on the number of tournaments and the popularity of the particular sport (retail sales). The demand of these products is affected by International and National tournaments held in India. The per capita consumption of the sporting goods like inflatable balls is very low in India which is an indicator of the huge market potential.

Key manufacturers

At present, the units in Jalandhar account for around 60% of the production of sports goods in India, units in Meerut account for another 20% production and the remaining 20% of the production is contributed by other units spread all over India.

Cosco India Limited is the major player in the sports goods market. Its production and capacity details are given in the following table:-

Product Name	Installed Capacity	Production Quantity	Sales Quantity	Sales Value
Rubber Moulded Balls	1 crore pieces approx.	23 lakh pices approx	26 lakh pieces approx	Around Rs 9 crore
Synthetic Sports Balls & Components	8 lakh pieces approx.	7 lakh pieces approx	7 lakh pieces approx	Around Rs 8 crore
Latex Bladders for Sports Balls	45 lakh pieces approx.	38 lakh pices approx.	40 lakh pieces approx	Around Rs 5 crore
Sports Ball Butyl Bladder	15 lakh pieces approx.	-	12 lakh pieces approx	-

Market size and future forecast

The total production of sports composites in India is around Rs 455 crore. The industry exports almost one-third of its production although the share of exports is decreasing gradually. The increasing popularity of various sports and favourable demography augurs well for the domestic market. The sports composite industry is also getting a boost because of tournaments like Indian cricket league, Indian football league, etc. International events like common wealth games being hosted in India is also a favourable factor.

Production of sports composites

S. No.	Name of the Products	2007-08
1	Inflatable Balls	Rs 280 crore
2	Cricket Protective Equipment	Rs 135 crore
3	Boxing Equipment	Rs 40 crore

Source: Industry survey, SGEPC, IMaCS Analysis

The current and future forecast of sports composites consumption is given below:-

Sports Composites (Domestic consumption)	2007-08 Value	2012-13 Value
Inflatable Balls	Rs 179 Crore	Rs 250 Crore
Cricket Protective Equipment	Rs 85.5 Crore	Rs 120 Crore
Boxing Equipment	Rs 28.5 Crore	Rs 40 Crore

Source: Industry survey, SGEPC, IMaCS Analysis

The current market size of sports composites products in India is around Rs 293 and is estimated to grow at the rate of 7 % per annum to Rs 410 crore by 2012-13.

Imports and exports

The key sports goods items exported from India are inflatable balls, protective equipment for cricket and boxing equipments. The important export markets for inflatable balls are UK, USA, Australia, and Germany. The Boxing equipments are exported to countries like UK, South Africa, USA and Australia.

Cricket protective gear (Thigh pads, Pads, Helmets etc) have a huge domestic demand and are exported to UK, Australia, South Africa, New Zealand, U.S.A. The exports figures are as given below:-

S. No.	Name of the Products	Exports
1	Inflatable Balls	Rs 110 crore
2	Cricket Protective Equipment	Rs 50 crore
3	Boxing Equipment	Rs 15 crore

Source: SGEPC, DGCIS, IMaCS Analysis

Sports composites have an export potential of Rs 352 crore in 2012-13.

The import details of these goods are given in the following table.

S. No	Name of the Products	Imports
1	Inflatable Balls	Rs 9 crore
2	Boxing Equipment	Rs 3.5 crore
3	Cricket Protective Equipment	Rs 0.5 crore

Source: SGEPC, DGCIS, IMaCS Analysis

Key Exporters

Company	Location	Products
Sanspareils Greenlands Pvt Ltd	Meerut	Cricket Bats & Balls, Soft Leather Goods
Soccer International Pvt Ltd	Jalandhar	Inflatable Sports Balls Soccer Shin Guards Bags
Mayor International Limited	Gurgaon	Golf Balls, Plastic Tees, Rubber Tees, Soccer Balls, Volley Balls, Rugby Balls, Miniature Balls
Bhalla Sports Pvt Ltd	Meerut	Inflatable balls and others
F.C. Sondhi & Co. (India) Pvt Ltd	Jalandhar	Cricket protective equipments

These exporters were recognised with export excellence awards by Sports goods export promotion council for their performance in 2006-07.

Raw materials and machinery

The major steps involved in the manufacture of sports composites are cutting and stitching. The small cottage units make these composites by hand stitching where as the bigger units go for sewing machines.

Boxing equipments are made of PU laminated / PVC coated fabrics, woven polyester fabric, nylon coated with PVC on both sides. PU/PVC coated fabrics are the most commonly used fabrics.

Leg guards are made of PU laminated / PVC coated fabric in front and cotton fabric on the inner side as the impact of the cricket ball is on the outside surface. Batting gloves are made of PU laminated fabric while wicket keeping gloves are made of PVC coated fabric as they are subject to more wear and tear.

Quality Control and Standards

The standards for different Sports composites are specified by their governing bodies.

Artificial turf

Artificial turf, or synthetic turf, is a man-made surface manufactured from synthetic materials with appearance similar to natural grass. It is used for making world-class surfaces for playing sports (especially hockey and soccer) which are normally played on grass. The hockey stadiums account for most of the consumption of the artificial turf in India. It is also used indoors or outdoors for landscaping.

Artificial turf is considered a safe alternative to natural grass; turf has no direct harmful effects to pets or children. Several studies have shown that the artificial turfs have a higher injury rate than grass on playgrounds. The new manufacturing and installation procedures have resulted in lowering of injury rates than on natural grass.

Product characteristics

The artificial turf system consists of various layers - the pile fibers & backing cloth, shock absorbing layer and the supporting base.

- **Pile Fiber** - The grass like piles are non abrasive and soft to touch. The synthetic grass is made of either the polyamide nylon/nylon 6.6 or PP/PE, which is custom extruded into a monofilament ribbon form. The pile fiber has to allow for smooth ball roll and bounce, support non-directional foot traction, allow for water permeability and should have the correct balance of strength, elasticity and stiffness to withstand the wear and tear of regular usage.
- **Backing Fabric** - the material to which surface fibers are attached to form the underside of the artificial turf surface. The backing has to permit water to flow through the fabric readily.
- **Shock-Absorbing Foam** - provides cushioning for running or falling athletes. The foam is made of a closed-cell polymer alloy like polyurethane, typically 1/2 inch in height and perforated for vertical drainage
- **Supporting Base** - supports the load placed on the entire structure, typically a 2-feet or 3-feet layer of asphalt or concrete

Installation and maintenance are very crucial for the performance of Artificial Turf. For ground installations, a good quality sub-base is very important. The turf suppliers provide these services themselves. Turf generally lasts at least a decade and requires no mowing, watering or fertilisation.

The pile fibers are knitted directly into the backing using flat-bed Raschel knitting machines which are between 4.5 m to 5 m wide to form a mechanically strong and stable structure. The sewing threads which are used are high-strength, weather resistant and pigmented to exactly match the colour of the turf.

Market dynamics and key growth drivers of Astro-turfs market in India

The hockey stadiums account for most of the consumption of artificial turf in India. It also finds use in use indoor or outdoor landscaping: Rooftops, Balconies, Atriums, Home and Corporate Lawns, Hotels and Resorts, Club Houses, Jogging / Walking Tracks, Shopping Malls, Traffic Islands, Road Medians, Kids' play area etc.

The key market driver is the government expenditure to improve the hockey infrastructure. The Commonwealth games and Hockey Olympics, which are to be hosted in India, are expected to increase the short-term demand of astro-turfs in India. In the long term, various Government schemes providing subsidy to universities / colleges for lying down of artificial turfs augur well for this industry.

Other than sports, the usage of artificial turf for landscaping is increasing on account of increasing awareness and acceptance of the product and also because of the rising labour costs in maintaining natural grass lawns.

More than 1000 installations of astro-turf are already complete in India. Some of the installations of astro-turf in India are given below (*Source: www.fieldturfindia.com*):-

- Synthetic Track installed for Military World Games, Hyderabad, 2007
- SAARC countries first artificial grass football field (80,000 sq ft) installed for Chowgule Group, Goa
- Two Tennis Courts installed for Jain International School
- 8 Basketball Courts installed for Eastern Naval Command at Vizag, Chennai, Arakkonam
- Multipurpose artificial grass field at Mahatma Education Society
- 48,000 sq. ft. installed on Infosys rooftop

Market size of Astro-turfs in India

There are 20 artificial turf hockey pitches in all of India. The Ministry of Youth Affairs & Sports has approved laying of 12 new Astroturfs at the cost of Rs. 42 crore with a view to create better facilities for hockey in the country. Locations for new Astroturfs include one at Singpura (Baramullah, J&K) and tribal

pockets like Rajnandgaon (Chhattisgarh), Hazaribagh (Jharkhand) and Kokrajhar (Assam). At another eight places, the work for establishment of Astroturf is at different stages of the completion. Besides this, the work relating to replacement of old Astroturfs at NIS, Patiala and Kolkatta is underway. The proposal for setting up of another four Astroturfs are in the pipeline. By the end of 2009, India will have 30 Astroturfs spread across the country for the promotion of hockey.

Hence, on an average, 6-8 astro-turfs are being laid every year In India. In addition, 3-4 synthetic astro-turfs are being laid in India every year.

The cost of laying an artificial turf for a hockey field is approximately Rs 3.5 crore which usually lasts for a minimum of ten years assuming proper maintenance. The cost of an 8-lane synthetic athletics track is around Rs 2.5 crore. Technical textiles account for 60% of the cost.

Astro-turf usage in India

No. of hockey fields for astro turfs per year	7
Area of astro-turf	6000 sq. m.
Cost of astro-turf per field	Approx. Rs 3.5 crore
Share of technical textiles in the cost	60%
GSM of technical textile fabric	1884 (175 grams per square feet)
Astro-turf usage per annum	**Rs 14.7 crore** **88 MT**

Source: Industry survey, PIB, IMaCS Analysis

Synthetic athletics tracks usage in India

No. of synthetic athletics tracks per year	4
Area of synthetic track	Approx. 4500 sq. m.
Cost of astro-turf per field	Approx. Rs 2.5 crore
Share of technical textiles in the cost	60%
GSM of technical textile fabric	1884 (175 grams per square feet)
Synthetic track usage per annum	**Rs 6 crore** **37 MT**

Source: Industry survey, PIB, IMaCS Analysis

The market size has been increased by 20% to account for usage in landscaping.

The demand for artificial turfs / synthetic tracks is likely to double in the next 5 years as a result of strong government focus on developing the sports infrastructure of India.

The Indian artificial turf market size is expected to increase from 140 MT in 2007-08 to around 280 MT by 2012-13. No inflationary increase has been assumed for the price of artificial turfs. Hence, in value terms, the market size of the artificial turfs market in India is expected to increase from Rs 26 crore in 2007-08 to around 52 crore by 2012-13.

The current and future forecast of artificial turf consumption is given below:-

Artificial turf	2007-08	2012-13
Quantity	140 MT	280 MT
Value	Rs 26 crore	Rs 52 crore

Source: Industry survey, IMaCS Analysis

Key manufacturers of artificial turf in India

There are no manufacturers of artificial turf in India. The demand is met entirely through imports. Artificial turfs are imported under the HS code 570330.

Key importers

The major importers of Astro-turf (fabrics) are Suravaram Marketing (Pvt) Ltd (Licensee of FieldTurf - Tarkett in India), Inderjit Mehta Constructions Pvt. Ltd (representing Polytan Sportstattenbau GmbH).

Key machinery manufacturers / suppliers in India

None

Quality control and standards:

The International Hockey Federation (FIH) has developed standards for Hockey turfs. Manufacturers of synthetic turfs have to adhere to the FIH standards to get their products registered as FIH approved products. These products are tested and verified by a FIH accredited laboratory.

The standards for artificial turf used in football grounds are governed by FIFA. It specifies various ball / surface and player / surface tests for these turfs and cerfies as FIFA RECOMMENDED 1 Star and 2 Star. 1 Star is mainly for recreational, community and municipal use while 2 Star for artificial turf designed specifically for the playing characteristics of professional football. Both the FIFA recommended 1 Star and 2 Star have to go through a series of stringent laboratory and field tests for getting the FIFA certificate.

Parachute Fabrics

A parachute is a device used to slow the descent of a falling body or load.

Product characteristics

A parachute consists of four main components: parachute canopy, rip-cords, suspension lines and the harness.

- **Parachute canopy**
- **Harness** - The pack is fastened to the person's back or front with a harness. The harness is specially constructed so that the parachutist is not injured as the forces of deceleration (slowing down), gravity and wind are transmitted to the wearer's body as the chute opens.
- **Rip-cord** - A rip-cord is used to open the duck pack and allow the chute to deploy (pop out). The rip-cord can be used in three different ways (pulling the rip manually, a static line connected to the aircraft deploys the chute as the person jumps or automatically as the pilot is ejected from the aircraft).
- **Suspension lines** - Suspension lines, or shrouds, connect the canopy (parachute cloth) to a ring on the harness. The line is continuous from the ring, through a seam in the shroud over the top of the chute and back down to the ring again.

Parachute canopies are primarily made of high tensile nylon multi-filament fibres, generally ripstop woven, from 32 to 200 deniers. Ripstop fabrics are woven fabrics whilst using a special reinforcing technique that makes them very resistant to tearing and ripping. Older lightweight ripstop fabrics display the thicker interlocking thread patterns in the material quite prominently, but modern weaving techniques make the ripstop threads less obvious.

Ripstop fabrics have high strength to weight ratio. The smaller tears and rips cannot easily spread further in the fabric. Air-permeability is one of the most important characteristics because it determines the behaviour of the parachute itself, the rate of descent depends dramatically on this characteristic. The fabric should be of minimal thickness to enable folding of the parachute into a bag.

Harness, webbing, tapes etc are made-up of high tensile nylon yarn (denier range 210 to 840 denier) as nylon has the highest strength to weight ratio.

Market dynamics and key growth drivers

Parachutes can be broadly classified into three categories based on usage: Defence, aero-sports and space vehicles.

- The parachutes applications in defence are - Emergency Escape Parachute Assemblies for aircrafts with fixed seats or assisted, escape seats, Personnel Restraint Harness for seated or moving crew members, Airborne Forces' Parachute Assemblies including Reserve parachutes, Aerial Delivery (Supply Dropping) Parachute Assemblies, Aircraft Landing Brake and Anti-Spin Parachute Assemblies, Parachute devices for flares, markers, bombs and other munitions.
- Recovery System Parachute Assemblies are used in space vehicles to recover some equipment as the vehicles descending towards earth.
- Parachutes are used in aero sports like parasailing/ parascending (the person is towed behind a vehicle and attains flight of hundreds of feet above ground), Sky diving etc.

The specifications associated with a parachute are type of canopy (flat, circular), size, load capacity, weight of parachute assembly, canopy fabric and material of suspension lines.

In India, more than 90% of the demand for parachutes is from the defence sector. Ordinance parachute factory is the only manufacturer in India and caters to most of the demand. The parachute fabric usage at Ordinance Parachute Factory, Kanpur is around three lakh metres.

The key demand drivers are defence spending on parachutes and popularity of aero-sports. The market for parachutes is likely to increase only at around 5% per annum.

Key manufacturers of the parachute fabric in India

The major parachute fabric manufacturers are Kusumgar Associates (Mumbai) and Oriental synthetics & Rayon Mills Pvt. Ltd (Mumbai). Kusumgar manufactures 3-4 lakh square meters of parachute fabric while Oriental Synthetics & Rayon Mills manufactures more than two lakh metres of parachute fabric.

Manufacturer	Year	Quantity
Kusumgar Associates	2007-08	Up to 3 – 4 lakh metres
Oriental synthetics & Rayon Mills Pvt. Ltd	2005-06	Up to 2 lakh metres

Source: Industry Survey, Office of Textile Commissioner

Market size of parachute fabrics and future forecast

The market size of parachute fabrics has been estimated as given below:-

Parachute fabric usage in India

Usage at Ordinance Parachute Factory	3 lakh metres approx.
Average price	Rs 170 per metre
Domestic consumption of parachute fabric	Rs 5.1 crore
Fully-built Parachutes imported	Rs 1.5 crore
Equivalent parachute fabric consumption	Around 1 lakh metre
Total parachute fabric consumption	**Rs 6 - 6.5 crore approx** **Around 4 lakh metres approx.**

Source: Industry survey, IMaCS Analysis

The current and future forecast of artificial turf consumption is given below:-

Parachute fabrics	2007-08	2012-13
Quantity	4 lakh metres	5 lakh metres
Value	Rs 6 – 6.5 crore	Rs 7.5 – 8 crore

Source: Industry survey, IMaCS Analysis

The Indian parachute fabric market size is expected to increase from 4 lakh metres in 2007-08 to around 5 lakh metres by 2012-13. No inflationary increase has been assumed for the price of parachute fabric. Hence, in value terms, the market size of the parachute fabric market in India is expected to increase from Rs 6-6.5 crore in 2007-08 to around Rs 7.5-8 crore by 2012-13.

The ECTT report had estimated the market size of parachute fabrics as Rs 4.5 crore in 2001-02 and projected the market as Rs 10.67 crore in 2007-08. The market has not grown as per TECS estimates because of lower than expected consumption in the defence sector and the slow rate of growth in aerosports.

Imports & Exports of parachute fabric

The Indian imports of parachute fabric are as given below:-

HS Code	Description	Imports Value	Imports Quantity
		2006-07	2006-07
54071011	Unbleached parachute fabrics	Rs 0.14 crore	10,340 sq m
54071021	Bleached parachute fabrics	Rs 0.20 crore	13,000 sq m
54071091	Other parachute fabrics	Rs 0.01 crore	980 sq m
Total Imports		**Rs 0.35 crore**	**24,320 SQM**

Source: DGCIS, IMaCS Analysis

The direct exports of parachutes are as given below:-

HS Code	Description	Exports Value	Exports Quantity
		2006-07	2006-07
54071011	Parachutes & parts thereof*	Rs 1.5 crore	350 numbers

Source: DGCIS, IMaCS Analysis

** Most of the imports under the HS code above are fully-built parachutes*

The export of parachute fabric from India is very low. Even in the year 2012-13 the export potential is only around Rs 1.7 crore. *Though as per DGCIS classification, HS codes 52114170, 54071011, 54071021, 54071031, 54071041 and 54071091 are related to Parachute fabrics, various man-made fabrics for garment purpose are being exported under these HS codes.*

Raw materials

Parachutes comprise of almost 90-95 % technical textiles. Parachute canopies are primarily made of high tensile nylon multi-filament fibres, generally ripstop woven, from 32 to 200 deniers with GSM of around 35. Harness, webbing, tapes etc are made-up of high tensile nylon yarn (denier range 210 to 840 denier) as nylon has the highest strength to weight ratio.

Quality Control and Standards

Quality control is a stringent requirement for parachutes. The relevant standards are framed by Aerial Delivery Research and Development Establishment, Agra, India.

Ballooning fabrics

Hot air balloon drives its lift from heated air contained within the envelope. Hot air ballooning is a very popular leisure activity and adventure sport across the globe. In addition, aerostat balloons are used in military as surveillance equipments.

Product characteristics

The primary components of a Hot air balloon are: Envelope, basket and burner. The envelopes of the hot air balloons are usually made of light-weight and strong synthetic fabrics such as ripstop nylon or dacron (a polyester). Normally, the maximum temperature attained by the top of the envelope is around 120 degrees Celsius (a temperature lower than the melting point of nylon).

Market dynamics and key growth drivers

The market for hot air balloons is very small in India as Hot air ballooning as a sport is still in a nascent stage. The demand for hot air balloons is mainly from defence sector. A hot air ballooning node has been established in Bhopal where a large number of army cadets participate in hot air ballooning. In the non defence sector, the balloons are used on rent i.e. people are charged for each rides.

The Ballooning Club of India (based in Delhi) organizes training programs and hot balloon rides. The club revealed that about 2000 people participate in these events which are organized through out the year. Balloon rides are organized in Agra, Pushkar, Beneshwar, Nagaur, Rishikesh, Haridwar and Dehradun. The participation cost is about Rs 40,000 per person. The balloon rides are generally done in winters when the wind speeds are not very high.

The ballooning club also organizes an annual event called Balloon Mela in the month of November. 35 teams from across the globe participate in this event. The organization hopes to conduct this event on a bigger scale once they get adequate sponsorships.

The key market drivers for ballooning are the popularity of the sport and the purchasing power of the customers as the current cost of Rs 40,000 for each ride is very high. The increase in both domestic and international tourists augurs well for the sport.

Key manufacturers of ballooning fabrics

Bandhu Aerospace Private Ltd (Delhi) is the pioneer in the field of hot air ballooning. It is the only manufacturer (Fabricator) of Hot air balloons in India. The company has a tie up with Ultra Magic balloons (Spain). The hot air balloons are manufactured as and when the orders are received. The company is fabricating 4-5 balloons per annum over the past few years.

This company imports most of the fabric required for balloons from Carrington (UK). The company is trying to find local sources for the balloon fabric to cut down the cost (the cost can come down from Rs 15 lakhs to Rs 5 lakhs if sufficient domestic supply of ballooning fabric is present).

In India, Kusumgar and Entremonde are the key manufacturers of ballooning fabrics in India.

First Media Inflatable & Balloons (Hyderabad) has stopped making hot air balloons due to inadequate demand. The company has not renewed its license from Director General of civil aviation (DGCA).

Market size of TT product and future forecast

Hot air balloons	
Width	15 metre
Height	22 metre
Fabric requirement	1,000 square metre
Price per square metre	3-4 USD
Price per square metre inclusive of duties	Rs 200-250 per sq m
Life time of a balloon *	300 flying hours
Price of a balloon	Rs 15-20 Lakhs

Source: Industry survey

**Life time of a balloon is a function of maintenance*

As mentioned earlier, the market for ballooning fabrics is very small. The rising disposable incomes, favourable demography and increasing popularity of adventure games are likely to result in a strong growth of around 6%.

The current and future forecast of hot air balloons industry size is given below:-

Hot air balloons	2007-08	2012-13
Hot air balloons Quantity	7 nos.	50 nos.
Hot air balloons Value	Rs 1.25 crore approx	Rs 9.00 crore approx
Hot air balloons (fabric) Quantity	7,000 sq m approx	50,000 sq m approx
Hot air balloons (fabric) Value	Rs 0.18 crore	Rs 1.25 crore

Source: Industry survey, IMaCS Analysis

The domestic usage of hot air ballooning fabric is expected to increase from 7,000 sq m in 2007-08 to around 50,000 sq m by 2012-13. No inflationary increase has been assumed for the price of these products. In value terms, the market size of the hot air ballooning fabric in India is expected to increase from Rs 0.18 crore in 2007-08 to around Rs 1.25 crore by 2012-13.

Imports & Exports of hot air balloon envelopes

The estimated direct import figures for hot air balloon envelopes are as given below:-

HS Code	Description	Imports Quantity	Imports (in Rs crore)
		2007-08(E)	2007-08(E)
88010020	Hot air balloon envelope	2-3 nos.	Rs 0.07 crore approx

Source: IBIS, IMaCS Analysis

The direct imports of envelopes are from UAE, USA & UK. Ballooning fabrics are mostly imported from UK and USA.

There are no exports of these products from India.

Raw materials

There are two basic fabrics from which balloon envelopes are manufactured - nylon or polyester. In Europe, nylon fabrics are primarily used for balloons because it is the material that both Carrington and Luckenhaus make and these two companies provide the fabric for most of the European balloon

manufacturers. American balloonists are more familiar with the choice between nylon and polyester because a few American manufacturers use polyester.

The nylon balloon envelope is made of nylon multifilament in the denier range of 32 to 200 deniers which are generally ripstop woven. Ripstop fabrics are woven fabrics whilst using a special reinforcing technique that makes them very resistant against tearing and ripping. During weaving (thick) reinforcement threads are interwoven at regular intervals in a crosshatch pattern in the fabric. The intervals at which reinforcement threads are interwoven are typically 5 to 8 millimeters (0.2 to 0.3 in) apart. Thin or lightweight ripstop fabrics get a 3 dimensional structure due to the thicker threads being interwoven in thinner cloth. Older lightweight ripstop-fabrics display the thicker interlocking thread patterns in the material quite prominently, but more modern weaving techniques make the ripstop threads less obvious.

Advantages of ripstop fabrics are - the favourable weight to strength ratio and that smaller tears and rips can not easily spread further in the fabric. The fabric (or at least part of it, the top 1/3 for example) may be coated with a sealer, such as silicone or polyurethane, to make it impermeable to air. It is often the degradation of this coating and the corresponding loss of impermeability that ends the effective life of an envelope, not weakening of the fabric itself. Heat, moisture, and mechanical wear-and-tear during set up and pack up are the primary causes of degradation. These fabrics have a GSM of 150 to 250. Bandhu Aerospace is importing these fabrics from UK and USA.

Regulations and standards in India / other countries

Director General of civil aviation (DGCA) is the regulatory body for hot air balloons in India.

The standards prescribed in FAR Part 31(Federal Aviation regulations) for the design are the minimum requirements for airworthiness of the hot air balloons. No hot air balloon can be flown unless it possesses a valid Certificate of Airworthiness. The suitability and durability of all materials must be established on the basis of experience or tests. It has to be ensured that the material has the strength and other properties assumed in the design.

Persons/firms desirous to take up design and manufacture of hot air balloons have to intimate the DGCA of their intention and apply for necessary approval as required under CAR Section 2 - Series 'E' Part I.

There are several security requirements mandated for flying air balloons. One time security clearance of the manufacturer, owner, and operator shall be obtained from the State Police authorities before initial

commencement of the operations. The hot air balloon shall not be sold or disposed of in any way to any person or firm without production of a certificate from the DGCA. The hot air balloon shall not be flown over entire air space covering VIP locations, defence installations, other restricted and prohibited areas. The hot air balloon shall also not be flown over an assembly of persons or over congested areas unless prior permission in writing is obtained from appropriate authorities. The restricted areas are notified by the DGCA from time to time in consultation with the Ministry of Home Affairs.

Sail cloth

Sail is a large piece of fabric (usually canvas fabric) by means of which wind is used to propel a sailing vessel. Sails were used for in every type of boats before the advent of motorized boats. In the modern times, the sails are used in sailing boats, yachts for sports and recreational purpose.

Product description

Earlier, sails were made from flax (linen), hemp or cotton in various forms including canvas. However, modern sails are rarely made from natural fibers. Most sails are made from synthetic fibers ranging from low-cost nylon or polyester to expensive aramids or carbon fibers.

The cotton canvas sails tend to wear out faster and are not capable of achieving high sail speeds. They also tend to be more bulky compared to sails made of polyester and polyamides as they have a higher strength to weight ratio.

Market Dynamics and key growth drivers

The usage of sail cloth is primarily in the following segments:

- **Luxury yachts**
  The demand of luxury yachts in India is still to catch up. They have a huge potential for leisure tourism as is the case in the developed countries.

- **Sporting sail boats**
  Sailing as a sport is yet to catch up in India. The Yachting Association of India (YAI) is promoting the sport in the country, developing and training judges, umpires and other administrators of the sport and representing the sailors in all matters concerning the sport. The YAI is also officially recognized by the Indian Olympic Association and the Ministry of Youth Affairs and Sports, Government of India as the governing authority for sailing, windsurfing, motor boating, powerboat racing and personal watercraft, at sea and on inland waters in India. There are around 40 clubs affiliated to YAI, spread across various parts of the country like the Kerala Yachting association, Tamil Nadu Sailing Association, etc.

  The sporting sail boats use modern sail cloths which are made from synthetic fibres. The sporting sails boats are categorized into various classes. There are 14 class associations affiliated to YAI,

ranging from the smallest, the Optimist Dingy, to the largest, the J 24 class. The fabric requirement is dependent on the type of class.

Key classes of Yachts in India	Type	Requirement of Sail cloth per Yacht in square metre
Laser	Centre boat	7.06
Laser Radial	Centre boat	5.76
470	Centre boat	9.45

YAI estimates the total fleet of sporting yachts in the country to be around 800. The laser type of boats are the most common types of yachts in this fleet and are estimated to be 140 in number.

The performance of Indian teams in the international sailing events has shown continuous improvement which is likely to result in the increased popularity of the sport.

There are no domestic manufacturers of these sporting yachts. The yachts are imported for sporting purposes and are exempted from the high import duties, but, imports involve a long lead time which is a discouraging factor.

- **Non motorized Fishing boats**

  These sail boats are used by small fishermen who can not afford the motorized fishing boats. These boats are propelled by sails made of natural fibres. The canvas sails are being substituted by hand plastic sheeting or sacking.

Market size and future forecast

The requirement for synthetic sail cloth is very small although it has tremendous potential in lieu of the long coastline and the rising popularity of the sport. The sporting yachts are the key driver for this industry. The sail cloth is required for the new yachts as well as for the replacement demand of worn-out sails.

There are no yacht manufacturers in India and hence they have to be imported even though the import tariffs are very high. This gap in the value chain of sail cloths is the most important obstacle in the development of the Indian market.

The current fleet size in India is very low and hence, the replacement demand is abysmally low. YAI has tried to source the product locally but the small market size is a huge impediment. The demand of synthetic sail fabrics is entirely met through imports.

The market for sporting yachts is expected to increase at a greater pace as compared to growth over the last 5 years. YAI has plans of sourcing around 200 sporting yachts in the next couple of years. The Indian navy has also floated a tender for sail boats in 2008-09. The fleet size of various sporting yachts is expected to double by 2012-13 to 1500. It is assumed that the fleet increase will be spread equally over the years which equals to 120 yachts per year and the sail cloth requirement to 7 square metre per yacht.

The market for sail cloth is not expected to reach a critical size in the next five years even considering the favourable trends mentioned above.

	Market size
Number of sail boats	110 nos.
Synthetic sail cloth required including replacement demand	
Quantity	Less than 1 MT
Value	Less than Rs 1 lakh

Source: Industry survey, IMaCS Analysis

The imports and exports of sail boats / fabric are negligible.

Raw materials

The performance of a sail depends on two crucial aspects: Sail Design and Sail cloth. The sail cloths are tightly woven fabrics and mostly made of Polyester and polyamides like Nylon. These fabrics have a GSM of 200-600. Some of the high value sail cloths are laminated using sheets of PET.

An ideal sail cloth should have the following properties:

- Tear resistance
- Modulus of elasticity: stretch resistance per weight
- High Tensile strength or tenacity
- High breaking strength per unit weight
- Good Creep properties (the long term stretch of a fibre or fabric)
- UV Resistance

Quality Control and standards in India

There are relevant Indian standards for sail cloth.

Sleeping bags

A sleeping bag is a protective "bag" for a person to sleep in, similar to a blanket that can be closed with a zipper (allowing it to be folded in half and secured in that position) and functions as a bed while camping, hiking, hill-walking or climbing. Its primary purpose is to provide warmth and thermal insulation. Sleeping bags are used at high altitudes in extremely cold weather. It also protects against wind chill, precipitation, etc.

The basic design sleeping bags work well for most camping needs but are inadequate under more demanding circumstances. The second major type of sleeping bags is mummy bags (because of its shape). Most modern sleeping bags are of a 'mummy' shape as it is the most thermally efficient design. A sleeping bag with little or no 'dead space' around the user is warmer as there is less air to warm up with heat from the body.

Market dynamics and key growth drivers

The major consumption of sleeping bags is by armed forces and para-military forces. The demand from these sectors accounts for close to 90 % of the total demand of sleeping bags. The sleeping bags used in these segments are of superior quality as compared to the bags used for leisure activities.

The demand for sleeping bags for camping/adventure sports is less than 10 % of the total market for sleeping bag. The awareness of the criterion required for a good sleeping bag is very low. The customers are very price conscious as well.

The manufacturers need to upgrade their products to superior sleeping bags which could be used for extreme cold climate conditions (also known as Arctic bags) which will help them to tap the export market.

Market size and future forecast of sleeping bags

The Directorate General of Supplies & Disposals (DGSND) finalises the rate contracts for the various government bodies. The DGSND estimates the demand of sleeping bags for government agencies to be Rs 8.09 crore in 2008-09.

The favorable demography with more and more people going for activities like camping / Trekking is likely to result in the industry growing at 10% per annum.

The current and future forecast of sleeping bags industry size is given below:-

Sleeping bags	2007-08	2012-13
Sleeping bags Quantity	Around 1.5 lakh nos.	Around 2.5 lakh nos.
Sleeping bags Value	Rs 12 crore approx	Rs 20 crore approx

Source: Industry survey, IMaCS Analysis

The domestic usage of sleeping bags is expected to increase from 1.5 lakh nos. in 2007-08 to around 2.5 lakh nos. by 2012-13. No inflationary increase has been assumed for the price of these products. In value terms, the market size of the sleeping bags in India is expected to increase from Rs 12 crore in 2007-08 to around Rs 20 crore by 2012-13.

Key manufacturers of the product with information on capacity / production / sales

Sleeping bags are reserved for small scale industries. Some of the manufacturers of sleeping bags are Standard Gram Udyog Sansthan, Kanpur Tent Factory, Mahalaxmi Textile Industries, Madhur enterprises (P) Ltd, Standard Niwar Mills, etc. The manufacturers of sleeping bags are concentrated around Kanpur.

Imports & Exports of sleeping bags

Sleeping bags are primarily imported from Italy. The imports of sleeping bags are as given below:-

HS Code	Description	Imports (Value)	Imports (Quantity)
94043010	Sleeping bags filled with feathers or down	Around Rs 0.15 crore	Around 1,000 nos.
94043090	Other sleeping bags	Around Rs 3 crore	Around 0.5 – 0.6 lakhs nos.

Source: DGCIS, IMaCS Analysis

Most of the exports of sleeping bags from India are to France & Netherlands. The exports figures of sleeping bags are as given below:-

HS Code	Description	Exports (Value)	Exports (Quantity)
94043010	Sleeping bags filled with feathers or down	Around Rs 0.5 crore	Around 10,000 nos.
94043090	Other sleeping bags	Around Rs 18 crore	Around 6 lakhs nos.

Source: DGCIS, IMaCS Analysis

Sleeping bags have an export potential of Rs 20 crore in the year 2012-13

Raw materials

A typical sleeping bag uses around 7 linear metres of fabric and 1.5-4 kg of filling material based on the field conditions. Several insulating materials are used for making sleeping bags.

Outer fabric: These are almost exclusively synthetic materials which are windproof and usually have a water-repellent coating.

Inner fabric: Synthetic fabrics (especially Nylon) are used predominantly. Cotton / poly cotton usually costs less than a high-wicking synthetic but traps moisture which can have a chilling effect.

These fabrics have a GSM range of 60-300.

Filling: Weight and pack size, for a given amount of warmth, are two of the key considerations when choosing a filling. The fillings are - Down, Kapol or Synthetics.

- **Down:** This filling is made up of highly specialised insulating feathers, normally from ducks or geese.
- **Kapol:** The fibre is light, very buoyant, resilient, highly flammable and resistant to water. It cannot be spun but is used as an alternative to down as filling.
- **Synthetic:** This term encompasses a whole range of sleeping bag fillings made from synthetic fibres. They range from simple hollow fibres to complex fibres which are designed to mimic the structure of down. Ultra-holofil or polyfil is the most commonly used material. Synthetic fillings tend to cost less than down, but they last for a shorter time.

Key machinery manufacturers/suppliers in India

The following machines are required for the manufacture of Sleeping bags.

- Teasing machine for opening / cleaning for kapok
- Foot operated / power Driven Heavy Duty sewing machine for stitching.
- Power Driven K-45 Heavy duty machines for quilting

These machines are available locally.

Quality Control and standards

The following tests and equipments are required to determine the quality of the sleeping bags**.**

- Tensile Testing machine for measurement of breaking strength.
- Testing facilities for Ends/ picks per dm.
- Beesley' Balance for count of yarn.
- Testing facilities for cone test.
- Bundesman water Repellency Equipment.
- pH Meter
- Soxlet Apparatus.
- Facility for Shrinkage Test.
- Colour fastness to washing test.
- Buoyancy Test.
- Oven with Time & Temperature control.
- Sample Conditioning Chamber.
- Colour fastness test.

The relevant Indian standards are IS 8991: 1978, JSS-8465-25:1997.

Sports nets

Sports nets are used in various sports like Badminton, Football, Basket ball, Volleyball, Tennis, Handball, etc. Nets are also used by cricket players in practices areas.

Product description

The typical specifications of the various kinds of sports nets are given in the table below:-

Product features	Twine Size	Colour	Mesh opening size	Dimensions	Side & Bottom	Material of construction
Badminton nets	0.75mm	Black	20mm	24X2.5 ft	Black PVC tape (width 20 mm + 20 mm)	HDPE, P.P., Cotton & Nylon
Tennis Nets	3.5mm	-	45mm	42 ft x 4 Ft	Black vinyl coated fabric (width = 63mm + 63mm)	HDPE , UV heated-Machine knotted
Volley Ball Nets	3 to 4 mm	-	100 mm	9.5 Mtr x 1 Mtr	PVC coated fabric	HDPE, P.P., Nylon
Football Nets / Soccer Goal Nets	7 to 10mm	-	5 inch	24 x 8 x 6ft	-	HDPE, P.P., Nylon
Handball Nets	-	-	4 inch	2 x 3 x 1 mtr	-	HDPE & P.P.
Cricket nets	-	-	2 to 3 inches	100 x 10ft, 100 x 12ft, 100 x 15ft	-	HDPE & P.P.

The sports nets have an average GSM of 400 and typically cost Rs 250 per square metre.

Market dynamics and key growth drivers

The nets used in cricket, football and badminton account for majority of the domestic consumption. The market for sports nets is driven by the development of sports in the country. In India, the investments in sports are very low as compared to other countries. Sports are regarded more as a leisure activity. For instance, it is common to find people playing football with makeshift goals or goal posts sans the nets. Also, the popularity of various sports is skewed in the favour of cricket where nets are required only for practice sessions.

The end customers include various schools, colleges, universities, sports clubs and individuals. The sports nets are not purchased centrally by Sports Authority of India (SAI) as these are low cost items. The regional centres of SAI purchase the sports nets.

The specifications for various nets are adhered to only in the case of institutional buying. Smaller sports clubs and individuals tend to base their purchase decision more on the cost factor. The replacement frequency of sports nets is also very high. The sports nets are used for a number of years with some repairs with out being replaced.

The key demand drivers for the sporting nets are the national and international tournaments. The likely increase in sports infrastructure, increasing popularity of the sports like football and hockey and the international tournaments like the commonwealth games etc being organized in the country augur well for the industry. The demand is likely to grow at the rate of 6 % year on year over the next 5 years.

Key manufacturers

Garware Wall Ropes and Kwality Nets are the largest manufacturers of sporting nets in India.

Garware Wall Ropes is the largest player in the nettings market with a capacity of 6,970 MT of nettings *(Source: Capitaline)* of which the capacity of fishing nets is around 5,000 MT. The company manufactured 6,133 MT of nettings in 2007-08.

Kwality Nets Manufacturing Co. is one of the major producers of sports nets with an installed capacity of 0.72 million sq meters/annum for all types of nets including safety nets, bird protection nets, fishing nets, mosquito nets, agro shade nets, packaging nets and other nets. In 2007–08, the company had a capacity of 200,000 square meters of sports nets.

The production details of the key players manufacturing sports nets are as given below:-

Manufacturer	Year	Production Quantity	Sales Value	Installed capacity
Garware Wall Ropes*	2007-08	6,133 MT	Rs 146.91 crore	6,970 MT
Kwality Nets**	2007-08			2 lakh sq m

**The revenues of only the nets is given here which includes sporting nets.*

*** The company manufactures other kind of nets also. The capacity given here is only for sport nets.*

Source: Capitaline, Annual reports, Industry survey

Market size and future forecast

The current and future forecast of sports nets market size is given below:-

Sports nets	2007-08	2012-13
Sports nets Quantity	80 MT	107 MT
Sports nets Value	Rs 5 crore approx	Rs 6.7 crore approx

Source: Industry survey, IMaCS Analysis

The domestic usage of sports nets is expected to increase from 80 MT in 2007-08 to around 107 MT by 2012-13. No inflationary increase has been assumed for the price of these products. In value terms, the market size of the sports nets in India is expected to increase from Rs 5 crore in 2007-08 to around Rs 6.7 crore by 2012-13 growing at around 6 per cent per annum.

Imports & Exports of sports nets

The quantum of imports for sports nets is not significant as per discussions with the industry players as well as analysis of imports data.

The estimated export figures for sports nets are as given below:-

HS Code	Description	Exports Quantity	Exports (in Rs crore)
		2007-08(E)	2007-08(E)
56075090, 56081110	Sports nets		**Approx. Rs 1 crore**
95069960	Sports nets	**Around 4 lakh nos.**	**Approx. Rs 12 crore**

Source: DGCIS, IMaCS Analysis

The sport nets are primarily exported to USA, Finland & Belgium with around 70-80% share. The other export destinations are Denmark, Caribbean, UK, Netherlands, Kenya, Newzealand, Switzerland, Sri Lanka, Sweden, etc. Sports nets exports are expected to grow at a rate of 6% year on year to reach a level of 17.4% in 2012-13.

Raw materials

Sports nets are made of HDPE, PP or nylon. HDPE is the most widely used material for making sports nets. The Mesh opening can be square or hexagonal depending upon the end use requirements. The bulky nets like football and cricket nets are packaged in the form of rolls.

Quality Control and standards in India / other countries

The standards for different sports are governed by their respective governing bodies. There are no relevant standards for practice nets used in cricket.

Sport shoes components

Product characteristics

Sports footwear is used while playing outdoor sports like football, cricket, hockey, tennis, etc. These shoes are also used for running / jogging and as casual wear. In India, most of the demand for sports shoes is from the casual wear segment.

The specifications of the sports shoes vary with the end user requirements. For example, the football shoes are black in colour with coloured strips on the quarters. The tongue and the quarter portions have foam backed cloth lining. The sole of either rubber or leather is then attached by hand-sewn process. The rubber soles have grooves or leather studs for better hold on the ground. In case of cricket shoes, the upper is made from either white chrome or from nubuck leather. The lining of tongue is made of foam. The sole of the cricket boot is made of rubber or of leather.

The technical textile components typically used in the sport shoes are as following:

- Shoe uppers made of PU/PVC coated/Laminated fabrics
- Linings on the counters and below the shoe uppers
- Others including non woven insoles, laces, tapes, labels, elastics, sandwiched meshes, etc

The shoe upper material should have uniform thickness and colour and should possess water-proofing property. The desired characteristics of the shoe uppers are

- Breathability
- Dimensional flexibility
- Colour fastness
- Light weight
- Durability

The shoe uppers and linings account for 90-95 % of the technical textile components used.

Market dynamics and key growth drivers

The Indian shoe manufacturing industry is concentrated in the small scale and cottage sectors. The manufacturers are concentrated in Agra, Delhi, Vellore, etc.

The shoe manufacturers source the requirement of laminated fabric from the laminators and / or suppliers/dealers. The laminators source the base fabrics from the fabric manufacturers and laminate them

with PU or PVC. Polyester is the most widely used fabric for sport shoes. These companies also supply the lining material required.

The key demand drivers for this industry are:-

- Increasing trend of usage of the sports shoes as casual wear
- Rising disposable incomes
- Sport shoes being perceived as status symbols
- Popularity of various sports
- Increasing health awareness

Market size and consumption norms

The key assumptions for assessment of the technical textiles usage in the footwear industry are:-

	Value
Footwear domestic market	2200 million pairs
Footwear exports	143 million pairs
Closed footwear domestic market	1100 million pairs
Share of sports footwear in domestic market	30%
Share of sports footwear in exports	40%
Total sports shoes market	387 million pairs
Laminated fabric required per pair for shoe uppers	0.23 sq m
Average price of laminated fabric per square metre	Rs 180
Lining material required per pair	0.2 sq m
Average price of lining fabric per square metre	Rs 85

Source: Industry survey, IMaCS Analysis

The growth rate of the sports shoe industry is estimated at 11% based on the discussions with the industry players. Inflationary increase of 5 % per annum has been assumed for the price of the fabric.

Domestic Market size	2007-08		2012-13	
	Quantity	Value	Quantity	Value
Sport shoes	387 million pairs		652 million pairs	
Shoe upper fabric	89 million sq m	Rs 1,600 crore	150 million sq m	Rs 2,700 crore
Lining fabric	77 million sq m	Rs 650 crore	130 million sq m	Rs 1,110 crore

The domestic usage of technical textiles fabric in the sports shoes industry is expected to increase from 166 million sq m in 2007-08 to around 280 million sq m by 2012-13. No inflationary increase has been

assumed for the price of these products. In value terms, the market size of the sports nets in India is expected to increase from Rs 2,250 crore in 2007-08 to around Rs 3,810 crore by 2012-13.

Key manufacturers of sports footwear

The Indian shoe manufacturing industry is concentrated in the small scale and cottage sectors. The manufacturers are concentrated in Agra, Delhi, Vellore, etc. The major players in the Indian footwear market are Reebok, Adidas, Nike, Bata, Liberty, Lakhani, Relaxo, etc.

The major manufacturers of the technical textile components of the shoes are given below:-

Company	Products	Year	Units	Capacity	Production	Capacity utilisation	Sales (Rs crore)
Jasch Industries Ltd	PU/PVC Leather Cloth	2006-07	Million metres	36	1.593	44.25%	19.24
		2007-08	Million metres	36	1.87	51.94%	22.28
	Non Woven & Coated Fabrics	2006-07	Million metres	-	0.163	-	1.26
		2007-08	Million metres	-	0.23	-	3.82
Mayur Uniquoters Ltd	Coated Man-made Fabric	2006-07	Million metres	-	5.3	-	110.02
	Coated Man-made Fabric	2007-08	Million metres	-	6.96	-	76.08
	Non Woven Fabric	2006-07	Million metres	-	0.166	-	4.58
		2007-08	Million metres	-	0.368	-	11.34
	Non-Woven Fabric-Coated	2006-07	Million metres	-	0.306	-	5.57
		2007-08	Million metres	-	0.323	-	5.79
	PVC/PU Sheet	2006-07	Million metres	-	0.102	-	1.12
		2007-08	Million metres	-	0.176	-	1.97
Wilhelm Textile Industries Pvt. Ltd	Interlinings	2007-08	Million metres	3.0	-	-	-
Siddh Lamifab Pvt. Ltd.	laminated fabrics	2007-08	Million metres	4.95	-	-	-
Northern India Leather Cloth Mfg. Co. Ltd	PVC Leather Cloth	2007-08	Million metres	4.32	-	-	-
Ridhi Sidhi laminators	Laminated fabrics	2007-08	Million metres	4.29	-	-	-

Imports & Exports of sports footwear fabrics

The estimated import figures for sports footwear fabrics are as given below:-

HS Code	Description	Imports Quantity	Imports (in Rs crore)
		2007-08(E)	2007-08(E)
59039010, 59039090, 59031090	PU Synthetic leather / Synthetic lining for footwear	**0.8 million meters**	**Around Rs 12 crore**
56039400, 56031400, 56031300, 56039300	Non-woven insole & Lining material for footwear	**1 million meters**	**Around Rs 8 crore**

Source: IBIS, IMaCS Analysis

Under the HS code 59X, China & Italy account for around 25% share (each) of the imports of Indian footwear components followed by Germany with around 15% share and Taiwan with 10% share. France, Hong Kong, Finland, UK & Portugal account for the remaining 20-25% share of Indian imports.

Under the HS code 56X, China accounts for around 30-40% share of the imports of Indian footwear components followed by Spain, Italy & Taiwan with around 10% share each and Germany, Japan & Hong Kong with 5-10% share each. UK, Korea, Brazil, Vietnam, France, Austria and Hungary account for the remaining share of Indian imports.

The exports of sports footwear components from India are negligible.

Raw materials

PVC and PU fabrics are the most widely used material for sport shoes and are also known as artificial leather. PU fabrics have the advantage of higher breathability over PVC fabrics.

Quality Control and standards in India / other countries

There are no relevant BIS codes for laminated cloth used in sport shoes. Other BIS standards relevant to sport shoes are given in the following table:-

BIS code	Description
IS 13800: 1993	Shoe sizes - Method of marking

The fabrics are subjected to the following tests for various physical properties.

Test	Shoe component
Martindale abrasion test	Uppers and linings
Colour migration test	Uppers
Tensile strength	Uppers
Tear test	Linings

These tests can be conducted at Footwear Design and development Institute (FDDI), Noida.

Tents

Tents are portable shelter made of cloth, supported by one or more poles and stretched tight by cords attached to pegs driven into the ground. Tents can be classified based on application, design and construction. Based on application the tents can be classified into four main categories –

- Defence/Army tents,
- Disaster relief tents,
- Camping tents and
- Others (Party/wedding tents, Resort tents, Exhibition tents etc)

Based on design the tents can be classified as -

- **Frame Tents**: Frame tents are supported by a tall frame, giving it nearly perpendicular sides and standing headroom throughout. The frame tents are in the silhouette of the letter A.
- **Dome tents:** Dome tent has the ideal shape for adverse weather conditions. Its sloping profile is aerodynamic, and sheds wind and rain better than any other design.
- **Hoop tents:** The hoop tent design consists of strong and flexible poles. These tents are more suitable for camping and expedition.
- **Tunnel tents**: These are constructed of two or more hoop along with its length

Tents can be classified into three categories based on construction -

- **Single-fly:** Tents with one layer of fabric
- **Double-fly:** Tents with one layer of fabric and a fly-sheet
- **Winterized:** Tents which usually have one layer of fabric, a lining (usually of cotton), a fly sheet, and a hole for a stove-pipe

Product characteristics

Tents are generally made of four different fabrics.

- Outer tent and flysheet: fabric cover pitched over a tent to give extra protection against bad weather
- Inner tent and lining
- Valances/mud flaps
- Ground sheet: a waterproof sheet spread on the ground inside a tent

An ideal tent fabric should have few or all of the below mentioned properties depending on the application:

- Waterproof
- Breathable
- Lightweight
- Strength
- UV protection
- Rot proof, Persistence & Decolorize Resistance
- Flame retardant
- Durable

The product characteristics depend on the application of the tent. The details of dimension, weight and material used for various varieties of tents is given in Annexure 4.

The wedding industry also has a huge demand for tents which is met through "shamiyana" tents. The shamiyana fabrics are typically made of cotton fabric. Their main functionality is to provide shade, thus, these tents need not be water resistant. These fabrics are made from grey cloth which is dyed and printed. The shamiyana fabric is available in different designs made by appliqué technique[2].

Market dynamics and key growth drivers

The demand from the Defence, Para military forces and other government agencies like Geological Survey of India, Railways etc account for majority of the demand both in volume and value terms. Various types of tents are required by the government agencies for housing of defense personnel, stores, temporary hospitals etc. Many of the government agencies route their procurement through Director General of Supplies and Disposables (DGSND), which finalises the rate contracts with a number of tent manufacturers.

The demand for relief tents is dependent on the occurrence of natural calamities. The National Disaster Management Authority (NDMA) works in co-ordination with various state and government agencies for relief operations. Most of the requirement of tents is met by assistance from the state police forces, Defence and Para military forces. The shortage of tents is met through purchase from local markets and by alternate shelters like structure from plastic sheeting poles and rope, mud walls and plastic sheeting for

[2] Appliqué refers to a needlework technique in which pieces of fabric, embroidery or other materials are sewn onto another piece of fabric to create designs.

roof. Relief tents are also purchased by organizations like ICRC, IFRC, UNHCR, IOM, UNICEF, MSF, World Vision etc.

The domestic market for camping tents is in a nascent stage. The increasing popularity of outdoor adventurous sports like trekking, camping etc augurs well for the industry. However, the customers are very cost conscious when selecting a camping tent. The export market holds a better potential for the time being.

The other applications include tents like wedding tents, resort tents, circus tents, exhibition tents etc. The business model of wedding tents is quite different from other tents. The tents are rented out for the purpose of various parties by service providers who offer a host of other services like furniture, catering etc. The life of tent fabric is dependent on the usage and varies from 8 to 10 years. This industry is facing threat from increasing number of hotels and banquet halls.

Market size of tents and future forecast

The market size of the Defence/Para military tents (also known as '*choldhari*' tents) depends on government spending and the requirement from various armed forces. The domestic market for these tents is estimated based on the tenders floated by various government bodies and estimations by the Director General of Supplies and Disposables. The estimated withdrawal (by DGSND) of tents and accessories of tents (Tent Private MK-3, 80 Kg MK-3, store tents) for the year 2008-09 is Rs 7.3 crore. The demand for tents is inclusive of the spare parts like fly sheets.

The demand for tents from the government sector was 582 MT in 2007 – 08 valued at Rs. 15 crore The State government of Rajasthan was one of the largest consumers of tents in 2007-08 with estimated consumption of over Rs. 41 lakh. The police department of Andhra Pradesh consumed 1200 tents in the same year. The demand from the government sector is estimated to grow at the rate of 5% based on our discussions with the industry players and tenders in the recent past. The market for tents is estimated to increase to 743 MT by 2012 -13 thus, resulting in 595MT of demand for tent fabric. The market potential for the tent fabric would be Rs 15.35 crore in 2012-13.

The demand for tents from the private sector depends on the number of social functions, popularity of adventurous sports etc. The increasing spending on social functions is an encouraging factor for the

industry which is also facing competition from hotels, banquet halls etc. The demand is estimated to have a growth rate of 7 %.

Based on industry survey, the demand is estimated to be 1,359 MT in 2007-08 valued at Rs 34 crore. This translates into 1,085 MT of demand for fabric valued at Rs 27 crore. The market for tents in the private sector is estimated to increase to 1,734 MT by 2012-13 thus, resulting in 1,388 MT of demand for the tent fabric. The market potential for the tent fabric would be Rs 34.45 crore in 2012–13. No inflationary increase has been assumed for the price of these products.

Tents Domestic Market size	2007-08 Value (Rs crore)	 Quantity (MT)	2012-13 Value (Rs crore)	 Quantity (MT)
Demand from government sector	Rs 15 crore	582 MT	Rs 19.15 crore	743 MT
Technical Textile Component	Rs 12 crore	465 MT	Rs 15.35 crore	595 MT
Demand from private sector (Inclusive of demand for shamiyana tents)	Rs 34 crore	1359 MT	Rs 43.4 crore	1,734 MT
Technical Textile Component	Rs 27 crore	1085 MT	Rs 34.45 crore	1,383 MT

Source: Industry survey, IMaCS Analysis

Key manufacturers of the product

Tent fabricators are mostly small scale industries. Most of the tent suppliers have tarpaulins in their product line and fabricate the tents as and when they receive the orders. M Kumar Udyog is a leading supplier of tents located in Kanpur with a capacity of 36,000 tents per annum. The company has four manufacturing facilities and 700 high-speed and heavy-duty sewing machines. The other manufacturers are

- Madhur Enterprises Pvt. Ltd. (Kanpur)
- Tirupati Taxco Product Pvt. Ltd (Kanpur)
- Industrial Enterprisers (Kanpur)
- Manmohan Commercials Ltd (Kanpur),
- Standard Gram Udyog Sansthan (Kanpur),
- Standard Niwar Mills,
- A.V.R. Enterprises,

- Maheshwari Textile Mills (Bikaner)
- Abinitio Overseas Inc (Delhi)
- Daisy Trading Corporation (Mumbai)
- Bansal Industries (Delhi)

These manufacturers are registered with the Director General of supplies and disposables (DGSND).

Cotton and Polyester cotton blended canvas is the most widely used fabric for tents. Gokak mills is the leading manufacturer of cotton canvas. Other manufacturers of cotton canvas are Bharat Textiles, BKS textiles Coimbatore, Giri Textiles (Bangalore) and Agilandavari Textile Mills (Coimbatore).

Manufacturer	Year	Quantity*	Value (Rs crore)	Unit Price	Installed capacity
Gokak Mills	2007-08	27.2 lakh m	20.71	Rs 76.08/m	NA
Bharat Textiles & proofing industries Limited	2002-03	8.11 lakh m	5.15	Rs 63.46/m	NA

**The Canvas cloth is used for other applications like footwear, bags, tarpaulins, etc.*

Imports & Exports of TT product

The estimated import of tents and tent fabrics is as given below

HS Code	Description	Imports (Rs crore)		Import Quantity (MT)	
		2006-07	2007-08(E)	2006-07	2007-08(E)
63062100	Tents of cotton	0.0	0.0	0.01	0.0
63062200	Tents of synthetic fibres	0.31	2.08	14.60	14.93
63062910	Tents of jute	0.08	0.0	0.35	0.0
63062990	Other tents	0.42	0.89	8.51	50.01
54071012	Unbleached tent fabrics *	0.01	0.0	0.13	0.0
Total Imports		**0.8**	**3.0**	**23.6**	**64.9**

Source:DGCIS, IMaCS Analysis

**The quantity is approximated into tonnes by assuming a GSM of 200*

Tents are imported from China, Hong Kong, Malaysia, and Denmark etc. The imports from China account for almost 50% of the total.

The estimated export of tents and tent fabrics is as given below:

HS Code	Description	Exports (in Rs crore)		Exports Quantity (MT)	
		2006-07	2007-08(E)	2006-07	2007-08(E)
63062100	TENTS OF COTTON	2.41	1.49	96.35	69.53
63062200	TENTS OF SYNTHETIC FIBRES	2.72	0.16	385.48	7.40
63062990	OTHER TENTS	7.25	7.72	387.35	347.76
54071012	UNBLECHD TENT FABRICS *	0.55	1.70	17.69	73.69
54071022	BLECHD TENT FBRCS*	0.00	0.01	0.00	0.19
54071032	DYED TENT FABRICS *	0.67	0.01	348.32	140.35
54071042	PRINTED TENT FBRCS*	0.01	0.00	0.20	0.00
54071092	OTHR TENT FBRCS *	0.00	0.002	0.00	0.06
Total Exports		**13.6**	**11.1**	**1235.4**	**638.9**

Source:DGCIS, IMaCS Analysis

**The quantity is approximated into tonnes by assuming a GSM of 200*

The Indian made tents are exported to Malaysia, Australia, Luxembourg, UK, France, Germany, and Italy. These countries account for about 75 % of the exports. These exports in the year 2012-13 are estimated to be around Rs 12.1 crore.

Govt. of India recognized 2Star export house exports fire retardant tents for defence applications. It has a production of 50,000 linear metres per month of fire retardant fabrics.

Type of Raw materials

The tents are generally are made of the following fabrics:

- Cotton canvas
- Polyester/Poly cotton
- Jute
- Nylon/Ripstop nylon

Pure cotton canvas and polyester cotton blended canvas (Polyester/cotton 30/70 or 50/50) are the most widely used material for making tents. Canvas cloths of 8-15 Oz per square yard are generally used for tents.

The camping tents are generally made of synthetic materials as they have a higher strength to weight ratio. Nylon is a very popular material because of its excellent strength, abrasion resistance, ease of drying, flexibility and resistance to attack by insects and micro-organisms. The fabric is woven ripstop when rip proof tents are desired. Nylon, which is also used in the hot-air ballooning and parachute industries, is primarily utilized in fabrication of dome tents and ridge tents.

Water proofing is commonly imparted by a coating of paraffin emulsion and alum acetate. Synthetic fabrics like nylon are coated with one or more polyurethane coatings in order to provide waterproofing. The flame retardant tents are generally made of polyester and have a vinyl coating.

Besides the outer part of tent, fabric is also used as tent lining and ground sheets. The standard lining for a canvas tent is a "desouti" or cotton lining. This is generally made from 20x20 or 16x16 denier cotton yarn with 32 threads per inch in the warp and 32 threads per square inch in the weft. Lining of non-woven synthetic insulation layer of 4mm terrylene weighing 500 GSM is reported to be used by some manufacturers in western countries.

Groundsheets are either separate from an inner tent or sewn in as an integral part of the tent giving wind and water proofing. The ground sheets are made of LDPE coated woven polypropylene (175-200 gsm), PVC coated canvas fabric (500 gsm) or Waxed cotton canvas fabric (440 gsm).

Key machinery manufacturers/suppliers in India

The leading manufacturers of canvas are reported to use rapier looms of Sulzer (Sultex Limited, Switzerland). Itema Weaving (India) Private Limited, Mumbai is the supplier of the same. Other domestic manufacturers/suppliers of rapier looms:

Company	City
Aalidhra Textile Engineers Ltd.	Surat
Alidhra Weavetech Pvt.Ltd.	Surat
Amritlakshmi Machine Works	Mumbai
Bianco Textile Solutions (I) Pvt.Ltd.	Mumbai
Friends Engineering Works	Panipat
Himson Textile Engineering Industries Pvt. Ltd.,	Surat
Lakshmi Automatic Loom Works Limited	Coimbatore
Himson Engineering Pvt. Ltd.	Surat
Batavia Exporters	Bangalore
Lifebond Machines Pvt. Ltd.	Surat

Source: Textile Machinery Manufacturers' Association of India

The domestic manufacturers/suppliers of coating lines are:

Coating Machines/coating lines	
Company	**City**
A.T.E. Private. Limited	Mumbai
Harish Enterprise Pvt. Limited	Umbergaon
Kusters Calico Machinery Limited	Mumbai
Shreeji Engineering & Marketing Services	Ahmedabad
Stovec Industries Limited	Ahmedabad

Source: Textile Machinery Manufacturers' Association of India

Quality Control and standards in India / other countries

The quality standards applicable to the tent fabrics are:

Code	**Description**
IS 7609: 1988	General requirements for tents
IS 12989: 2000	Camping Tents
IS 12990: 1990	Camping tents - Requirements and test methods - Type L (Lightweight tents)
IS 12991: 2005	Textiles - Camping Tents and Caravan Awnings - Vocabulary and List of Equivalent Terms
IS 14445: 1997	Textiles - Fabrics for awnings and camping tents - Specification.
JSS: 8340-38: 2002 (Amds No 2)	Tent Extendable Frame Supported
JSRL 8340-01: 2000 (REV No. 1)	Tents
JSRL 8340-02:2004 (REV No. 1):	Poles Tent

Swimwear

A swimsuit, bathing suit or swimming costume is an item of clothing designed to be worn while participating in water sports and activities such as swimming, water polo, diving, surfing, water skiing.

Men's swimsuit styles are swimming trunks such as boardshorts, jammers, speedo-style briefs, thongs, g-strings or bikini. Women's swimsuits are generally either one-pieces, bikinis or thongs. The most recent innovation is the burqini, a more modest garment designed for Muslim women; it covers the whole body and head (but not face) in a manner similar to a diver's wetsuit.

Special swimsuits for competitive swimming, designed to reduce skin drag. For some kinds of swimming and diving, special bodysuits called 'diveskins' are worn. Most competitive swimmers also wear special swimsuits including partial and full bodysuits, racerback styles, jammers and racing briefs to assist their glide through the water and gain speed advantages

Market dynamics and key growth drivers

The market for high performance swimwear totally depends upon the popularity of competitive swimming in the country. Competitive swimming can only be promoted if there is adequate swimming infrastructure making the facility available to majority at affordable rates. In India the penetration of swimming pools is very low and even in that there are hardly any temperature maintained or heated swimming pools.

Swimming in India is still to a large extent considered as a leisure activity rather than a sporting activity. Majority of the population do not know how to swim, the ratio is especially worse in the female population. Most of the people who swim do so in natural water reserves like rivers or lakes without the use of any proper swimming gear or swimsuit. Swimming in a pool is still considered a luxury accessible only to a small percentage of the total population.

Modern real estate in India is developing a facility of swimming pool in most of their new construction plans. This should create more awareness about the activity and increase interest and participation in the same. However such kind of swimming does not involve the requirement for high performance swimwear. Competitive swimming will take at least another five years to become a little popular in the country. The high performance swimwear category being very expensive will only be purchased by serious enthusiasts the number for which still is very miniscule. This is expected to grow only at an average of about 5% year on year for the next five years.

Product Characteristics

Suits less than 1.5 inches wide at the hips, sometimes called bikinis, are less common for sporting purposes and, unlike the racing style, are not designed specifically for drag reduction. Bikinis are most often worn for recreation, fashion, and sun tanning where minimal suit coverage is preferred.

Unlike regular swimsuits, which are designed mainly for the physical appearances, competitive swimwear is manufactured for the purpose of aiding athletes in swim competitions. They reduce friction and drag in the water, increasing the efficiency of the swimmer's forward motion. The tight fits allow for easy movement and are said to reduce muscle vibration, thus reducing drag. In an effort to improve the effectiveness of the swimsuits, engineers have taken to designing them to replicate the skin of sea based animals, sharks in particular.

The kneeskin is similar in design to the full bodyskin absent the leggings beyond the knee. It also resembles a "shortie" style wetsuit only made of drag-reducing fabric instead of neoprene and commonly features a zippered back. The bodyskin resembles the design of a diveskin, commonly used by snorkelers and scuba divers for warm weather climates.

Raw Material

Swimsuit manufacturers like to introduce new swimsuits made from different types of fabric into the market in order to produce unique swimsuit. The key fabrics used for swimsuit manufacturing are:

- Cotton: Swimsuits and bikinis made entirely from cotton are becoming popular. While cotton swimsuits are fashionable, they do not always provide the best fit or the greatest overall longevity in a swimsuit. Cotton swimsuits are not known for staying in place on the body, and they have a tendency to ride up and bunch (an undesirable characteristic in any swimsuit). As a fabric, cotton does not stand up long to the destructive nature of chlorine and sun. It is likely that cotton swimsuit will fade fairly quickly, especially if swimming in chlorinated pools.
- Spandex/Lycra: Most swimsuits contain some percentage of spandex or Lycra in their fabric. These fabrics provide the stretchy fit that allows a swimsuit to stay in place on the body. Generally, the higher the percentage of spandex or Lycra in the swimsuit material, the more the swimsuit is designed for more serious or competitive swimming. While high-spandex materials cover the body well and smooth out any unsightly body bulges, they can become tight and uncomfortable. Also, spandex has a tendency to run if snagged on the side of a concrete pool or on a wooden lounge chair. Suits made from spandex and provide little thermal protection, but they do protect the skin from stings and

abrasion. Because high-spandex swimsuits are designed for use in serious and competitive swimming pursuits, however, they are often treated for chlorine resistance. While this chlorine resistance does not provide complete protection from chlorine, it does significantly lengthen the lifetime of the swimsuit.

- Metallic Overlay: Swimsuits with metallic overlay sewn into the fabric are designed to be fashionable and not to hold up and endure extensive swimming. The overlay is guaranteed to fray and dull after only a short amount of time.
- Velvet: Swimsuits made from velvet and other types of crushed fabrics have become more popular in recent years. A velvet swimsuit is definitely nice to look at and to touch, but it is not best for either swimsuit fit or longevity. When wet, velvet has a tendency to soak up water, and can become quite heavy and sodden. This heaviness causes a velvet swimsuit to sag away from the body, losing the tight fit that is so necessary in a swimsuit. Also, velvet is not a fabric meant to come in close contact with chlorine. Like swimsuits with metallic overlay, velvet swimsuits are much more valuable for their uniqueness and style factors than they are for their longevity.

Swim briefs are most often made of a nylon and spandex (Lycra) composite, while some longer lasting suits are made from polyester and still others from other materials. Most swim briefs have a beige or white front lining made of a similar fabric.

Kneeskins and bodyskins are normally made of technologically advanced lycra-based fabrics designed to hug the body tightly and provide increased speed and decreased drag resistance in the water.

The LZR Racer Suit is a line of high-end swim suits manufactured by Speedo using a high-technology swimwear fabric composed of woven elastane-nylon and polyurethane.

The current and future forecast of Swimwear consumption is given below:-

The size of high performance swimwear in India is very small. The current consumption of the same in 2007-08 is under Rs 1 crore at only Rs 84 lakhs. It is expected to grow at a CAGR of 5% for the next five years and reach a size of Rs. 1.08 crore which is also not a significant number.

Market size of Swimwear	2007-08	2012-13
Quantity	1050 pieces	1350 pieces
Value	Rs 0.84 crore	Rs 1.08 crore

Source: Industry survey, IMaCS Analysis

Key manufacturers of Swimwear

The manufacturing of swimwear in India is highly unorganized with various indigenous players spread across the country. The production of swimwear in India does not consist of the high performance swimwear segment and comprises mainly of the fashion swimwear only.

Imports & Exports of Swimwear

There are high imports of swimwear from India but these are more fashion swimwear than high performance swimwear. The very small market of high performance swimwear in India is met through imports.

The estimated import figures for swimwear are as given below:-

HS Code	Description	Imports Quantity	Imports (in Rs crore)
		2007-08(E)	2007-08(E)
61123100, 61123920/90, 61124100, 61124910/20/90, 62111100, 62111200	Swimwear	142.07 thousand numbers	**1.8616**

Source: DGCIS, IMaCS Analysis

In chapter 61 over 80% of the swimwear imports are from China. Rest takes place from various countries like Italy, France, Sweden, UK, Spain and Tunisia. Under Chapter 62 around 30% of the imports are from China. Around 18% of imports are from UK, 13% from Cambodia, 12% from Italy and 8% from Hong Kong. The imports from European countries are mainly higher in value than others.

Exports of Swimwear

The estimated export figures for swimwear are as given below:-

HS Code	Description	Exports Quantity	Exports (in Rs crore)
		2007-08(E)	**2007-08(E)**
61123100, 61123990, 61124100, 61124910/90, 62111100, 62111200	Swimwear*	2447.36 thousand numbers	**54.6228**

Source: DGCIS, IMaCS Analysis

** This primarily consists of fashion swimwear with hardly any share of high performance swimwear*

In chapter 61 the maximum exports are to USA, Spain, UK and Italy. Canada, Ireland and UAE also have small share. In chapter 62 around 37% of exports are to USA, 15% to France and UK each and around 5% to Italy.

Key importers

The famous international brand Speedo, who has the highest share in swimwear internationally, is the highest importer high performance swimwear in India. To some extent high performance swimwear is also imported by other international brands like Nike, Adidas, Reebok and Puma.

BUILDTECH

The Buildtech segment comprises of textiles or composite materials used in the construction of permanent and temporary buildings as well as structures. The products covered under Buildtech are given below:-

- Architectural membranes
- Hoardings & signages
- Cotton canvas Tarpaulins
- HDPE Tarpaulins
- Awnings & canopies
- Scaffolding nets
- Floor & wall coverings

The market size of the Buildtech segment has been estimated at Rs 1,726 crore. HDPE and Cotton canvas tarpaulins account for 65% of the Buildtech market size. The HDPE tarpaulins are valued at Rs 650 crore and account for around 40% of the segment share. HDPE Tarpaulins are likely to achieve growth rate in excess of 15% to reach Rs 1,330 crore by 2012-13.

The cotton canvas tarpaulin is the second largest product in this segment valued at Rs 457 crore with a share of around 25%. However, the demand of cotton canvas tarpaulins is expected to decline because of substitution by HDPE tarpaulins.

The Floor & wall coverings are rapidly growing technical textiles products accounting for around 25% of the segment value. They are estimated to grow at around 10% year on year from Rs 425 crore to Rs 685 crore.

The flex market (hoardings & signages) is estimated to grow from around 95 million square meters valued at Rs. 175 crore in 2007-08 to around 140 million square meters by 2012 –13 (growing at the rate of around 8% year on year) valued at Rs 258 crore.

Architectural membranes are expected to grow at a CAGR of 20% to reach a size of Rs 40 crore by 2012-13 from Rs 16 crore in 2007-08. Scaffolding nets and awnings and canopies account for the remaining Buildtech market with sizes of Rs 0.58 crore and Rs 2.25 crore respectively.

The Buildtech segment is estimated to grow at a CAGR of around 9% to Rs 2,655 crore by 2012-13.

Summary of the market-sizing for Buildtech

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
Architectural membranes	**Quantity**	1 million sq. m.	10 million meters	-	11 million sq. m.	27.5 million sq. m.	
	Value	Rs 1 crore	Rs 15 crore	-	Rs 16 crore	Rs 40 crore	-
Hoardings & signages	**Quantity**	4.5 million meters	90.5 million meters	-	95 million meters	140 million meters	
	Value	Rs 14 crore	Rs 161 crore	-	Rs 175 crore	Rs 258 crore	-
Cotton canvas Tarpaulins	**Quantity**	52 million sq m	9 million sq m	0.01 million sq m	61 million sq m	45 million sq m	
	Value	Rs 396 crore	Rs 66 crore	Rs 5 crore	Rs 457 crore	Rs 336 crore	Rs 5.5 crore
HDPE Tarpaulins	**Quantity**	70,000 MT	500-600 MT	400-500 MT	70,000 MT	1,13,000 MT	
	Value	Rs 650 crore	Rs 1.75 crore	Rs 1.25 crore	Rs 650 crore	Rs 1,330 crore	Rs 1.4 crore
Awnings & canopies	**Quantity**	0.134 million sq m	0.016 million sq m	-	0.15 million sq. m.	0.3 million sq. m.	
	Value	Rs 1.75 crore	Rs 0.5 crore	-	Rs 2.25 crore	Rs 4.5 crore	-
Scaffolding nets	**Quantity**	0.4 million sq m	-	-	0.4 million sq m	0.8 million sq m	
	Value	Rs 0.58 crore	-	-	Rs 0.58 crore	Rs 1.17 crore	-
Floor & wall coverings	**Quantity**	75 million sq m	7 million sq m	15 million sq m	67 million sq m	108 million sq m	
	Value	Rs 750 crore	Rs 100 crore	Rs 425 crore	Rs 425 crore	Rs 685 crore	Rs 570 crore
TOTAL	**Value**	**Rs 1,813 crore**	**Rs 344 crore**	**Rs 431 crore**	**Rs 1,726 crore**	**Rs 2,655 crore**	**Rs 577 crore**

As per ECTT report, the potential market sizing for 2007-08 was as given below:-

Market size (ECTT report)		2001-02	2007-08 (P)
Hoardings & signages	**Quantity**	5 million meters	20 million meters
	Value	Rs 50 crore	Rs 200 crore
Tarpaulins	**Quantity**		
	Value	Rs 1,000 crore	Rs 1,000 crore
Awnings & canopies	**Quantity**	45,454 sq. meters	1,36,363 sq. meters
	Value	Rs 1 crore	Rs 3 crore
Scaffolding nets	**Quantity**	40,000 sq. m.	90,000 sq. m.
	Value	Rs 0.1 crore	Rs 0.25 crore
TOTAL	**Value**	**Rs 1,051.1 crore**	**Rs 1,503.25 crore**

The key impediments to growth of Buildtech products are:-

1. Low awareness level of buildtech products
2. The usage of buildtech products at construction sites is not mandatory. For example, the Indian Building Laws do not stipulate the use of scaffolding nets at construction sites.
3. The architectural membrane market has huge potential, however, the demand for the products is low because the Indian manufacturers are unable to supply desired product quality
4. The hoarding and signage industry is facing tough price competition from Chinese imports
5. The technical know-how to manufacture the awnings and canopies is not available in India. Hence, these products have to be imported.

Architectural Membranes

Architectural membranes are relatively new construction materials being used in India. The applications of architectural membranes include construction of permanent and semi-permanent structures such as car park covers, cafes, walkways, hotels, outdoor entertainment areas, pool surrounds, greenhouses, airports, stadiums, sports halls, exhibitions and display halls, storage bases for industrial and military supplies and any venues that require protection against harsh UV rays, heat, glare, rain and wind. The textile structures used for construction material can be classified into the following types:

- **Clear-span structures**: These structures provide a clear space beneath the fabric, free from supporting elements. Clear span structures are less permanent than air or tensile structures however, they accommodate doors, flooring, insulation, electricity and HVAC easily as compared to tents.

- **Tension structures**: In this structure, the fabric is supported by metal pylons, tensioning cables, wooden or metal frameworks. A relatively minimal rigid support system is required for these structures since the fabric carries most of the load.

- **Air Structures**: The main components of an air supported system are the envelope (fabric), inflation system (fans), anchorage system (cables and foundation), doors and access equipment. Air pressure inside the envelope provides tensioning and maintains required configuration and stability**.**

Product characteristics

Architectural membranes are strong, energy efficient and aesthetically superior products that offer flexibility to designers and architects thus, allowing high levels of creativity. The textile material used for construction purpose is expected to be:

- Waterproof
- Fire retardant
- Resistant to deformation and extension under tension
- Impermeable to air and wind
- Resistant to abrasion and mechanical damage
- Resistant to sunlight and acid rain
- Resistant to microbial attack

Depending on application, the fabric may need to transmit or reflect different levels of light. The most widely used materials are:

- **PVC coated polyester**

  PVC coated high tenacity polyester fabric with weight ranging from 600 gsm to 1100 gsm is used for construction applications. The polyester base cloth is used because of its durability, strength and relatively low cost. The base cloth is coated with PVC to impart the color, strength and waterproof properties. PVC coating also allows adjoining panels of fabric to be seamed by high frequency welding.

  Most architectural PVC coated polyester fabrics have some sort of top-coating on their exterior surface which improves the appearance of material, extends its life and allows self cleaning of material by rain water. Different types of top-coatings include acrylic solutions, PVDF solutions and PVF film laminations.

  Acrylic topcoat: This is the most economical and most widely available finish. It gives a transparent glossy finish to the PVC. The acrylic coatings have a good resistance to UV degradation. It is a thin coating, thus, this material is easy to fabricate and repair. Acrylic top-coats give the material a ten-year lifespan depending on the ambient climatic conditions and air quality at the site where it is installed.

  Polyvinylidene fluoride topcoat: This finish offers resistance to UV degradation, atmospheric chemical attack, algae and fungal attack thus, is far superior to the acrylic topcoat. These properties result in a membrane lifespan of 15 to 20 years depending on site conditions. Like acrylic top-coats, they are highly flexible and resistant to cracking, making them easy to handle during installation. Though, owing to chemical-resistant properties of PVDF the finished top-coated material cannot be welded. The top-coating must be abraded off to effect welding which increases the cost of fabrication and involves risk.

  PVDF/PVC top-coating: This is effectively a dilution of the PVDF topcoat; the finished fabric is weldable thus, offering saving in fabrication costs. Fabrics with this coating have a life expectancy of 10 to 15 years, depending on prevailing conditions.

  Tedlar top-coating: Tedlar is the trade name for polyvinyl fluoride (PVF). This is a film-layer that is laminated to the fabric during manufacture. This results in a thicker finished fabric that is more resistant than its competitors to weather and chemical attack. It has superior self-cleaning capabilities

than the PVDF range of topcoatings and resists attack from graffiti, acid rain and bird droppings. For this reason it is frequently specified for use in highly industrialized areas, high saline coastal zones and desert environments. Having a thicker coating, it erodes at a much slower rate giving it a life expectancy of about 25 years depending on conditions.

The Tedlar film renders the PVC sheet non-weldable. This problem is overcome by butt welds. Tedlar topcoated material is comparable in price to PVDF but substantially less costly than PTFE coated glass fiber.

- **Polytetrafluoroethylene (PTFE) coated glass fabric**

  PTFE coated glass fabric is a frequently specified material due to its life expectancy of 30 years, depending on conditions. The woven fiberglass is incombustible, strong and does not undergo significant stress relaxation. The PTFE or Teflon coating is incombustible and has good self-cleaning ability.

  Fabrication of a PTFE membrane requires slow and specialized welding techniques under controlled environmental conditions. It also requires extra care in handling and packaging due to susceptibility to cracking and self-abrasion. These properties contribute to its high cost and to the need for additional tensioning hardware for the finished fabric structure. The tensioning of PTFE glass fabric is a slow process, as it requires incremental adjustment over long periods of time on site. This factor also contributes to its higher cost.

Market dynamics and key growth drivers

In India, stadiums, airports, restaurants, hotels, residential complexes and shopping malls account for majority of application of architectural membranes. According to industry experts, tensile structures are now well accepted by the architects and builders on account of their light weight, aesthetic superiority and the design flexibility offered by the product. The market for architectural membranes is at a nascent stage. The demand surged over the last two years growing at a rate of 30% on account of increased awareness about the product and booming infrastructure projects. The demand for architectural membranes is expected to further increase on account of its increasing popularity and the boom in infrastructure projects.

Market size of architectural membranes

Based on discussions with industry experts, the current market size of tensile membrane fabric is estimated at Rs. 1.1 lakh square meters valued at Rs. 16 crore. The market for tensile structures is

expected to grow on account of its increasing popularity among the architects as well as booming infrastructure in the country. The demand of fabric is expected to increase to 2.75 lakh square meters by 2012-13 (growing at a CAGR of 20%). The market potential in 2012-13 is expected to be Rs. 40 crore. No inflationary increase has been assumed for the price of the material.

The current and future forecast of the consumption of architectural membranes is given below:-

Market size of tensile membrane fabric	2007-08	2012-13
Quantity	1.1 lakh square meters	2.75 lakh square meters
Value	Rs. 16 crore	Rs. 40 crore

Source: Industry survey, IMaCS Analysis

Key manufacturers of architectural membranes

Entremonde Polycoaters Ltd. is the manufacturer of tensile membranes in India. The company manufactures double side PVC coated polyester fabrics with weight ranging from 600 gsm to 1100 gsm. The company also has in-house fabrication facility with Hot air, Hot wedge and HF welding techniques.

Manufacturer	Year	Product	Production quantity**	Installed capacity
Entermonde Polycoaters	2007-08	Coated fabric for awnings/ tensile fabric	14,364 meters	NA

***This includes the awning fabric, tensile fabric, etc.*

Imports and Exports of architectural membranes

The estimated figure of import of architectural membrane is:

HS Code	Description	Imports (in square meters)	Imports (in Rs crore)
		2007-08(E)	2007-08(E)
39269099 39219029	PTFE TENSILE MEMBRANE / OTHER SHEETS, FILM, FOIL STRIP, ETC OF POLYMER OF VINYL CHLORIDE/OTHER	Around 1 lakh square meters	~ Rs 15 crore

Source: IBIS, IMaCS Analysis

Majority of architectural membranes are imported from Germany, Australia and China.

The architectural membranes are not exported from India.

Key importers

Sujan Impex Pvt. Ltd., Meridian Architectural Systems Pvt. Ltd. and Construction Catalysers are the key importers of tensile membrane in India. Sujan Impex Pvt. Ltd. represents Ferrari Group (France) for Ferrari® Precontraint Coated Fabric. Meridian Architectural Systems Pvt. Ltd. imports tensile membranes from Mehler Haku Coated Fabrics, Germany. Mehler texnologies also has an office in India that imports the architectural membrane for projects in India. Similary, Verseidag Technologies, Germany also has an office in India to supply the material.

Type of raw materials

Synthetic fibres are used for manufacturing of architectural membranes because of their properties such as good strength, hydrophobicity, rot and fungi resistance which are essential properties of fabrics to be used as building and construction materials. The most widely used materials are :-

PVC Coated Polyester Materials

High tenacity polyester base fabric coated with PVC is used for majority of application. The base fabric is woven or knitted to highly controlled specifications in order to impart desired properties. The most commonly used weaves are plain weave, panama weave, precontraint and Malimou.

PVC coated fabric is topcoated with acrylic solutions, PVDF solutions or PVF film laminations. The topcoats are applied in different ways depending on the nature of the topcoat and the required thickness. Lacquers are sprayed, whereas thicker coatings are "knife applied" or laminated to the PVC.

Polytetrafluoroethylene (PTFE) Coated Glass Fabric

The base fabric is made up of glass fibers that are drawn into continuous filaments and then bundled together in yarns. The yarns are then woven to form a substrate. The base fabric is then coated with Polytetrafluoroethylene or Teflon.

Key machinery manufacturers/suppliers in India

The domestic manufacturers/suppliers of coating lines are:

Coating Machines / coating lines	
Company	**City**
A.T.E. Private. Limited	Mumbai
Harish Enterprise Pvt. Limited	Umbergaon
Kusters Calico Machinery Limited	Mumbai
Shreeji Engineering & Marketing Services	Ahmedabad
Stovec Industries Limited	Ahmedabad

Source: Textile Machinery Manufacturers' Association of India

Quality Control and Standards

The parameters tested by Indian manufacturers for tensile membrane along with the test methods are mentioned in the table below:

Parameter	**Test Method**
Fire retardancy	BS 3119
Physical Testing	IS-7016
Tearing Strength (Tongue Tear)	BS-3424 7A
Resistance to Heat & Loss of Mass	IS: 1259
Water Repellency	IS-390

Source: Industry survey

The desired properties depend on the end application and desired life of the tensile structure.

Hoardings / Signages

Hoardings / Signages are made of a translucent flexible textile substrate called flexible-face sign fabric. Flexible-face sign fabric, also known as flex was developed as an alternative to rigid-faced substrates like acrylic, plastic and polycarbonates. Besides hoardings, this material has applications in light boxes, exhibits, trade show displays and majority of other static out of home (OOH) advertising.

Flex is preferred over its rigid counterparts since the material offers flexibility in taking on graphics. It is amenable to screen printing, inkjet printing or painting, thus opening up more channels of creativity. As a result, print consistency can be maintained across locations. It is possible to produce large seamless signages using flex. Since this material is designed to withstand winds of speed 110 to 140 miles per hour, it is ideal for huge billboards on the expressways and national highways. Moreover, it can be easily transported because of its light weight and ease of handling.

Product characteristics

Flex is made of a PVC coated polyester warp knitted fabric. The fabric is made from high tenacity polyester filament yarn of denier ranging from 250 to 500. This fabric is coated with PVC and surface treated with lacquer. The material has the following properties:

- Light transmission
- Printability
- Ultra Violet resistance
- Heat Sealability
- Mildew resistance
- Anti wicking

Flex is available in different varieties depending on its application. The flex used for front-lit hoardings is available in GSM ranging between 280 and 370 and that for back-lit hoardings is available in GSM ranging from 450 to 650.

Market dynamics and key growth drivers

Flex is the most preferred material for hoardings / signages and other static OOH media which together account for 90% of the OOH advertising industry. OOH media has assumed great significance because of considerable shift in consumers' lifestyles and suburban growth. Consumers spend an average of four hours a day travelling, shopping and eating at out-of-home areas like airports, shopping malls, restaurants

and multiplexes which has resulted in increased importance of OOH media at these spaces. The OOH advertising industry grew at 20-25% in 2006-07and is expected to grow at a CAGR of 14% over the next five years.

Hoardings are facing resistance because of potential traffic hazards as well as environmental hazards, specifically in cities like Chennai, Delhi and Mumbai. On the other hand, new/refurbished airports, highways, street furniture and mushrooming retail space present opportunities for significant growth. Though the use of digital media i.e. LCD, LED is expected to reduce the share of static advertising, the rate of adoption of digital media is slow. Thus, flex is expected to continue as preferred media for the OOH advertising industry.

The market for flex is no more quality conscious because of reduced campaign life and significant cost pressures. Over the last few years the market has observed a significant reduction in price of flex because of cheaper Chinese imports. The selling price of front-lit flex reduced from Rs. 6.8 to 7 per square foot in 2002-03 to Rs. 2 to 2.5 per square ft in 2007-08. Similarly, the price of back-lit flex reduced from Rs. 11 to 15 per square foot in 2002-03 to Rs. 5 to 6 per square ft in 2007-08.

Market size of hoardings/signages fabric and future forecast

Hoardings account for majority of the consumption of flex in India. On an average, each metro has 3000 hoardings (legal as well as unauthorised) measuring 450 square feet to 40 square feet with campaign duration of 10 days to a month. The campaign duration in other cities is around a month to two months.

Usage of flex for hoardings

		No. of hoardings per city		
	No of cities	Used by corporate	Municipal Elections	Trade Shows / Festivals etc
Mega cities - pop>4mn	7	3000	7500	4000
Metro cities - pop>1mn	28	1500	5000	3000
Class I cities/towns (pop>1 lakh)	388	250	2000	1000
Other cities	4738	25	750	0
Usage of flex in Hoardings	95%			
Total No of flex hoardings		264,528	859,180	475,000
SIZE OF HOARDING	% Break-up			
30" x 15"	10%	26453	85918	47500
25" x 10"	20%	52906	171836	95000
15" x 5"	25%	66132	214795	118750
10" x 8"	10%	26453	85918	47500

		No. of hoardings per city		
	No of cities	Used by corporate	Municipal Elections	Trade Shows / Festivals etc
8" x 5"	35%	92585	300713	166250
Usage/Replacement frequency (per year)		12	1	1
Total demand of flex hoardings (million sq. m.)		40	11	6

Usage of flex for banners/hoardings at the malls

	Number	Average area (sq ft)	Frequency of change (per annum)	Flex usage per annum (sq m)
No of banners	100	180	6	10,000
No of backlit	50	30	1	Approx 150
No of malls	500			
Total demand of flex at malls (million sq. m.)	5			

Usage of flex for banners/hoardings at the retail stores

	Number	Average area (sq ft)	Frequency of change (per annum)	Flex usage per annum (sq m)
No of banners	2	24	4	18
No of retail stores in India	25,000,000			
Penetration of flex	5%			
Total demand of flex at retail stores (million sq. m.)	22			

In addition, flex is also used for assembly and Loksabha elections, other special events, etc. The usage of flex in these applications is around 10-15% of the total usage.

Current market size and future potential

The market size of flex for hoardings is estimated at 57 million square meters while for malls and retail stores at 27 million square meters. Usage of flex for assembly/loksabha elections and other special events is estimated at around 11 million square meters. Thus, the total market for flex fabric is estimated to be around 95 million square meters valued at Rs. 175 crore. Majority of the unauthorised hoardings are expected to be removed over the next five years thus affecting the flex demand. On the other hand

new/refurbished airports, highways and street furniture are likely to augment the demand of flex. The demand of flex for hoardings is expected to grow at a CAGR of 9% over the next five years. The demand of flex in the organised retail sector (malls) is expected to increase at a CAGR of 30% and in the unorganised retail sector at a CAGR of 9% over the next five years, in line with the growth of retail industry in India. Hence, the demand of flex is expected to increase to 140 million square meters by 2012-13 (growing at a CAGR of around 9% over the next five years). The market potential in 2012-13 is estimated at Rs. 258 crore. No change (upwards or downwards) in the price of flex has been assumed for deriving the projected market size.

The current and future forecast of flex consumption is given below:-

Market size of hoarding fabric	2007-08	2012-13
Quantity	95 million sq m or 31,500 MT	140 million sq m or 46,421 MT
Value	Rs. 175 crore	Rs. 258 crore

Source: Industry survey, IMaCS Analysis

Key manufacturers of flex for hoardings/signages

SRF Limited, Entermonde Polycoaters and Centannial Fabrics were the key manufacturers of flex in India. However, because of increasing competition from cheap Chinese imports the companies have stopped manufacturing flex since last four to five years. At present, the domestic demand of this fabric is largely met through imports, primarily from China. There are a few producers (like Delhi Tirpal House, etc.) who cater to around 5% of the domestic demand.

Imports and Exports of flex for hoardings/signages

The import figure of flex for hoardings/signages is as given below:-

HS Code	Description	Imports	Imports (in Rs. crore)
		2007-08(E)	**2007-08(E)**
39204900, 39203090, 39205919, 39209999, 39199090, 39205911, 39199090*	FLEX BANNER (FRONT-LIT OR BACK-LIT), INKJET MEDIA FOR BANNERS, PVC SELF-ADHESIVE VINLY FOR SIGNAGES	**Around 90 million sq m or 30,000 MT**	**~ Rs. 160 crore**
59031090, 59032090	BANNER FLEX	**Around 0.5 million sq m or 125 MT**	**~ Rs. 1 crore**

Source: IBIS, IMaCS Analysis

** In addition, flex is also imported in small amounts under the HS codes 39201019, 39219029, 39209919, 39219010, 39269099, 39205112, 39219099, 39042110, 39232990, 39209939, 39211900, 39211200 (included in the imports quantity and value above)*

Almost 80-90% of the flex is imported from China followed by around 10-15% from Korea. A small amount of flex is also imported from UAE and Taiwan.

The exports of flex from India are negligible.

Manufacturing process and type of raw material

The process of manufacturing flex involves coating the base fabric with PVC emulsion by either dip or knife roll method followed by drying and curing. Drying and curing of the chemicals applied to the substrate is accomplished by means of heat wherein the fabric is passed through an oven with continuous circulation of hot air.

Key machinery suppliers in India

The domestic manufacturers/suppliers of coating lines are:

Coating machines/coating lines	
Company	**City**
A.T.E. Pvt. Limited	Mumbai
Harish Enterprise Pvt. Limited	Umbergaon
Kusters Calico Machinery Limited	Mumbai
Shreeji Engineering & Marketing Services	Ahmedabad
Stovec Industries Limited	Ahmedabad

Source: Textile Machinery Manufacturers' Association of India

Quality standards

There are no quality standards available for this product.

Tarpaulins – HDPE, Cotton canvas and Jute Tarpaulins

A **tarpaulin** or **tarp** is a large sheet of strong, flexible, water resistant or waterproof material. Traditionally tarpaulins were made out of cotton however currently nylon and polyester fibre fabrics are being increasingly used in manufacturing tarpaulins.

Tarpaulin is widely used for rain water protection in sheds, transportation - trucks & other automobiles, storage godowns, boats, snowmobiles, construction sites, lumber, grain storage, temporary storages, tents, ground-sheets, etc.

Tarpaulins are categorized as given below:-

1. Cotton canvas tarpaulins
2. HDPE/PP/Nylon tarpaulins

Tarpaulins are sheets made out of polyethylene, cotton canvas, jute, etc. Polyethylene tarpaulin is also known as HDPE Tarpaulin, Laminated Tarpaulin, Plastic Tarpaulin, etc. Traditionally, cotton canvas had been the more common form of tarpaulins, but, lately, HDPE woven and laminated fabric and polyethylene sheets have replaced canvas in many of the applications.

Canvas Tarpaulin

A canvas **tarpaulin** or **tarp** is a large sheet of strong, flexible, water resistant or waterproof material. Traditionally tarpaulins were made out of cotton however currently nylon and polyester fibre fabrics are being increasingly used in manufacturing tarpaulins.

Canvas tarpaulins are largely used as truck covers. Trucks travel long distances and hence come across huge climatic variations. Given India's rough environmental conditions, damage to goods is inevitable if the goods are not adequately shielded. A steel body truck not only increases the weight of the truck but also reduces the fuel efficiency. Thus, truck tarpaulin covers are widely used as truck covers. As the logistics industry is getting more and more organised, the product liability clauses are being enforced on the logistics players leading to increase in usage of truck covers. Moreover, the advent of organised players in retail industry has also given boost to the use of well covered trucks.

Product Characteristics

Canvas Tarpaulin covers are made of cotton canvas or nylon or polyester fibre fabrics coated with PVC. The cotton fabric is available in GSM ranging from 380 to 500. Vinyl coated polyester fabrics are 610 GSM to 678 GSM with the base fabric of 102 GSM to 107 GSM. These fabrics being heavy have lower elongation, minimum shrinkage over wide range of temperature and humidity conditions and resistance to UV degradation.

Market dynamics and key growth drivers

The key application of canvas tarpaulins is as truck covers. In India, road is the dominant mode of transportation carrying almost 65% of the country's freight. Truck transport accounts for majority of the goods transfer through road and thus, holds immense significance. Around 2.5 lakh new trucks are sold every year, increasing at 10% y-o-y.

Production of Medium & Heavy Commercial Vehicles (Goods carriers) in India

(Vehicles in '000 numbers)	Production					
Segment	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08
Commercial Vehicles (CVs)						
M&HCVs Goods Carriers	95.7	136.8	172.9	179.3	246.9	232.3

Source: SIAM

India experiences extreme climatic conditions from heavy rains to extreme heat. Since trucks travel long distances, tarpaulin covers are a necessity to protect the goods. Thus, use of tarpaulin is expected to increase in line with increase in truck transport.

The industry survey has revealed that HDPE tarpaulin is becoming more popular vis-a-vis its canvas counterpart because it is cheap and inherently waterproof. The only advantage that canvas tarpaulin enjoys over the HDPE tarpaulin is that the former has higher tear strength thus, does not easily tear while tying with ropes. Usually a combination of both type of tarpaulins in used in every truck. However, HDPE tarpaulins are increasingly replacing canvas tarpaulins. Hence the demand for canvas tarpaulin is expected to fall by around 6% y-o-y.

Market size of tarpaulin fabric and future forecast

In 2007-08, 2.3 lakh trucks were sold in India out of which 70% are expected to require tarpaulin. As per the industry survey, each truck requires three to four tarpaulins out of which one or two are canvas tarpaulins in sizes 36ft X 21ft or 40ft X 21 ft. The canvas tarpaulin is replaced every 15-18 months depending upon the wear and tear of the fabric.

Usage of tarpaulin for Truck covers

Particulars	Assumption
Average size of canvas tarpaulin	36ft X 21 ft
Number of canvas tarpaulins used in a truck	1.5
Average life of a truck	12 years
% of trucks requiring tarpaulin every year	70%
Replacement period of canvas tarpaulin (conservative)	2 years
Average price of canvas tarpaulin	Rs 75 per sq m

In addition, tarpaulin is also used in other applications such as agriculture, construction and marine. The market size of canvas tarpaulins has been increased by 10% to account for the application of canvas tarpaulins in these miscellaneous applications.

Current and future forecast of Canvas Tarpaulin consumption

The market size of canvas tarpaulin is estimated to be 61 million square meters valued at Rs. 457 crore. The demand for tarpaulin is expected to increase in line with increase in road freight transport. However, the demand for canvas tarpaulin is likely to be hit because of its increasing replacement by HDPE tarpaulins. Thus, the demand for canvas tarpaulin is estimated to decrease to 45 million square meters by 2012-13 (falling at the rate of 6% year on year). The market potential in 2012-13 is estimated at Rs. 336 crore. No inflationary increase in price has been considered.

The current and future forecast of tarpaulin consumption is given below:-

Market size for tarpaulin fabric	2007-08	2012-13
Quantity	61 million sq m	45 million sq m
Value	Rs 457 crore	Rs 336 crore

Source: Industry survey, IMaCS Analysis

Key manufacturers of tarpaulin substrate

Majority of the market for tarpaulin is being serviced by the unorganised sector with only few players in the organised sector. Gokak mills, Bharat Textiles, SRF Limited are few key manufacturers of cotton canvas for tarpaulin in the organised sector. The substrates made by these players are fabricated into truck tarpaulins by converters.

Manufacturer	Year	Quantity (lakh m)	Value (Rs crore)	Unit Price	Installed capacity
Gokak Mills*	2007-08	27.2	20.71	Rs 76.08/m	NA
Bharat Textiles	2002-03	8.11	5.15	Rs 63.46/m	NA
SRF Limited**	2007-08	4 million sq m	35	Rs 87.5/m	NA

**These are the figures for complete cotton canvas which includes tarpaulin*
*** This is SRF's total capacity for all coated fabrics including tarpaulin*
Source: Capitaline, Annual reports, Industry survey

The other players are

- Sri Arjun Tarpaulin Industries, Salem
- Calcutta Canvas Co., Chennai
- Delhi Tirpal House, New Delhi
- Lamifab Industries, Mumbai
- Guru Nanak Industries, New Delhi
- Daisy Trading Corporation, Mumbai

Imports & Exports of tarpaulin

The estimated import figures for Tarpaulin are as given below:-

HS Code**	Description	Imports Quantity	Imports (in Rs crore)
		2007-08(E)	2007-08(E)
59031010, 59031090, 59032090, 59039090, 59070099	PVC coated fabric, PVC coated Polyester fabric, PVC coated Nylon fabric *	40 million meters	Rs 66 crore

Source: IBIS, DGCIS, IMaCS Analysis
** It includes fabric used for tarpaulin, tents, awning etc.*
*** The above codes constitute over 99% of imports*

HS codes 59031010 and 59039090 constitute over 97% of the total imports. Around 87% of the imports are from China while the next highest contributor is Taiwan with over 7% share. Other countries include Korea, France, Germany, Hongkong etc.

The estimated export figures for tarpaulins are as given below:-

HS Code	Description	Exports Quantity	Exports (in Rs crore)
		2007-08(E)	**2007-08(E)**
63061990	NYLON TARPAULIN*	Approx. 2,000 sq. m.	**Rs 0.5 crore**
63061990, 63061100, 63061910, 63062990	COTTON CANVAS TARPAULIN	Approx. 7,100 sq. m.	**Rs 4.6 crore**

Source: IBIS, DGCIS, IMaCS Analysis

Over 99% of the exports of cotton canvas tarpaulin take place under the HS codes 63061990, 63061100, 63061910. USA has over 50% of the share in exports, while countries like Canada, UK and Germany have around 15% share each. These exports will increase marginally by 2012-13 and reach a size of Rs 5.5 crore.

Key machinery suppliers for manufacturing tarpaulin in India

The domestic manufacturers/suppliers of coating lines are:

Coating Machines/coating lines	
Company	**City**
A.T.E. Private. Limited	Mumbai
Harish Enterprise Pvt. Limited	Umbergaon
Kusters Calico Machinery Limited	Mumbai
Shreeji Engineering & Marketing Services	Ahmedabad
Stovec Industries Limited	Ahmedabad

Source: Textile Machinery Manufacturers' Association of India

HDPE Tarpaulins

Polyethylene tarpaulin is also known as HDPE Tarpaulin, Laminated Tarpaulin, Plastic Tarpaulin, etc. Polythene Tarpaulins are made of High Density Polythene woven fabric laminated on both sides with low density polythene. The advantages of PE tarpaulins are that they are very economic compared to cotton canvas tarpaulins. PE tarpaulins with HDPE woven fabric and LDPE lamination on both the sides are 100% waterproof. PE tarpaulins have the capability to adopt wide range of colours unlike the canvas tarpaulin which makes it more usable and a preferred product all over the world.

Product characteristics

The polyethylene tarpaulin usually ranges from 70-500 gsm. The most popular characteristics in tarpaulins are listed below:

GSM	: From 100 to 350 gsm.
Mesh	: From 8 X 8 to 14 X 14
Denier	: From 700 upto 1200
Width	: 6ft and above
Length	: 6 ft and above
Lamination	: LDPE Lamination on both sides
Color	: Blue, Yellow, Black, Silver/Blue, Silver/White, Silver/Black

3 layers tarpaulin goes from 72 GSM upto 200 GSM and in 5 layers it can go up to 300 GSM, giving it higher strength and durability. It is generally available in standard sizes 15ft X 12ft, 18ft X 12ft, 18ft X 15ft, 24ft X 18ft, 24ft X 16ft and 30ft x 30ft. UV stabilization can also be done and is opted by many users.

Market dynamics and key growth drivers of tarpaulin market in India

The tarpaulin is used for the following applications in India:

- Floor lining for storage or stacking railway wagon covers
- Ground work sheet, transportation
- Water proof liner for trucks, tempos, warehouses, sheds, etc.
- Storage Tarpaulin, fumigation covers, poultry shading
- Construction sites - covering for cement bags, equipment, metal rods
- Curtains for unfinished buildings

- In various packaging industries
- Recreational uses at picnics and camps

Of the above applications, the growth in the usage of tarpaulin has been driven by the usage in trucks, tempos, warehouse, sheds, storage covers, construction sites and the packaging industries.

Industry size - HDPE tarpaulins industry

The Indian Raffia industry is estimated as 1.07 million MT in size in 2007-08. HDPE/PP tarpaulins account for 6.5% of the Indian Raffia industry, thus, amounting to around 70,000 MT.

The average domestic market price of these tarpaulins in 2007-08 was around Rs 90-95 per kg. The prices of HDPE tarpaulins are strongly linked with the crude oil prices and hence, the prices have increased drastically in the last one year. The average export price increased to around Rs 150 per kg from Rs 116 per year last year. However, with the downward trend in the crude oil prices, they are expected to go down and stabilize. At present, the domestic market price is around Rs 110 per kg.

Assuming the average price for 2007-08 as Rs 92.5 per kg, the HDPE tarpaulins market size is estimated as Rs 650 crore approx.

The HDPE tarpaulins industry in India is expected to grow at around 10% per annum as cotton canvas tarpaulins will be replaced by HDPE tarpaulins. Hence, the industry size of the HDPE tarpaulins is expected to increase from 70,000 MT in 2007-08 to around 113,000 MT by 2012-13. An inflationary increase of 5% y-o-y has been assumed for the price of these tarpaulins due to their linkage with crude oil prices. Hence, in value terms, the market size of the HDPE tarpaulins industry in India is expected to increase from Rs 650 crore in 2007-08 to around 1,330 crore by 2012-13.

The current and future forecast of HDPE Tarpaulin industry size is given below:-

HDPE Tarpaulins industry	2007-08	2012-13
HDPE Tarpaulins Quantity	70,000 MT	113,000 MT
HDPE Tarpaulins Value	Rs 650 crore	Rs 1,330 crore

Source: Industry survey, IMaCS Analysis

Key players – HDPE Tarpaulins

Manufacturer	Year	Quantity (MT)	Value (Rs crore)	Unit Price	Installed capacity
Gujarat Raffia	2006-07	1,750 MT	16	Rs 92.6/kg	4440* MT
Gujarat Craft	2006-07	73 MT	0.63	Rs 86.3/kg	1800* MT
SRMTL	2007-08		0.14		85 million sq. ft. per month
Binny	2006-07		0.09		

** It includes capacities for PE fabrics, sacks, tarpaulins etc.*

Source: Capitaline, Company Annual Reports

Other players in the HDPE tarpaulin industry are Commercial SynBags Ltd., Tarpaulins India Tarp (P) Ltd., S K Enterprise, Texel Industries Ltd., Shreeji Plastic, Ranka International Limited, Gujarat Bulk Packs Limted etc. There are many other small players present who make tarpaulin in the unorganised sector.

Imports of HDPE/PP Tarpaulin

The estimated import figures for tarpaulins are as given below:-

HS Code	Description	Imports Quantity	Imports (in Rs crore)
		2007-08(E)	2007-08(E)
63062900, 63069990	PP TARPAULIN*	Approx. 500 – 600 MT	**~ 1.5 - 2**

Source: IBIS, DGCIS, IMaCS Analysis

** PVC coated tarpaulins are also imported under the HS code 63061990, though rarely*

The contribution of imports in the overall HDPE/PP tarpaulins consumption in India is very low. Almost 100% of the Indian imports of PP Tarpaulin are from China.

Exports of HDPE/PP Tarpaulin

The estimated export figures for tarpaulins are as given below:-

HS Code	Description	Exports Quantity	Exports (in Rs crore)
		2007-08(E)	2007-08(E)
63061990	HDPE TARPAULIN*	Approx. 15,000 sq.m.	**~ 1 – 1.5**

Source: IBIS, DGCIS, IMaCS Analysis

** Tarpaulins worth Rs 5 crore of cotton canvas and jute are also exported from India to Germany, UK, USA, Canada, Australia and Sri Lanka*

The share of exports in the overall HDPE/PP tarpaulins production in India is very low. Almost 80% of the Indian exports of HDPE Tarpaulin are to USA. Exports to Germany and African countries like Kenya account for the remaining 20% exports. There will only be a minor or negligible growth in exports by 2012-13.

Key importers & exporters

The key exporters of tarpaulin from India are Gujarat Raffia Industries Ltd., Shree Rama Multi Tech Ltd., Commercial SynBags Ltd., Tarpaulins India Tarp (P) Ltd., S K Enterprise, Texel Industries Ltd., Ranka International Limited, etc

Key machinery manufacturers/suppliers in India

The main machine required for tarpaulin manufacturing is the 8-10 Wide width Shuttle Loom. The main suppliers of these looms in India are:

- Lohia Starlinger Limited
- J. P. Industries
- Kabra Extrusiontechnik Ltd. (KET) – Kolsite
- Windsor Machines Limited

Quality Control and Standards

IS 7903:2005 is the standard applicable to HDPE tarpaulins, besides this a draft standard has also been finalised under DOC.TXD 23(907) but has not yet been sent for print.

Awnings and Canopies

An awning is a secondary covering attached to the exterior wall of a building. With the addition of columns an awning becomes a canopy, which is able to extend further from a building, as in the case of an entrance to a hotel.

The location of an awning on a building may be above a window, a door, or above the area along a sidewalk. Restaurants often use awnings broad enough to cover substantial outdoor area for outdoor dining, parties or reception. In commercial buildings, an awning is often painted with information such as the name, business, and address, thus acting as a sign or billboard in addition to providing shade from the sun, break from steep winds and protection from rain or snow. The key benefits of an awning or a canopy are weather protection, decoration and identification.

An awning fabric gives an extremely high level of protection from UV radiation. This degree of protection depends on the color of the fabric. Lighter colors let more UV light through than the dark colors, but they remain as effective as a factor 50 sunscreen (filtering out more than 90% of UV radiation).

Advantages:

- Weather protection
- High tear strength
- Long lasting
- Good breaking strength
- Does not get warped
- Weldable
- Good drape
- Aesthetic appeal combined with strength

Product characteristics

The fabric for awnings & canopies usually varies from 400-700 gsm, though it can also be higher depending upon the fabric used.

Key growth drivers, consumption norms and the market size

Growth in the real-estate segment especially hotels, fast food places, sale counters, etc is driving the usage of awnings and canopies in India. Usage of awnings / canopies as truck covers has been included

under tarpaulins and has been excluded from awnings & canopies market size. The market size of awnings & canopies has been estimated based on discussions with industry players. Some of the key assumptions based on the industry survey are:-

Particulars	Assumption
Requirement of a small shop	100-150 sq ft
% of PVC coating done in India for awning	25%
Average % of the fabric cost in the total awning cost	15%
Average price of 1 sq m of Acrylic coated fabric	Rs 250-350
Average price of 1 sq m of PVC coated fabric	Rs 100-150
Acrylic coated fabric import percentage	100%

The current and future forecast of awnings & canopies industry size is given below:-

Awning industry	2007-08	2012-13
Awning Quantity	1.5 lakh sq m	3.0 lakh sq m
Awning Value	Rs 2.25 crore	Rs 4.5 crore

Source: Industry survey, IMaCS Analysis

The domestic usage of awnings & canopies is expected to increase from 1.5 lakh sq m in 2007-08 to around 3 lakh sq m by 2012-13. No inflationary increase has been assumed for the price of these products. In value terms, the market size of the awnings & canopies in India is expected to increase from Rs 2.25 crore in 2007-08 to around 4.5 crore by 2012-13.

Key manufacturers

SRF and Entremonde Polycoaters are the key players in the awning fabric market in India. There are also few other players like Coated Sales Corporation. Rest of the players in India are importers, fabricators or distributors of awnings.

Manufacturer	Year	Production Quantity	Production Value	Installed capacity
SRF Limited*	2007-08	4 million sq m	Rs 35 crore	NA

**This is the production of the entire coated fabrics division*

Source: Capitaline, Annual reports, Industry survey

The key importers of awning fabric are:

- Alps Industries Ltd. (Vista)
- Systems India Pvt. Ltd – Authorised for Dickson & KITEX (Korea PVC awning)
- Mac Décor Ltd.
- Sujan Impex, Mumbai – Authorised for Ferrari (Italy)

The major distributors of awning fabric who do not import directly are:

- Unitech Awning
- Ideal Shades
- Décor World

Imports & Exports of Awning Fabric

The estimated import figures for Awning are as given below:-

HS Code	Description	Imports Quantity	Imports (in Rs crore)
		2007-08(E)	2007-08(E)
55122990, 59069190, 39269099, 59112000, 54072090	Awning*	Around 16,000 sq. m.	Rs 0.5 crore

Source: IBIS, DGCIS, IMaCS Analysis

** Imports above include only the fabric imported under the name of awning and not the seperate PVC/Acrlyic coated fabrics used for awnings*

Most of the imports take place from European countries including Spain (which contributes around 80% share), UK (which has a share of around 10-15%) and France and Italy. China accounts for less than 5% of the imports.

There are no exports under the head of awnings but some exports take place under the category of coated fabrics.

Raw material

Awnings & canopies are typically composed of canvas woven of acrylic, cotton or polyester yarn, or vinyl laminated to polyester fabric that is stretched tightly over a light structure of aluminum, iron or steel and sometimes even wood. The key raw materials are:

- Woven or Warp knitted fabrics – 50-150gsm made of polyester filament yarn
- PVC emulsion grade
- Water based PU emulsion
- Fillers like $CaCO_3$, China clay etc.
- Plasticizer
- Additives:
    - Different colour pigments
    - Stabilizers

Key Raw material Suppliers

Key suppliers for PVC are:

- Chemplast – Chennai
- Finolex – Pune
- Solvay – Belgium

Key PU suppliers are:

- Stahl chemicals – UK
- Schill and Silacher – Germany

Key Stabilizers' suppliers are:

- JV Organics
- CIBA

Key Pigments' suppliers are:

- Meghmani – Ahmedabad
- Clariant - Mumbai

Key machinery suppliers

- Yamuna Industries, Umbergaon
- Swatik Industries, AHmedabad
- Shakti Industries, Mumbai
- Web Processing, UK
- Coatema, Germany
- Zimmer, Germany

Floor and wall coverings

Floor & Wall covering items can be classified as following:-

- PVC flooring & Printed PVC flooring
- Non-woven carpets
- Woollen carpets
- Carpets / floor coverings of polypropylene, polyester, etc

Floor coverings have been mostly dominated by wool, polypropylene and acrylic carpets. But, as consumers began to look for affordable carpets that were easy to care and maintain at home, the trends started shifting towards polyester. Distinct advantages such as higher bulk, strength, resilience, colour, clarity, fastness, easy care, affordability and longevity have fuelled the demand for polyester carpets. Nowadays, non-woven needle punched wall-to-wall carpets are also being used widely. Wall to wall carpets provide a dust free environment and serve as good insulators against noise. With the boom in IT industry and commercial establishments, wall to wall carpets are in demand in India too.

Product characteristics and applications

Floor and wall coverings applications are:-

- 1 mm thickness: Can be used in Residential Areas & Study Centres.
- 1.5 mm thickness: Computer Rooms, Departmental Stores,
- 2 mm thickness: Industrial Areas & Electronics Rooms

Vinyl flooring is produced in a variety of designs i.e. mosaic, ceramic, wood, marble, floral, granite, geometric pattern etc. to suit different applications in Home, Hotels, Hospitals, Offices, Nursing Homes, Airport, Bank, Computer Rooms, Railways, Restaurants, Shopping Complexes, etc. Commercial flooring in 2mm thickness is designed to suit medium and heavy traffic areas like Hospitals, Offices, Airports, Shopping Complexes, Railways, Libraries, etc.

The non-woven wall-to-wall carpets and floor coverings are also increasingly being used in India. These carpets are made of PP and are tufted.

Key manufacturers

The key manufacturers of floor and wall coverings are:-

Manufacturer	Year	Sales Quantity	Sales Value	Installed capacity
Uniproducts	2007-08	3,833 MT	Rs 79.77 crore	4,000 MT
Birla Corporation	2007-08	0.461 million sq m	Rs 6.8 crore	4.86 million sq m
Royal Cushion Vinyl Products Ltd.	2007-08	10.991 million sq m	Rs 75.78 crore	NA
Premier Polyfilm Ltd.	2007-08	14.34 million sq m	Rs 65.26 crore	16,200 MT
Supreme Non-woven*	2005-06	2.45 million meters**		15,000 MT
	2007-08	15,000 MT**		25,000 MT

Source: Capitaline, Industry survey
** Includes other non-woven products as well*
*** Production figures*

Automobile products account for around 50% of Supreme Non-woven production. The estimated capacity utilisation of Supreme Non-woven is around 60%. Supreme non-woven has increased its capacity from 15,000 MT in 2005-06 to 25,000 MT in 2007-08 and is expected to increase to 40,000 MT by the end of 2008-09.

Market size and key growth drivers

The Indian carpets, floor coverings and wall coverings industry is mainly export oriented. With the boom in IT industry and commercial establishments (like hotels, restaurants, airports, offices, etc), wall to wall carpets and non-woven carpets are gaining demand in India too. The industry is expected to grow in line with the building and construction industry at around 10-12% year on year.

The domestic usage of the floor and wall coverings has been estimated based on discussion with the industry players and published information about the production and sales of the key players in India as well as the imports and exports statistics.

The current and future forecast of floor & wall coverings industry size is given below:-

Floor & wall coverings Domestic usage	**2007-08**	**2012-13**
Floor & wall coverings Quantity	67 million sq m	108 million sq m
Floor & wall coverings Value	Rs 425 crore	Rs 685 crore

Source: Industry survey, IMaCS Analysis

The domestic usage of floor & wall coverings is expected to increase from 67 million sq m in 2007-08 to around 108 million sq m by 2012-13. No inflationary increase has been assumed for the price of these products. In value terms, the market size of the floor & wall coverings in India is expected to increase from Rs 425 crore in 2007-08 to around 685 crore by 2012-13.

Imports & Exports of Floor & wall coverings

The estimated import figures for Floor & wall coverings are as given below:-

HS Code	Description	Imports Quantity	Imports (Value)
		2007-08(E)	2007-08(E)
57031010, 57033010, 57033090, 57033020	NON-WOVEN FLOOR COVERINGS / CARPETS	1.2 million sq m	Rs 10 - 12 crore
57050090	NON-WOVEN FABRIC (FOR FLOOR COVERINGS)	2.25 million sq m	Rs 8 crore
57033090, 57033010, 57032090, 57032020, 57033020	PP CARPETS / SYNTHETIC MACHINE TUFTED CARPETS / FLOOR COVERINGS	1.65 million sq m	Rs 25 - 30 crore
39181090, 39189090, 39189010, 39181010	PVC FLOOR COVERINGS	1 million sq m	Rs 35 crore
39181090, 39181010, 39269099, 39189090	PVC WALL COVERINGS	0.15 million sq m	Rs 10 crore
39259010, 39259090, 39269099	PVC PROFILES (WALL & CELING ACCESSORIES)	0.75 million sq m	Rs 7 crore

Source: IBIS, IMaCS Analysis

Non-woven carpets for floor coverings are imported from UAE & USA with share of around 40% each followed by UK, Netherlands & Egypt. Non-Woven fabric used for floor coverings is imported from China, Iran & Belgium.

PP carpets and carpets of synthetic material / machine tufted carpets are imported primarily from UAE with around 40% share followed by China, Pakistan & Netherlands with around 10-20% share. The remaining imports are from Indonesia, Saudi, USA, Singapore and Malaysia.

Korea & France account for 30-40% of the imports (each) of floor coverings followed by China & Thailand with around 10% share each. Taiwan, Pakistan, Singapore, Germany, UK, Hungary, Sweden and Australia account for the remaining imports of PVC floor coverings.

USA accounts for around 50% share in the Indian imports of the PVC wall coverings followed by UK with around 25-30% share. Korea, Thailand, Netherlands and China account for the remaining imports of PVC wall coverings.

PVC profiles for wall and ceiling accessories are primarily imported from China with around 50% share followed by Malaysia with around 20-25% share and Korea & Vietnam accounting for the remaining imports.

The estimated export figures for Floor & wall coverings are as given below:-

HS Code	Description	Exports Quantity	Exports (Value)
		2007-08(E)	2007-08(E)
39181090, 39189090, 39219029, 39189010, 39181010, 39209919, 39264059	PVC VINYL FLOOR COVERINGS / WALL COVERINGS	15 million sq m	Rs 425 crore

Source: IBIS, IMaCS Analysis

The key export destinations of PVC vinyl floor and wall coverings from India are UAE, Saudi Arabia, S Africa and China with a share of around 60%. Israel, Slovenia, Greece, Germany, Australia, USA, Kenya, Sudan, Oman, Tanzania, Qatar, Ghana, Vietnam etc account for the remaining exports. Their exports in the year 2012-13 are expected to be Rs 569 crore.

Raw-materials

Typically the non-woven floor and wall coverings are made of polypropylene. In addition, to meet the industry demand for a suitable fibre, Reliance has launched its unique Recron Carpet Fibre in trilobal cross section. The PVC Vinyl flooring is also extensively used in India.

For the non-woven floor and wall coverings, needle-punching process is used. Needle loom is the key machinery for manufacturing these non-wovens. The needle looms are generally imported. One of the most famous needle punch machine manufacturers in the world is Dilo (Germany).

Scaffolding Nets

Scaffolding netting is a lightweight fabric used to cover a building under construction in order to improve the safety of construction site. It acts as a bi-fold barrier on a building under construction. The net prevents debris from falling out of building and also hides away unsightly work areas giving a tidier look.

Product characteristics

Scaffolding nets are knitted from High Density Polyethylene (HDPE) UV stabilized monofilament yarn. The UV stabilizers added to HDPE develop resistance to UV rays thus, increasing the product life. Scaffolding nets are available in different weights and shading factors ranging from 50% to 90%. The ex-factory selling price of these nets ranges from Rs. 13 to 16 per square meter depending on the quality.

Market dynamics and key growth drivers

The demand for scaffolding nets is driven by construction activity in the country. Indian Building Laws do not stipulate the use of scaffolding nets near the construction site. As a result hessian cloth or tarpaulin is widely used in place of these nets. However, industry survey reveals that because of awareness about the benefits of this product as well as increase in price of hessian cloth, the use of scaffolding nets has grown at a rate of 15-20% over the last two years.

Market size of scaffolding nets and future forecast

Based on discussions with the industry experts the market size of scaffolding nets is estimated at 4 lakh square meters valued at Rs. 0.6 crore. The demand for scaffolding nets is expected to grow on account of increase in construction activity as well as better market penetration of the product. Hence, the market size of scaffolding nets is expected to increase to 8 lakh square meters by 2012-13 (growing at a CAGR of around 15% over the next five years). The market potential in 2012-13 is estimated at Rs. 1.2 crore. No inflationary increase has been assumed for the price of the product.

The current and future forecast of consumption of scaffolding nets is given below:-

Market size of scaffolding nets	2007-08	2012-13
Quantity	4 lakh sq m	8 lakh sq m
Value	Rs. 0.6 crore	Rs. 1.2 crore

Source: Industry survey, IMaCS Analysis

Key manufacturers of scaffolding nets

In India, the production capacity of scaffolding nets is included in the Shade nets' manufacturing facilities. The key manufacturers of scaffolding nets are Rishi Packers Ltd and Kwality Nets.

Rishi Packers Limited is a multiproduct company. It is one of the leading manufacturers of scaffolding nets with an installed capacity of 12 million square meters/annum (2007-08) for a variety of nets including shade nets, wind breaker nets, bird nets, hail nets, scaffolding nets and crop protection nets. In 2007-08, the company produced 9 million square meters of nets.

Kwality Nets Manufacturing Co. is one of the major producers of scaffolding nets with an installed capacity of 0.72 million square meters/annum (2007-08) for all types of nets including safety nets, bird protection nets, fishing nets, mosquito nets, agro shade nets, sports nets, packaging nets and other nets. In 2007-08, the company manufactured 80,000 square meters of scaffolding nets.

Imports and Exports of scaffolding nets

In the absence of significant market, there are negligible imports of scaffolding nets. The exports of scaffolding nets are also negligible. Net manufacturers export shading nets to countries in Middle East, however, the end applications of these nets are diverse.

Raw materials

Scaffolding nets are knitted from High Density Polyethylene (HDPE) UV stabilized monofilament yarn. The UV stabilizers added to HDPE develop resistance to UV rays thus, increasing the product life.

Key machinery suppliers in India

The raschel knitting machines used for manufacturing nets are mostly imported. GCL India Pvt Ltd (Bangalore) is one of the local manufacturers of raschel knitting machines. The key raschel knitting machinery manufacturers in the world are Karl Mayer (Germany), LIBA Maschinenfabrik GmbH (Germany) and Brückner Technology Holding GmbH (Germany).

The Indian associates/suppliers of these machinery are:

- ATE engineering (Mumbai) for Karl mayer
- Brückner Machinery and Service India Pvt Ltd (Pune) for Bruckner.

Quality standards

There are no quality standards available for this product.

CLOTHTECH

The Clothtech segment of technical textiles comprises of all textile components used primarily in garment applications, which have some specific functional applications. These components are largely hidden, e.g. interlinings in shirts, sewing threads, shoe laces, labels, hook and loop fasteners (Velcro), etc. Various fabrics like umbrella cloth are also classified under the Clothtech segment.

The technical textile products covered under Clothtech are as give below:-

- Shoe laces
- Interlinings
- Zip Fasteners
- Elastic Narrow Fabrics (Tapes)
- Velcro
- Labels
- Umbrella Cloth
- Sewing Threads

Technical textiles consumption under Clothtech is estimated at around Rs 6,570 crore. Sewing threads alone account for around 60% of the technical textiles consumption under Clothtech followed by labels with around 19% share. Interlinings accounts for around 8% share, whereas elastic narrow fabric tapes have a share of almost 6%. Usage of technical textiles in shoe laces and zip fasteners is of total 5%. Velcro and umbrella cloth account for the remaining around 2% of the total usage in Clothtech.

The domestic consumption of technical textiles under Clothtech is expected to increase from around Rs 6,570 crore in 2007-08 to around Rs 9,665 crore by 2012-13.The demand for the clothtech products is dependent on the growth of the garment industry. In the medium term (next 5 years), the clothtech segment is expected to achieve growth at the rate of almost 8% year on year. Exports of Clothtech products (technical textiles component) from India are estimated as Rs 338 crore.

The maximum growth is expected in the Hook and loop fastener (Velcro) market. The share of Velcro in the total Clothtech market is expected to double over the next 5 years. With the high growth in the soft luggage industry, the consumption of zip fasteners is also expected to increase 12% year-on-year for the next five years. Elastic narrow tapes are also expected to have a healthy growth rate of over 11% year on year.

With the growth in the footwear industry, the growth in the consumption of shoe laces is also expected to be higher than the overall growth of Clothtech category. Demand for sewing threads is expected to be stable growing in line with the clothtech segment.

Moreover due to a slowdown in the garment exports from India, the growth in interlinings and labels is expected to be lower than other products of the clothtech category.

Most of the demand for these products is satisfied by domestic production with imports of only around Rs 400 crore. The umbrella cloth (taffeta) is 100% imported and not manufactured in India at all. Interlinings and narrow fabrics like elastics and Velcro also have imports over 15% of their domestic consumption.

Summary of the market-sizing for Clothtech

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
Shoe laces	Quantity			-	2540 MT	3400 MT	
	Value	Rs 195 crore	Rs 20 crore	-	Rs 215 crore	Rs 365 crore	-
Interlinings	Quantity	100 million meters	125 million meters	8 million meters	215 million meters	290 million meters	
	Value	Rs 440 crore	Rs 85 crore	Rs 8.5 crore	Rs 515 crore	Rs 700 crore	Rs 11.4 crore
Zip Fasteners (TT component)	Quantity	614 million meters	6 million meters	20 million meters	600 million meters	1050 million meters	
	Value	Rs 144.5 crore	Rs 7 crore	Rs 1.5 crore	Rs 150 crore	Rs 265 crore	Rs 1.7 crore
Elastic Narrow Fabrics (Tapes)	Quantity	830 million meters	111 million meters	110 million meters	830 million meters	1110 million meters	
	Value	Rs 455 crore	Rs 65 crore	Rs 155 crore	Rs 365 crore	Rs 625 crore	Rs 273 crore
Velcro	Quantity	155 million meters	20 million meters	8 million meters	165 million meters	300 million meters	
	Value	Rs 62 crore	Rs 9 crore	Rs 5.5 crore	Rs 65 crore	Rs 150 crore	Rs 9.7 crore
Labels	Quantity	17550 million pieces	1190 million pieces	175 million pieces	18560 million pieces	24840 million pieces	

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
	Value	Rs 1220 crore	Rs 85 crore	Rs 27crore	Rs 1280 crore	Rs 1710 crore	Rs 38 crore
Umbrella Cloth	Quantity	-	9 million sq meter	-	9 million sq meter	14 million sq meter	
	Value	-	Rs 80 crore	-	Rs 80 crore	Rs 120crore	-
Sewing Threads	Quantity	136990 MT	1860 MT	8845 MT	130,000 MT	191,000 MT	
	Value	Rs 3990 crore	Rs 50 crore	Rs 140 crore	Rs.3900 crore	Rs.5730 crore	Rs 226 crore
TOTAL	Value	**Rs 6,507 crore**	**Rs 401 crore**	**Rs 338 crore**	**Rs 6,570 crore**	**Rs 9,665 crore**	**Rs 550 crore**

As per ECTT report, the potential market sizing for 2007-08 was as given below:-

Market size (ECTT report)		2001-02	2007-08 (P)
Shoe laces	Quantity	2469 T	3308 T
	Value	Rs. 144 crore	Rs. 193 crore
Interlinings	Quantity	94.2 million meters	156.17 million meters
	Value	Rs. 246 crore	Rs. 407.3 crore
Zip Fasteners	Quantity	75 million meters	143.5 million meters
	Value	Rs. 300 crore	Rs. 574 crore
Elastic Narrow Fabrics (Tapes)	Quantity		
	Value	Rs. 1000 crore	Rs. 1772 crore
Velcro	Quantity	250 million meters	314 million meters
	Value	Rs. 120 crore	Rs. 212 crore
Labels	Quantity		
	Value	Rs. 700 crore	Rs. 1200 crore

Market size (ECTT report)		2001-02	2007-08 (P)
Umbrella Cloth	**Quantity**	490 T	940 T
	Value	Rs. 9.13 crore	Rs. 17.5 crore
Sewing Threads	**Quantity**	95,000 T	1,35,100 T
	Value	Rs. 2876 crore	Rs. 4040 crore
TOTAL	**Value**	**Rs. 5395.13 crore**	**Rs. 8415.8 crore**

Impediments to growth

The cheaper imports of clothtech products (like umbrella cloth, interlinings and hook & loop fasteners) from China and other South Asian countries is the major impediment of growth of clothtech products. The machinery sourced by Indian manufacturers is expensive as compared to cheaper machinery used by Chinese manufacturers, hence, increasing the fixed costs. Further, the Chinese companies have better economies of scale e.g. a hook and loop fastener company typically has 400-500 looms in China whereas Indian companies have 70-80 looms only.

Shoe laces

Shoe lace is a band that pulls the shoe together to hold it to the foot. A shoelace consists of two components: a tape that pulls the shoe tightly together, and an aglet, the hardened taped end that fits through the eyelets on a shoe or boot. Shoe laces are also known as shoestrings or boot laces

Shoe Laces also find application in garments (kids wear), shopping bags, office stationary, home decoration etc. However the consumption in these applications is negligible as compared to that in the footwear industry.

Product characteristics

Shoe laces are primarily made of Polyester, Cotton and Nylon. Polyester shoe laces dominate the market because of higher durability and better anti-slip properties. Cotton shoe laces are waxed to improve their performance and appearance.

Shoe laces are manufactured in variety of colours, shapes and sizes. Shoe laces are available in colours such as white, black, brown, blue, green, red, orange, yellow, etc. as well as colour combinations and patterns based on customer requirements. The product can be flat, round or oval in shape. Round laces are generally used for leather/formal shoes where as flat laces find majority of its application in sport/casual shoes.

Type of lace	Average Width / Diameter
Flat	8-10 mm
Round	3-5 mm

Source: Industry survey

Shoe laces are manufactured in standard sizes of 24”, 30”, 36”, 48” etc. as well as custom made as per the required length which depends on the application. The 24” and 30” sizes constitute 80% of the market.

Market dynamics and key growth drivers

Shoe laces are a commodity product. The simple technology level and minimal functionality of the product make it difficult for manufacturers to differentiate their products. Since the product contributes a small share to the total cost of footwear, most footwear manufacturers allow their manufacturing units to source shoe laces locally rather than doing centralised purchase. Thus, cost competitiveness and ability to provide variety of shades are the critical factors for success.

Majority of the consumption of shoe laces is in the footwear industry. Footwear industry is a significant segment of Indian industry with India ranking second among the footwear producing countries next only to China. The Indian footwear market in 2007-08 is estimated at 2.2 billion pairs including both open and closed footwear (*Source: NMCC report)*. In addition, India exported 143 million pairs of footwear in 2007-08.

The Indian footwear retail market is anticipated to surge at a CAGR of 20% during the next 3 years on account of rising brand and fashion awareness and improving living standard. The taste of Indian consumers is gradually inclining towards casual resulting in the expansion of the casual footwear market which is expected to have a share of approximately 60% in the overall footwear retail market. The growth trend in the footwear industry signals good prospects for the shoe lace industry however, considering the changes in consumer preference the shoe lace industry is expected to grow at a rate of 6%year on year.

Market size of Shoe laces and future forecast

Shoes account for majority of consumption of shoe laces. In 2007-08, the domestic market size of foot wear in India is estimated to be 2200 million pairs out of which closed foot wear account for 50% share. Amongst the closed footwear segment 55% of the footwear are expected to have laces. In addition majority of the exported footwear are expected to bear laces.

Usage of Shoe laces

Usage of Shoe laces	
Total domestic footwear market	2200 million pairs
Share of closed footwear	50%
Share of sports footwear bearing laces	30% of Closed footwear market
Share of men's footwear bearing laces	25% of closed footwear market
Total footwear exports	143 million pairs
Share of exported footwear with laces	70%
Replacement market	10%
Price per pair of shoe lace	Rs. 2.50
Weight of material required to manufacture a pair of lace	3 gms

Source: Industry survey, IMaCS analysis, DGCIS

Laces are also used in other applications i.e. garments (kids wear), shopping bags, office stationary, home decoration etc. The usage of laces in these applications is expected to be 10% of the total usage.

Current Market size and future potential

The market size for shoe laces is estimated to be 2540 MT valued at Rs. 215 crore. With increasing disposable income and improving living standard the per capita consumption of footwear is expected to increase over the next three years. Considering the growth prospects of the Indian footwear industry and the changes in consumer preference the demand for shoe lace is expected to increase at 6% year on year. Hence, the demand for shoe lace is expected to increase to 3400 MT by 2012 – 2013. The market potential in 2012-13 is estimated at Rs 365crore. An inflationary increase of 5% has also been considered to derive the projected market size.

Market size for shoe laces	2007-08	2012-13
Quantity	850 million pairs	1135 million pairs
	2540 MT	3400 MT
Value	Rs 215 crore	Rs 365 crore

Source: Industry survey, IMaCS analysis

Key manufacturers of shoe laces

The shoe lace manufacturers are predominantly SSI units and are located in the footwear manufacturing clusters of Agra, Chennai, Vellore, Kanpur, Kolkata etc. Some of the manufacturers of shoe laces are:-

- Neelam shoe lace industry (Delhi),
- Indian Shoe lace (Agra). Indian shoe Lace Company has a capacity of manufacturing 25,000 shoe lace pairs per day.

Imports & Exports of Shoe laces

The estimated import figures for laces are as given below:-

HS Code	Description	Imports (in Rs crore)
		2007-08(E)
58062000, 58063910, 58063990, 58081090	SHOE LACES*	~ Rs 15-20 crore

Source: IBIS, IMaCS Analysis

** Apart from these HS codes, Shoe-laces are also imported in nominal amounts under the HS codes - 58042990, 58043000, 58061000, 58063930, 58079090, 63079090 (included in Imports value above)*

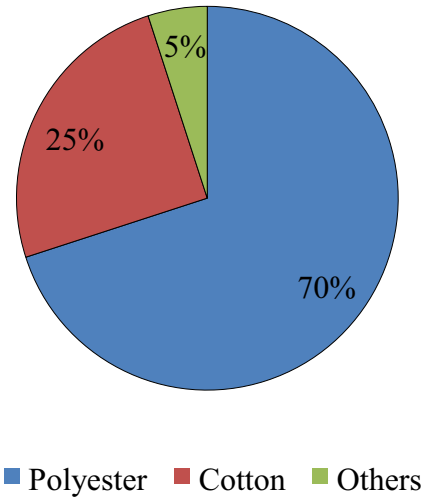
Hong Kong and Thailand account for over 80% of imports of shoe laces followed by China. Marginal quantity of shoe laces is also imported from Indonesia, Taiwan, US, Italy, Germany and other European countries.

The direct exports of shoe-laces from India are negligible.

Raw materials

Polyester, Cotton and Nylon are the main raw materials used for shoe laces. Fig 1 gives the raw material based market share of shoe laces. Polyester shoe laces have the largest market share and their share has been increasing over the years. These laces are manufactured from polyester filament yarn of 300 denier. Reliance Industries is the major supplier of polyester yarn in India. Cotton shoe laces are manufactured using cotton yarn of counts 6s, 10s, 20s and 40s. Dyed yarn is used for manufacturing standard coloured shoe laces like black, brown, blue etc.

Raw material based market share of shoe laces



Key machinery manufacturers/suppliers in India

The machinery used for manufacturing shoe laces is given below:

Machine	Approximate Cost of machine (Rs)	Capacity
Braining machine	7,500 – 20,000	60 -70 metre/hour
Tipping machine		
Manual	80,000	
Semi-automatic	150,000	
Automatic	250,000	500 pairs/hour
Waxing machine	75,000	

Source: Industry survey

Geesons International (Ahmadabad) and Shiv Engineering Works (Faridabad) are some of the manufacturers of braiding machines.

Quality Control and standards in India

There are no IS codes for shoe laces. The manufacturers use the testing facilities of FDDI (Noida).

Interlining

Interlining is a fabric used between the inner and outer layer of the garment to improve shape retention, strength or bulk. Interlining finds application in the waistbands, flies, pockets and belt loops of men's trousers; in the cuffs, collars and plackets of shirts and in the lapels, fronts, collars and pockets of tailored jackets and blazers. Invisible from the outside, interlining ensures accurate fit and optimum wearer comfort and thus, forms an important part of the garment.

The Garment sector is presently one of the most important sectors in the economy in terms of output, foreign exchange earnings and employment. In FY2006 India's total production in the Garment sector was estimated at 7.85 billion pieces (Rs. 933 billion) out of which exports comprised of 2.24 billion pieces (Rs 372 billion). Garment industry maintained a growth rate of 15% in 2007-08 and is expected to grow at a CAGR of around 13% over the next five years. The proposed growth of the garment sector signals good potential for interlinings.

Product characteristics

Interlining may be woven, knitted or nonwoven made out of cotton, polyester, polyester/cotton or polyester/viscose blend. Nonwoven interlining is available in weight ranging from 18 gsm to 70 gsm whereas woven interlining is available in weight ranging from 120 gsm to 250 gsm. Both woven and nonwoven interlinings are available in fusible as well as non-fusible varieties.

Fusible interlining is a base fabric coated with a thermoplastic material usually HDPE or LDPE. It can be bonded to another fabric by the application of heat and pressure. Fusing offers many advantages to both garment manufacturer and wearer. For the wearer, garment durability is increased and crease-recovery is improved. For the manufacturer, garments can be produced to a consistent quality.

Key application areas of interlining

Interlinings are majorly used in garments, the choice being driven by the buyer's requirement and cost. Majority of garment manufacturers use fusible interlinings however, basic interlinings find application as the back cloth for embroidery. Interlinings also find application in shoes, furnishing, etc.

Market dynamics and key growth drivers

The demand for interlining is majorly governed by the demand for garments. Readymade and tailor made shirts account for 80% of the consumption of interlining, the balance 20% of interlining being consumed in other garments i.e. trousers, jackets, ladies dresses, suits.

The current domestic men's readymade shirt market in India is estimated at 375 million pieces accounting for 23% of the total men's wear market and is expected to grow at a CAGR of 12% over the next five years. The domestic women's readymade shirt market has also seen a new dimension owing to the growing number of working women, changing fashion trends, rising level of information and media exposure and entry of large number of foreign brands. The segment is expected to grow at a CAGR of 15-20% over the next five years. In addition, the estimated sale of shirting fabric in 2007-08 was approximately 1750 million meters which corresponds to 800 million pieces of shirts. India exported 208 million pieces of shirts in 2007-08 *(Source: DGCIS data)* and the exports are expected to achieve a volume growth of 4-5%. The healthy growth in garment industry signals a good growth potential for the interlining industry though the market for interlining is very price conscious.

Market size of interlining fabric and future forecast

Readymade and tailor-made shirts account for 80% consumption of interlining fabric. On an average each shirt requires 15 to 20 cm of interlining. Interlinings are not used in all shirts; the choice based on requirement of the buyer and cost.

Usage of interlining for shirts in 2007-08

Readymade shirts for domestic consumption	423 million pieces
Tailor made shirts for domestic consumption	800 million pieces
Shirt exported	208 million pieces
Shirts considered for interlining	960 million pieces
Interlining required per shirt	15 – 20 cm
Interlining required for shirts	170 million meters

The domestic market size of interlining for shirts is estimated at 170 million meters. Other garments are expected to account for approximately 20% of the interlining domestic consumption. Thus, the total market for interlining fabric is estimated at 215 million meters valued at Rs. 515 crore.

The observed trend in the garment industry reveals a shift towards readymade garments. Thus, the domestic consumption of readymade shirts is expected to increase at 10% year on year. The domestic consumption of tailor made shirts is expected to increase at 5% year on year. Thus, the demand for interlining is expected to increase to 290 million meters by 2012-13 (growing at around 7% year on year). The market potential in 2012-13 is estimated as Rs. 700 crore. No change (upwards or downwards) in the price of interlining has been assumed for deriving the projected market size. The current and future forecast of interlining consumption is given below:-

Market size of interlining fabric	2007-08	2012-13
Quantity	215 million meters	290 million meters
Value	Rs. 515 crore	Rs. 700 crore

Source: Industry survey, IMaCS Analysis

Key manufacturers of interlining fabric

In India, the key manufacturers of woven interlining are Bombay Dyeing, Ruby Mills, Ashima Syntex and Talreja Textiles. Bombay Dyeing has an installed capacity of 12 lakh meters per month of woven interlining. The company manufactures 100% cotton fusible interlining with both HDPE and LDPE coating. Ruby Mills has an installed capacity of 9 lakh meters per month. The company manufactures 100% cotton woven interlining of both basic and fusible type. The fusible interlining is manufactured using powder coating technology. Ashima Syntex has an installed capacity of 6 million meters per annum of woven interlining. The company manufactures fusible interlining using HDPE/LDPE and polyester powder coating. Some of the other manufacturers of woven interlining are Udhawdas & Sons and Shri Lakshmi Cotsyn.

Manufacturer	Year	Production quantity	Installed capacity
Bombay Dyeing Ltd.	2007-08	9.6 million meters	14.4 million meters
Ruby Mills Ltd.	2007-08	6 million meters	10.8 million meters
Ashima Syntex Ltd.	2007-08	NA	6 million meters
Talreja Textile Ind Pvt. Ltd.	2007-08	NA	5 million meters
Udhawdas & Sons	2007-08	5 million meters	6 million meters
Shri Lakshmi Cotsyn Ltd.	2007-08	14 million meters	

Source: Capitaline, Annual reports, Industry survey

In addition, there are a large number of small units which account for a significant share of the interlining production.

Thermal bonded and chemical bonded nonwoven fabrics also find application as garment interlining. According to INDA report 140 million square meters of nonwoven interlining was consumed in India in 2006-07. The key manufacturers of non woven interlining fabric in India are:

- Supreme Nonwovens Pvt. Ltd.
- KK Nonwovens India
- Freudenberg Nonwovens India Pvt. Ltd.Uniproducts (India) Ltd.

Imports and Exports of Interlining

The estimated import figures for interlining are given below:

HS Code	Description	Imports (in million meters)	Imports (in Rs crore)
		2007-08(E)	**2007-08(E)**
54076900, 54078290 55121910, 55132300 59031090, 59039010 59039090, 62179090	100%POLYESTER, POLYESTER/COTTON BLENDED WOVEN, KNITTED, FUSIBLE INTERLINING	**Around 25 million meters***	**~ Rs. 50 crore**
56031100, 56031200 56031300, 56031400 56039100, 56039200 56039300, 56039400	100%POLYESTER, POLYESTER/COTTON BLENDED NON WOVEN INTERLINING	**Around 100 million meters**	**~ Rs. 35 crore**

Source: IBIS, IMaCS Analysis

**Some interlining fabric is also imported under HS Codes 54049090, 54072090, 52121110, 60019100, 60059000*

Interlining fabric is imported from Korea, Singapore, China, Hong Kong and Taiwan. China and Hong Kong together accounted for 70% of these imports.

HS Code	Description	Exports (in million meters)	Exports (in Rs crore)
		2007-08(E)	**2007-08(E)**
54076900,54078290 55121910, 55132300 59031090, 59039010 59039090,62179090	100%POLYESTER, POLYESTER/COTTON BLENDED WOVEN, KNITTED,FUSIBLE INTERLINING	**Around 2 million meters***	**~ Rs. 3 crore**
56031200,56039200 56039400,	100%POLYESTER, POLYESTER/COTTON BLENDED NON WOVEN INTERLINING	**Around 6 million meters**	**~ Rs. 5.5 crore**

Bangladesh and Srilanka account for more than 95% of these exports. The data indicate that the industry is import intensive. These exports are estimated to be Rs 11.4 crore for the year 2012-13.

Raw materials

Woven Interlining

Woven interlinings are made of cotton, polyester and polyester/cotton blend. The fibres used are domestically sourced. The base fabric as such can be used as interlining (base interlining). Else the fabric is coated with a thermoplastic material usually HDPE or LDPE to manufacture fusible interlining.

Nonwoven Interlining

Thermo bond and Chemical bond interlining are made of polyester, nylon and polypropylene sourced domestically.

Key machinery suppliers for manufacturing Interlining

Machine	Company
Machine for thermal bonding of nonwoven	A.T.E. Private Ltd.
Machine for Chemical bonding of nonwoven	Dhall Enterprises and Engineers Pvt. Ltd.
Fusible Interlining Coating and Laminating Plants: Powder Dot Coating Plant Scatter Coating Plant	Hi-Tech Engineers, Ahmedabad

Zip Fasteners

A zipper (zip fastener or zip) is a device for temporarily joining two edges of fabric. Zippers have applications in the following areas:

- Luggage industry: Soft luggage, handbags, purses, etc.
- Apparel industry: Trousers, jackets, skirts, frocks, etc.
- Home Furnishing industry: pillow covers
- Leather Garment and Footwear industry: leather garments, shoes, etc.

Product Characteristics

Zip fastener/zipper consists of two parallel teeth stringers closed or opened by means of a sliding clip between them. A zipper has three major parts - the tape, the elements and the slider. Tape is usually made of polyester. However, other synthetic fibre tapes, vinyl tapes and cotton tapes are also used. Zippers can be classified into three main varieties based on the material of construction– Polyester/Nylon (Coil), Metallic and Moulded (Plastic).

Polyester/nylon zippers have achieved greater commercial significance due to their light weight, longer life, corrosion resistance and easy availability in variety of colours. The application areas for various types of zippers are given below.

Application area for various types of zippers

Zippers	Applications
L type coil	Trousers, Skirts
Spiral Coil	Trouser, Skirts, Jackets, Shoes/Boots, Luggage, Hand Bag
Invisible	Ladies Dresses (Back Opening), Leather Skirts
Plastic	Track suits, T-Shirts, Men's open shirts, Jackets
Metal	Denim, Cotton Trouser, Jackets, Industrial Wear, Tents, Shoes/Boots

Source: Industry survey

Zip fasteners are described according to width of the zip element. They are also known by their length and size (width of the zipper chain). The average size of a zipper here has been considered as 8” and the length of a zipper (tape length) on an average is 2 centimetres more than the size of the zip.

Market dynamics and key growth drivers

Zippers dominate the category of fasteners. They are a key input to readymade garments industry, home furnishing industry, soft luggage industry and leather garments and footwear industry (*The table below gives the share of consumption of zippers in various application areas*). Thus, growth in these end user industries is the key growth driver for the zipper industry.

Consumption pattern of zip fasteners in India

Application of zip fasteners	*% Share (2007-08)*
Export Garments	20%
Domestic Garments	35%
Luggage	30%
Others*	15%

**Includes cushion covers, leather products, exports etc.*
Source: Industry survey, IMaCS Analysis

Readymade Garments industry is the largest consumer of zip fasteners. While all trousers and jeans have zippers, the product is also used to some extent in other garments such as frock, half pants, ladies dresses, skirts, jackets, kids wear and uniforms. Another major application of zip fasteners is in the soft luggage items like hand bags, school bags, purses, laptop bags, brief cases etc. The average price of zipper is 50 paisa per inch. The consumption norms of zippers in various application areas are given below:

End use product	Consumption norm of zip fastener
Trouser	7" to 9"
Children suits	5"
Ladies dresses	6" to 16"
Jeans	6" to 8"
Jackets	20" to 25"
Bags	Varies from 15" to 60" depending on the product
Cushion cover	12" to 22"
Sleeping bag	95" to 150"

In a zipper, the tape (technical textile part) is on an average 10% of the total weight. The value of the tape is varies from 5% - 15% of the value of overall zipper. On an average the value of the tape is 10% of the value of the zipper.

Zippers are used extensively in the garment segment. The penetration of zippers is higher in the western garments compared to the Indian outfits. However with increase in the penetration of western outfits in

the Indian clothing scenario the consumption of zippers in the overall garment sector is expected to increase in line with the growth of garment industry. The domestic garment consumption is expected to register a CAGR of 10% for the next five years whereas the Indian garment export segment is expected to grow at 4% year on year during the same period. Zippers have a significant penetration in the Soft luggage industry. Thus, the consumption of zippers is expected to increase in proportion to the growth in the soft luggage industry (growing at 20% year on year). There are various other applications of zippers such as home furnishings (e.g. cushion covers), sleeping bags, footwear, leather products, etc. Home furnishing segment is expected to grow at 8% whereas the leather goods at around 6%.

Market size of Zip Fasteners and future forecast

The current and future forecast of the market size of Zip fasteners is given below:-

Zip Fasteners Industry	2007-08	2012-13
Quantity	545 million meters	950 million meters
Value	Rs 1370 crore	Rs 2400 crore
Quantity of TT Component (Tape)	600 million meters	1050 million meters
Value of TT Component (Tape)	Rs 150 crore	Rs 265 crore

Source: Industry survey, IMaCS Analysis

The present consumption of zip fasteners in garment industry is estimated at 310 million meters valued at Rs. 620 crore. Luggage industry is another major consumer of zip fasteners; around 30% of the total consumption of zip fasteners is in the luggage industry which is estimated at 160 million meters valued at Rs. 395 crore. Zip fasteners are also used in various other areas as home furnishings (e.g. cushion covers), sleeping bags, footwear, leather products, etc. which account for around 15% of the total consumption of zip fasteners. The market size of zip fasteners for these applications is estimated at 85 million meters valued at Rs. 170 crore. Thus, the total market size for zip fasteners is estimated at 545 million meters valued at Rs. 1370 crore. The product mix of the zip fasteners market is given below.

Market share of various varieties of zippers

Zip Fasteners	% Share
Polyester/Nylon zippers	65%
Metallic zippers	25%
Plastic zippers	10%
Total	100%

Source: Industry survey

The total market size for zip fasteners is expected to increase to 950 million meters registering a growth rate of 12% year-on-year. The market potential in 2012 – 2013 is estimated at Rs. 2400 crore. Overall the consumption of zippers in these application areas is expected to grow at a moderate rate of 7%.

Key manufacturers of Zip fasteners

The key manufacturers of zip fasteners are:

- YKK India Private Limited
- Tex Corp. Ltd.
- Zip Industries Ltd.
- Coats India
- Ansun Multitech (India) Ltd.
- Sanghi Zip Fasteners
- Nipon Zip Industry Pvt. Ltd.
- Orbit Zippers Pvt. Ltd
- E. Z. Y. Slide Fastners Limited
- Prym Fashion India Private Limited

Ansun Multitech (India) Ltd. manufactures nearly two million assembled Zipper Sliders, 50,000 to 60,000 pieces of finished heavy duty Brass Denim Zippers, 25,000 Meters of Heavy Duty CFC Zipper long chain for Luggage and few other accessories. Besides these there are many small scale units that manufacture zip fasteners. These players in the unorganised sector account for 60% of the domestic production of zip fasteners.

Imports & Exports of Zip Fasteners

The estimated import figures for zip fasteners are as given below:-

HS Code*	Description	Imports (Quantity)	Imports (in Rs crore)
		2007-08(E)	2007-08(E)
96072000, 96071110/90, 96071910/90	ZIP FASTENER	~ 6 million meters	~ Rs 60 crore

Source: DGCIS, IBIS, IMaCS Analysis

** Around 95% of imports take place under the mentioned HS codes*

Hong Kong and China together contribute around 70% to the total imports, whereas Taiwan and Japan contribute around 8% each. Zip fasteners are also imported in small quantities from Italy, Japan, Tukey and UK.

The estimated export figures for Zip fasteners are as given below:-

HS Code*	Description	Exports (Quantity)	Exports (in Rs crore)
		2007-08(E)	2007-08(E)
96071110, 96071910/90, 96072000	ZIP FASTENER	~ 20 million meters	~ Rs 10 crore

Source: IBIS, IMaCS Analysis

Over 55% of the exports of zip fasteners are to Bangladesh whereas around 12% are exported to Pakistan, 10% to Sri Lanka and 8% to UAE. Out of the total exports the technical textile component is only about Rs 1.5 crore. These exports are estimated to be Rs 1.7 crore for the year 2012-13.

Quality Standards Applicable

The main quality standards applicable for the zip fasteners in India are: IS 8894/3184/4829. Other international standards are JIS-S3015 and ASTM D2061-1998

Elastic Narrow Fabrics

Elastic narrow fabrics are an important input to the undergarment industry. They are also used in other garments i.e. shorts, jackets and skirts, moulded luggage, baby diapers, sports goods, medical goods, etc.

Product characteristics

Elastic narrow fabrics are made from an elastomeric yarn and yarns made from cotton, polyester and nylon. More than 3000 different varieties of elastic fabrics are manufactured however, based on manufacturing technology they can be classified as woven and knitted. The fabric is expected to have the following properties:-

- Stretchability
- Shrink resistance
- Durability to regular wash
- Soft feel

Knitted elastic tapes are generally available in widths 8 mm, 12 mm, 20 mm and 25 mm. Woven elastic tapes range in widths 25 mm, 32 mm and 38 mm. These elastic tapes are primarily used for undergarments. The narrow fabric is made with or without logo along the length depending on customer's requirement.

Market dynamics and key growth drivers

Elastic narrow fabrics are majorly consumed in inner wears. The inner wear market accounts for around 15 - 20% of the total apparel sales volume in India. This market is expected to maintain a steady volume growth of 6% which functions as a key driver for growth in elastics industry.

Market size of elastics and future forecast

Undergarments account for 80 - 85% of the consumption of elastic fabrics. As per the National Household Survey 2006 by Textile Committee the undergarment domestic consumption in 2005 - 2006 was around 650 million pieces growing at a CAGR of 6% over the last 2 years. Thus, the undergarment market in 2007-08 is estimated at 750 million pieces in 2007-08 of which approximately 0.6 million pieces are imported. In addition, 50 million pieces of undergarments were exported in the same year. On an average each undergarment consumes 0.83 meters of elastic. The average price of elastic narrow fabric is Rs. 4.4 per meter.

In addition elastic tapes are also used in garments, moulded luggage, wrist bands, baby diapers, etc. The usage of elastics in these applications is 15 – 20% of the total usage.

Current Market size and future potential

The current and future forecast of the domestic usage of elastic narrow fabrics is given below:

Domestic usage of Elastic narrow fabrics	2007-08	2012-13
Quantity	830 million meters	1,110 million meters
Value	Rs 365 crore	Rs 625 crore

Source: Industry survey, IMaCS Analysis

The market size for elastic narrow fabrics is estimated at 830 million meters valued at Rs. 365 crore. The demand for elastic tapes is expected to increase to 1110 million meters by 2012-13 registering a growth rate of 6% per annum. The market potential in 2012-13 is estimated to be Rs. 623 crore. An inflationary increase of 5% has also been considered to estimate the market size.

Key manufacturers of elastics

Spica Elastic Private Limited is the largest manufacturer of narrow elastic fabrics in India with installed capacity of 18 million metres of narrow fabrics per month. The company has vertically integrated production facilities and manufactures broad range of products including men's jacquard elastics for briefs and boxers, men's plain elastics for briefs and boxers, bra strap elastics and ladies panty elastics in 100% Cotton, Nylon and Polyester.

The major producers of elastics in India are given as follows:

Manufacturer	Year	Production (million meters)	Value (Rs crore)	Price (Rs per meter)	Installed capacity (Million Meters)
Spica Elastics	2007-08	180	NA	NA	216
Sky Industries	2007-08	141.5	27.2	2	202.9
B. R. Elastic	2007-08	7.25	NA	NA	NA

Source: Spica Group website, Sky Industries annual report

Import and Exports of elastics

The import figures for elastic narrow fabrics are as given below:-

HS Code	Description	Imports Quantity (million meters)	Imports Value (Rs crore)
		2007-08(E)	2007-08 (E)
58062000, 58061000, 58063990, 58089090,	NARROW WOVEN FABRICS WITH 5% OR MORE OF ELASTOMER YARN THREAD	~ 110 million meters	~ **Rs 50 crore**
60012200, 60029000, 60024000, 60059000,	KNITTED OR CROCHETED NARROW FABRICS	**~ 1.5 million meters**	~ **Rs 15 crore**

Source: IBIS, IMaCS Analysis

Almost 40% of the elastic narrow fabrics are imported from Hong Kong followed by around 17% from Srilanka and 14% from China. Imports also take place from Philippines and Vietnam

The export figures for elastic narrow fabrics are as given below:-

HS Code	Description	Exports Quantity (million meters)	Exports Value (Rs crore)
		2007-08(E)	2007-08 (E)
58062000, 58061000, 58063990, 58089090,	OTHR NARROW WVN FBRCS CNTNG BY WT 5% OR MORE OF ELASTOMRC YRN/RUBR THRD	~ 65 million meters	~ **Rs 145 crore**
60012200, 60029000, 60024000, 60059000	KNITD OR CROCHETED NARROW FBRCS	~ 45 million meters	~ **Rs 11 crore**

Source: IBIS, IMaCS Analysis

The key export destinations of elastic fabrics are Egypt and Sri Lanka with export share of 25% and 28% respectively. These exports are estimated to be Rs 273 crore for the year 2012-13.

Raw-materials

Elastic narrow fabrics are made from heat resistant latex thread generally referred to as Rubber thread or heat resistance spandex yarn. This yarn is woven or knitted along with yarns of polyester, nylon or cotton. Polyester yarn of 150 deniers and nylon yarn of 210 denier are used for the purpose.

Key machinery suppliers

The key machinery suppliers in India are:

Company	Machines supplied
Trikso India Machineries, Ahmedabad	High Speed Needle Looms Festooning machine Warping Machine Elastic finishing machine Measuring & spool winding machine
Susmatex Machinery Ltd., Ahmedabad	Electric Jacquared For Narrow Fabric Loom Needle Loom Warping Machine

Other key suppliers of machinery are:

- A.T.E Pvt. Ltd.
- Biance Textile Solutions (I) Pvt. Ltd.
- Laxmi Automatic Loom Works
- Himson Textile Engineering Industries Pvt. Ltd.

Quality Control and Standards – The manufacturer of the elastic narrow fabric usually follows the breaking strength and elongation specifications given by the customer.

Hook and Loop Tape Fasteners (Velcro)

Velcro is a brand name of the fabric hook-and-loop fasteners however today it is used as a generic term for the product hook & loop tape fasteners. Hook and loop (H&L) fasteners consist of a combination of two separate woven tapes, one called as hook tape and the other as loop tape. The tapes display excellent fastening properties when placed in contact with each other and thus offer hundreds of potential closure systems (fastening applications) for a wide range of applications. H&L fasteners find application in industries such as:

- Leather garments/furnishings
- Surgical and orthopaedic apparatus
- Shoes and footwear manufacturing
- Luggage/bag manufacturers
- Toys
- Plastic goods
- Automobile upholstery and various other industry segments.

H&L fasteners are easy to use, safe and maintenance free. The effectiveness of the fastener is maintained even after repeated fastening and unfastening. Thus, the product has achieved good penetration in various application areas. Velcro held together a human heart during the first artificial heart surgery. It is used in nuclear power plants and army tanks to hold flashlights to walls. Cars use it to bond headliners, floor mats and speaker covers. It is used in the home when pleating draperies, holding carpets in place and attaching upholstery, among many other things. It closes backpacks, briefcases and Trapper Keepers, secures pockets and holds disposable diapers on babies. It is used in surfboard leashes and orthopaedic braces. H&L fasteners made of Teflon loops, polyester hooks, and glass backing is used on space shuttles.

Product Characteristics

H&L fasteners are generally made of Nylon and Polyester. The product is available in width ranging from 12 mm to 125 mm and length of 25 meters though it can be produced in any length depending upon the customer's requirement. The H&L fastener of 1 meter length and 25 mm of width, weighs 7.5 grams.

Market dynamics and key growth drivers

H&L fasteners are used as fastening system in a variety of areas. Footwear industry is the major consumer of H&L fastener accounting for around 20-25% of the total consumption. In the footwear industry especially these fasteners are used in the kids and speciality sports category. Defence segment consumes

H&L fasteners in clothing and other accessories and is the second largest application area with around 7-10% usage. Other important segments which consume around 10% of H&L fasteners are nettings, automobile and saddlery segment. Other applications include orthopaedic goods, sports goods, leather goods, abrasives, stationary, luggage etc.

The price of H&L fasteners is indirectly related to the oil prices as the raw material (nylon/polyester) is a petroleum product. However the price variations are not proportionate and are experienced after a long time lag. The average price of one meter tape in the year 2007-08 was Rs 3.90.

Market size of H&L fasteners and future forecast

Shoe industry is the largest consumer of H&L fasteners. While all the kids' shoes and floaters have H&L fasteners their application is lesser in other category of shoes. Another major application of H&L fasteners is in the defence segment for the clothing. It also has an application in soft luggage items like hand bags, school bags, purses, laptop bags, etc. The average price of H&L fastener is Rs 3.9 per m. The consumption norms of H&L fasteners in various application areas are given below:

End use product	Consumption norm of H&L fastener
Shoes	5 to 15 cms
Defence clothing	50 to 75 cms
Automobile	50 to 100 cms
Saddlery	75 to 100 cms
Netting	Equivalent to the perimeter of the net
Bags	Varies from 5 to 50 depending on the product
Cushion cover	5 to 25 cms
Sleeping bag	50 cm to 2 meters
Robe	5 to 10 cms

The current and future forecast of H&L Fastener's consumption is given below:

Market size of H&L Fasteners	2007-08	2012-13
Quantity	165 million meters	300 million meters
Value	Rs 65 crore	Rs 150 crore

Source: Industry survey, IMaCS Analysis

The current consumption of H&L fasteners is estimated at165 million meters valued at Rs 65 crore. The market is expected to increase to 300 million meters (growing at 12% year on year) by 2012 - 2013. The market potential in 2012 – 2013 is estimated at Rs 150 crore. An inflationary increase of 5% is considered for estimating the market size.

Key manufacturers of Hook & Loop fasteners

Sky Industries Limited is the largest manufacturer in India with over 50% market share. The company exports around 15% of its produce to USA (over 40%), Turkey (over 25%), Venezuela, UK and Sweden (6-8% each), Kenya, Tanzania, Srilanka and other European countries. Sky Industries had also worked towards successful implementation of anti-dumping on narrow woven fabrics originating in or exported from China and Chinese Taipei.

Manufacturer	Year	Sales Quantity (lakh m)	Value (Rs crore)	Unit Price	Installed capacity
Sky Industries	2007-08	904.96	34.61	Rs 3.82/m	924 lakh meters

Source: Capitaline, Annual reports, Industry survey

The other manufacturers in this industry are

- Siddartha Filaments Private Limited, Surat
- Siddartha Magic Tapes Private Limited, Gujarat
- Magic Fasteners Private Limited, Rohtak, Haryana.

Imports & Exports of Hook & Loop fasteners

The estimated import figures for H&L fasteners are as given below:-

HS Code*	Description	Imports (Quantity)	Imports (in Rs crore)
		2007-08(E)	2007-08(E)
58063990, 58061000, 59119090, 58089090, 39269099, 54073090, 58063200, 58069190	VELCRO TAPE, LOOP TAPE, HOOK AND LOOP FASTENER, ETC.	Approx 20 million meters	**~ Rs 9 crore**

Source: IBIS, IMaCS Analysis

** Around 95% of imports take place under the mentioned HS codes*

Hong Kong (30%) and Taiwan (40%) contribute around 70% to the total imports, whereas China contributes around 5% and Vietnam around 6%. Countries like Italy, USA, Denmark & Germany each have a share of 2-3% in the H&L fastener imports in India.

The estimated export figures for H&L fasteners are as given below:-

HS Code*	Description	Exports (Quantity)	Exports (in Rs crore)
		2007-08(E)	**2007-08(E)**
58061000, 58063990, 59069910, 59119090, 58063190, 59069990	H&L FASTENER	Approx 8 million mts	**~ Rs 5.5 crore**

Source: IBIS, DGCIS, IMaCS Analysis

**Around 98% of imports take place under the mentioned HS codes, with over 66% under 58061000*

Over 23% of the exports of H&L fasteners are to USA whereas around 18% are exported to Turkey, 14% to Canada and around 8% each to France, Bulgaria and Venezuela. Around 5% is exported to UK & Sweden each. These exports are estimated to be Rs 9.7 crore for the year 2012-13.

Raw Materials

Nylon filament yarn of deniers 100, 140, 170, 210, 280, 300 and 430 are the key raw material for Hook & Loop fasteners. Few manufacturers also use around 10% of polyester only for the black coloured H&L tapes. Because of poor quality consistency of the domestic supply of these yarns 80 – 85% of the raw material is imported from Malaysia or Taiwan under the HS Code 54026990. Key players like Sky Industries import around 90% of their raw material requirement.

Key machinery suppliers for manufacturing H&L Fasteners

The Hi speed needle looms used for making H&L fasteners are mainly supplied by KY Taiwan and Mueller.

Quality Standards

The main quality standards applicable to hook and loop fasteners are:

- IS-8156-1994
- Oeko-Tex Standard 100 (Product Class II)

- The following tests are performed on the product:
- Peel Strength (Initial)
- Peel Strength (After 5000 opening & closing)
- Shear Strength (Initial)
- Shear Strength (After 5000 opening & closing)
- Dimensional Stability (Shrinkage %)
- Width (mm)
- Colour Fastness to washing
- Phenols, Forbidden AZO-colorants, Allergenic colorants
- Colour Fastness, pH value, Formaldehyde, Extractable
- Heavy Metals, Organo tin compounds, Odour test

IS-8156-1994 standards and some tests like Forbidden AZO-colorants, colour fastness, Organo tin compounds and other tests as per requirement are conducted mainly at BITRA, TUV SUD South Asia, TEXANLAB, SGS India. Oeko-Tex standard 100 testing is performed at Forschungsinstitut Hohenstein in Bonnigheim. The approximate price of the above tests are:

Test	**Approximate price (Rs. per sample)**
Peel Strength	750
Shear Strength	750
Dimensional Stability	150
Colour Fastness	275
Organo tin compounds	5000
All tests for Oeko-Tex standard 100 testing & Certification	5000

Labels

Label is a piece of material attached to an object to show its contents, ownership, use or destination. Labels are used in garments, home furnishing, stuffed toys, soft luggage, shoes etc. Though manufacturers use different type of labels to create a distinct identity, labels in general can be classified into the following varieties:

Type of label	Purpose	Typical Size
Size label	Shows the size of garment i.e. small (S), medium (M), large (L), extra large (XL) etc.	12mm x 25mm
Pocket label	Label stitched on to the pocket	Width ranging from 15mm to 30mm
Main label	Contains information like Brand name and Logo	Width ranging from 16mm to 50 mm ; may go up to 100 mm
Wash care label	Contains the washing instructions for the garment.	Width ranging from 25mm to 40mm

Product Characteristics

There are two primary categories of labels – *Printed* and *Woven*. Printed labels are often printed on materials such as satin, acetate, polyester, nylon and cotton twill. These labels are available in a variety of sizes, colours, and printing options. Woven Labels also available in a variety of finishes and fabric choices i.e. damask, semi-damask, satin, and taffeta.

Labels have major application in garments where the labels are expected to have smooth feel and durability to regular wear and washing as well as they should not snag. Printed labels though inexpensive, are unable to withstand the standard wear. These labels fade either through washing or as a result of skin oils reacting with the print which reduces the branding aspect of the label.
On the other hand, woven labels have better durability to regular wearing and cleanings. Amongst the variety of woven labels damask and damask mixed fabrics are the most reliable and comfortable labels. Damask is a tighter weave fabric that remains soft even with finished edges and provides the best finish with a smoothness that reflects style and comfort and thus, is the most preferred amongst quality conscious customers. Semi-damask has many qualities of damask at a slightly lower price point and hence, is a mid line choice when it comes to labels. Satin is the most popular choice but the fabric is thin and can snag easily. Taffeta is stiffer than satin and can stand up to a bit more snagging. However, with both satin and taffeta the finished edges of the labels can be stiff, leading to a prickly feeling.

Clothing labels come in a variety of styles. The product is available in the following formats:

- Continuous tape in Roll Form
- Cut Seal
- Cut Fold in End fold, Centrefold and Mitre fold
- Filled / Stuffed labels
- Die-cut / Laser cut labels
- Ready-to –stick labels (backside double adhesive tape)

Market dynamics and key growth drivers

The demand for labels is majorly governed by the demand of Apparel, home furnishing, stuffed toys and soft luggage. Thus, the primary growth driver for the labels is the sale of these products.

Per capita disposable income of Indians during 2002 to 2007 has surged at a CAGR of nearly 14% leading to increase in consumerism. Moreover, the mushrooming of shopping malls has also worked in favour resulting in growth of various consumer products. India's total garment production in FY2006 was estimated at 7.85 billion pieces; the domestic clothing consumption registered a 5-year CAGR of 6% *(Source: ICRA Industry Comment – Textiles & Clothing).* Likewise, the domestic consumption of home furnishing has also registered a growth of 6%. The stuffed toys market and soft luggage market has also seen an upsurge. Industry estimates suggest that the stuffed toys is growing at over 25 per cent annually whereas the soft luggage market is expected to grow at 20%. Since labels play an important role in the marketing of these products, consumption of labels is expected to grow in line with the growth in these sectors.

Market size of labels and future forecast

Apparels including hosiery garments and home furnishing sectors account for 80 – 85% of the consumption of labels. The number of labels per garment/home furnishing varies from one to four. Considering the label requirement of various product categories i.e. shirts, trousers, uniforms, inner wear, children wear, skirts, t-shirts, bed sheet, towel etc. the average consumption of label per product is computed as 1.5 labels/garment and 1 label per home furnishing product. The average price per label is around 55 - 60 paise.

Usage of labels in Apparel

Particulars	
Average label per garment	1.6
Average label per home furnishing product	1
Average price of a label	Rs 0.55
Average price of the big fancy label	Rs 5

In addition, labels are also used for shoes, soft toys, luggage, etc. The usage of labels in these applications is around 20% of the total usage.

Current Market size and future potential

The current and future forecast of labels domestic usage is given below:

Market size for labels	2007-08	2012-13
Quantity	18560 million pcs	24840 million pcs
Value	Rs 1280 crore	Rs 1710 crore

Source: Industry survey, IMaCS Analysis

The domestic market size for labels is estimated at 18560 million pieces valued at Rs. 1280 crore. Since apparel and home furnishing account for majority of the consumption of labels, the market for labels is expected to grow in line with the growth in production of these products. The market for labels is expected to increase to 24840 million pieces by 2012 – 2013 registering a growth rate of 6% year-on-year. The market potential in 2012 – 2013 is estimated at Rs. 1710 crore. No inflationary increase has been assumed to determine the market size.

Key manufacturers of labels

Indian Woven-labels industry has around 500 looms that are concentrated in the several cities like Bangalore (75), Delhi (200), Tirupur (50), Mumbai (30-35), Ahmedabad (50-55), Kolkata and other cities of North and North-east.

Unique Tags is one of the key manufacturers of labels; the company manufactured around 25 lakh woven labels in 2005-06 with value of Rs 13.5 crore. Black Label Fashions Ltd is another player selling over 5 crore labels with revenues of over Rs 15 crore. Few other manufacturers of labels are:

Manufacturer	Year	Quantity (million pieces)	Value (Rs crore)	Price (Rs per unit)	Installed capacity
Uniroyal Ind	2007-08	163	7.82	0.47	602880 sq m
Premco Global	2006-07	4.21	0.22	0.52	60.6 million pc
Arex Inds.	2006-07	215.38	14.18	0.66	10966 MPM*
Arrow Webtex (Woven)	2006-07	99.28	4.49	0.45	15 looms
Arrow Webtex (Printed)	2006-07	73.47	3.27	0.44	7 offset machines
Gopala Polyplast	2006-07	NA	22.95	NA	12 looms
Narain Labels		NA	NA	NA	2 lac pcs per day
Gokaldas Exports	In-house use	NA	NA	NA	1 lac pcs per day

Source: Capitaline, Company Annual Reports, Company websites, Industry Survey

**Million picks in mts*

Apart from these there are many small players with an installed capacity of one or two looms each

Imports & Exports of labels

The estimated import figures for labels are as given below:-

HS Code	Description	Imports Quantity	Imports (in Rs crore)
		2007-08(E)	2007-08(E)
58071010/20/90, 58079010/90, 58011000, 58061000, 58063190/990, 58081090, 58089010/40/90, 59019090	Labels	Approx. 1190 million pieces	~ Rs 85 crore
96063090/2990, 96071110/910/990, 94069990	Labels	Approx 0.5 million pieces	~ Rs 0.07 crore

Source: IBIS, DGCIS, IMaCS Analysis

Over 70% of all the imports take place from Hong Kong; China is the next highest contributor with around 10% share. Some quantity of labels is also imported from Italy, Taiwan, Germany, Turkey, France, USA, UK, Portugal and Switzerland

The estimated export figures for labels are as given below:-

HS Code	Description	Exports Quantity	Exports (in Rs crore)
		2007-08(E)	2007-08(E)
58071010/20/90, 58079010/90, 58089090, 58041090, 58109290, 58012290, 58090090	Labels	Approx. 170 million pieces	~ Rs 25 crore
62171010/90, 62179090, 63071010/90, 63079013/19, 63079090/2090*	Labels	Approx 5 million pieces	~ Rs 1.5 crore
90014090, 90029000, 90148090, 95029100/900, 95051000, 96020090, 96063090, 96089990	Labels	Aprrox 0.5 million pcs	~ Rs 0.15 crore

Source: IBIS, DGCIS, IMaCS Analysis

** HS Codes for only main products covering over 99% of exports are shown here*

Sri Lanka and Bangladesh have the highest share of around 30% each in Indian label exports. Exports to UK are around 10% of the total exports. Other countries which have significant share in Indian exports are China (around 5%), Germany, UAE, Pakistan, Thailand, Kenya, Turkey and Tanzania. These exports are estimated to be Rs 37.9 (~38) crore for the year 2012-13.

Raw materials

Printed labels are often printed on materials such as satin, acetate, polyester, nylon and cotton twill. Woven labels are manufactured on Air-Jet Weaving Looms and Rapier Weaving Looms. For polyester labels the warp yarn is supplied by international players like Global Pacific whereas weft yarn is supplied by various domestic players like Reliance, JK Textile, Valson, Welspun, Tirupati, etc.

Key machinery suppliers for manufacturing flex in India

The machines used for manufacturing Woven labels are:

- Flexible Rapier Weaving Machines equipped with electronic jacquard
- Needle Looms
- Warping machines
- MuCAD designing systems.
- Ultrasonic slitting machine.
- Cutfold machines
- Laser cutting machine
- Label finishing machine
- Label stuffing devices

The main suppliers of these machines are

- Jakob-Mueller (Switzerland)
- Kong River (Hong Kong)
- Willy (Italy)
- Viable (USA)
- AG Frick

Printed labels are made using the screen printing or offset printing technology. Machines used for Printed labels are:

- Flexo Fabric Printing Machines
- Letter Press Machines
- Sonic Cutting Machines
- Cold Cut Machines
- Hot Cut Machines

Quality Control and Standards

Quality standards for labels depend on specific buyer requirements since different buyers have their own standards related to product, environment, social etc. However, wash fastness test and dimensional stability test are usually carried out for all labels. Another commonly followed standard is Oeko-Tex Standard 100.

Umbrella Fabric

Umbrella fabric is a medium weight, plain weave taffeta fabric used for manufacturing Umbrellas. Umbrellas are used primarily in rainy seasons. They are also used for protection against Sun however such usage is majorly in regions which encounter extreme sunshine especially the regions close to the equator. Earlier umbrellas were manufactured using cotton fabric coated with waterproofing agent. With advent and extensive usage of synthetic material the umbrella fabric used these days is polyester and nylon taffeta fabric.

Product characteristics

Umbrella fabric is made of polyester filament yarn or nylon filament yarn in varying constructions i.e. 150T, 160T and 190T where T indicates the thread density. The umbrella fabric is expected to be water-proof for the rainy season, should maintain physical form during extreme ultraviolet exposure in the summer season, and should have high tear resistance and high abrasion resistance. The GSM of umbrella fabric typically ranges from 110 to 280 based on type of umbrella.

Market dynamics and key growth drivers

The demand for umbrellas depends upon climatic conditions, population, usage of umbrella for advertisement and social outlook. The umbrella market generally grows slowly due to reuse of old umbrellas however the market has seen a spurt due to usage of umbrella in advertisement and promotional activity by Corporates. Umbrellas for kids with fancy and contemporary designs are also a growing market. The demand for umbrella is expected to grow at 7-10% over the next five years. (*Source: Ministry of Micro, Small and Medium Enterprises)*.

Market size of umbrella fabric and future forecast

The polyester and nylon taffeta fabric is primarily used for umbrella manufacture. Industry survey revealed that umbrella taffeta fabric is still not manufactured in India and is imported. The other usage of taffeta fabric is for some garment application and wind cheater manufacture.

The umbrella market in India is estimated to be 11 million pieces. The complete requirement for umbrella fabric is fulfilled through imports. In FY 2007-08 approximately 7 million dozens of cut umbrella straps in size ranging from 17” x 8” to 24” x 8” were imported. This translates into approximately 9 million square meters of umbrella cloth. Thus, the market for umbrella fabric is estimated to be 9 million square meters valued at Rs.80 crore. With umbrella being a necessity in certain regions due to climatic condition, the increase in population as well as the increase in use of umbrella in corporate promotional activity the

market for umbrella fabric is expected to increase at 9% year on year, in line with increase in demand for umbrellas. Hence, the demand for umbrella fabric is expected to increase to 14 million square meters by 2012 –13. The market potential in 2012-13 is estimated at Rs 120 crore. No change (upwards or downwards) in the price of umbrella fabric has been assumed for deriving the projected market size.

The current and future forecast of umbrella fabric market is given below:

Domestic umbrella fabric consumption	2007-08	2012-13
Quantity	~9 million sq m	~14 million sq m
Value	Rs 80 crore	Rs 120 crore

Source: Industry survey, IMaCS Analysis

Key manufacturers of umbrella

Umbrella manufacturing is concentrated in small scale sector with few players in the organised sector. The key manufacturers of umbrella are given below:

- Ebrahim Currim and Sons., Mumbai
- Kwality Umbrella Manufacturing Co., Mumbai
- Metro Umbrella Industries, Mumbai
- Guru Nanak Industries, New Delhi
- Village Kraft, Orissa

Imports & Exports of umbrella fabric

The entire umbrella fabric requirement is met through imports. Around 80% the imports are from China. Nearly 82 million umbrella fabric pieces of varieties ranging from 150T to 200T were imported in FY08.

HS Code	Description	Imports	Imports (in Rs crore)
		2007-08(E)	**2007-08(E)**
63079090	UMBRELLA COMPONENTS / STRAPS CUT TO SIZE	**Around 9 million sq m**	**~ Rs 80 crore**

Source: IBIS, IMaCS Analysis

Raw-materials and machinery

Taffeta fabric used as umbrella fabric is manufactured on shuttle looms as well as shuttle less looms. The basic raw material used is Nylon or Polyester filament yarn generally 70 denier.

Quality Control and Standards

The requirements for complete umbrella are prescribed in IS: 2920/1964.

Sewing threads

Sewing thread is a ply or cabled yarn used for stitching of apparels, hosiery, embroidery, footwear, leather goods, quilted mattresses, sports goods, saddlery & harness, industrial Gloves, automotive seats/seat belts, upholstery, parachutes, sails, tents, etc.

Product characteristics

Sewing threads are made of ***natural fibres*** like cotton, silk or ***artificial fibres*** like Nylon, Polyester or their blends. An ideal sewing thread should confirm to a high standard of single thread strength, perfectly balanced twist and colour fastness. It should be free from yarn defects like knots, cuts, snarling, twist subs etc. The sewing threads are available in different counts ranging from 18 Tex to 240 Tex. The usage of sewing thread based on end application is given below:

Application		Approximate fabric GSM	Tex Size	Average Strength (gms)
Garments	Extra light	< 135	18	850
			21	
	Light	135 - 205	24	1050
			30	1250
	Medium	205 - 270	40	1850
			60	2950
	Heavy	270 - 408	80	3550
			105	4450
	Extra Heavy Weight	408 & above	120	5500
			120	5500
			150	7400
			180	9800
			220	10500

Application	Tex	Application	Tex
Premium leather	60,40,20	Mattress and quilting	60,40
Economy leather	60,40,20	Saddlery	25,15
Canvas	60,40,20	Outdoor application	40,20,15
Sole stitching	8, 7	Filter cloth	40
Apparels (leather)	75,50,36	Compressor winding	8
Accessories(leather)	75,50,36	Curtain and tents	40
Automotive upholstery	60,40,20	Book binding	15
Soft luggage	40,30,20		

Source: Industry survey

Market dynamics and key growth drivers

Sewing thread being a key component in the stitching, the demand for sewing thread is derived from various end applications such as apparel, hosiery, embroidery, footwear, leather goods and many other industrial goods. The demand from apparels and hosiery are the key segments as they contribute to more than 50% of the market for sewing threads. Price and product availability are important criteria for majority of the applications.

Market size of Sewing threads and future forecast

Sewing threads are majorly used in the stitching of garments both readymade and tailor made, hosiery garments, footwear as well as mechanical closing of bags. The consumption of thread depends on the end application and the type of stitch. The average consumption of sewing thread is given below:

Usage of sewing threads

Article	Average consumption of sewing thread
Garments/apparels	120 meter per piece
Hosiery	50 meter per piece
Footwear	35 meter per piece
HDPE and jute bags	4 – 5 meter per piece

Besides this, sewing threads are also used in stitching of leather products and tarpaulins, kite flying, umbrella stitching, book binging, fish net manufacture and other industrial uses. As per industry sources, these application areas account for 25 -30% of consumption of sewing threads.

The current and future forecast of sewing thread consumption is given below:-

Sewing threads domestic usage	2007-08	2012-13
Quantity	130,000 MT	191,000 MT
Value	Rs 3,900 crore	Rs 5,730 crore

Source: Industry survey, IMaCS Analysis

The market size for sewing thread is estimated at 130,000 MT valued at Rs.3900 crore. The demand for sewing threads is expected to increase to 191,000 MT by 2012-13 registering a growth of 8% year on year. In 2012-13 the market potential is estimated at Rs.5730 crore. An inflationary increase of 5% is considered to estimate the market potential.

Key manufacturers of sewing threads

The key manufacturers of Sewing threads in the organised sector are Madura Coats, Mahavir Spinning Mills (Vardhman Threads) and Precot Meridian.

Madura Coats Ltd (MCL), a subsidiary of Coats Viyella Plc, UK is a market leader in sewing and embroidery thread with 50% market share in the organised sector. MCL supplies its products to clients such as Clairborne, Lee, Levis, Gap, Nike, Adidas, Tommy Hilfiger, among others. In 2007 – 08 the company had an approximate sales volume of 50 million Common Length Unit (CLU) (43 million CLU in domestic and 7 million CLU in export) (One CLU = 10,000 metres).

Mahavir Spinning Mills Ltd (MSML) has two subsidiaries namely VMT Spinning (73.33%) and Vardhman Threads (100%). Vardhman is the second largest producer of sewing thread in the country with production of 28.3 MT per day. The sewing thread plants are located at Hoshiarpur, Baddi, Perundarai and Ludhiana. Two-third of the sewing threads of the company have synthetic base and the remaining are made of cotton.

The sewing thread market is dominated by the unorganised sector i.e. the rewinding mills which are concentrated in the cities of Mumbai, Nagpur, Amaravati, Pune and Sholapur, Ahmedabad, Kolkata, Chennai, Tuticorin, Cochin, Coimbatore, Bangalore, Hyderabad, etc.

Manufacturer	Year	Quantity	Value	Unit Price	Installed capacity
Madura Coats	2001-02	371.173 billion metres	Rs 467.23 crore		
Mahavir Spinning Mills / vardhaman	2006-07	8,851 MT	Rs 296.35 crore	Rs 335/kg	9,767 MT
Precot Meridian	2007-08		Rs 54 crore		2,000 MT
Pasupati Spinning & Weaving Mills	2006-07	5,096 MT	Rs 83.66 crore		
Malwa Cotton Spinning Mills	2006-07	3,995 MT	Rs 122.83 crore		

Source: Capitaline, Annual reports, IMaCS Analysis

Imports & Exports of Sewing thread

The sewing threads are exported to more than 45 countries. The export value is estimated to be Rs 140 crore in 2007-08.

HS Code	Description	Exports (in Rs crore)		Exports (Quantity MT)	
		2006-07	2007-08(E)	2006-07	2007-08(E)
52041110	COTON THREAD, SEWING, CONTNG ANY SYNTHETICSTAPLE FIBRE	35	3	1611	222
52041120	COTTON THREAD,DARNING	0.4	0.8	20	65
52041130	EMBROIDERY COTTON THREAD	4.5	0.3	184	15
52041140	COTON SEWING THREAD NOT CNTNG ANY SYNTHETIC STAPLE FIBRE	2.3	1.5	144	137
52041190	OTHERS	48	51	3840	4544
52041900	SWNG THRD CONTNG LESS THN 85% BY WEIGHT OFCOTTON NOT PUT UP FOR RETAIL SALE	3	2.5	215	119
52042010	COTON THREAD,SEWING, CNTNG ANY SYNTHETIC STAPLE FIBRE	13	10	485	400
52042020	COTTON THREAD,DARNING	0.0	0.1	1	3
52042030	EMBROIDERY COTTON THREAD	0.2	0.9	7	32
52042040	COTON SEWING THREAD NOT CNTNG ANY SYNTHETIC STAPLE FIBRE	20	19	950	810
52042090	OTHER COTTON SEWING THREAD	2	2	90	100
54011000	SEWING THRED OF SYNTHETIC FILAMENTS	30	46	1535	2275
54012000	SEWING THREAD OF ARTIFICIAL FILAMENTS	3	3	115	120
Total Exports		**162**	**140**	**9200**	**8845**

Source: DGCIS, IMaCS Analysis

The imports of sewing threads are dominated by Specialty threads like threads for manufacturing seat belts, automotive seat covers etc.

HS Code	Description	Imports (in Rs crore)		Imports (Quantity MT)	
		2006-07	2007-08(E)	2006-07	2007-08(E)
52041110	COTON THREAD, SEWING, CONTNG ANY SYNTHETICSTAPLE FIBRE	0.1	0.3	2	3
52041120	COTTON THREAD,DARNING		0.2		9
52041130	EMBROIDERY COTTON THREAD	0.2	0.2	3	5
52041140	COTON SEWING THREAD NOT CNTNG ANY SYNTHETIC STAPLE FIBRE		0.3	0.2	22
52041190	OTHERS	0.9	0.6	32	20
52041900	SWNG THRD CONTNG LESS THN 85% BY WEIGHT OFCOTTON NOT PUT UP FOR RETAIL SALE	1	2	22	50
52042010	COTON THREAD,SEWING, CNTNG ANY SYNTHETIC STAPLE FIBRE	0.7		80	0.1
52042030	EMBROIDERY COTTON THREAD	1	0.3	22	19
52042040	COTON SEWING THREAD NOT CNTNG ANY SYNTHETIC STAPLE FIBRE	0.1	0	1	0.00
52042090	OTHER COTTON SEWING THREAD	1.4	0.5	50	32
54011000	SEWING THRED OF SYNTHETIC FILAMENTS	15	20	613	651
54012000	SEWING THREAD OF ARTIFICIAL FILAMENTS	9.4	26	393	1050
Total Imports		**30**	**50**	**1220**	**1860**

Source: DGCIS, IMaCS Analysis

These exports are estimated to be Rs 225.5 crore for the year 2012-13.

Quality Control and standards in India / other countries

The relevant BIS standards are: IS 1066: 1980, IS 1376: 1998, IS 1720: 1978, IS 2196: 1985, IS 4229: 1992 , IS 9543: 1980.

HOMETECH

The Hometech segment of technical textiles comprises of the textile components used in household applications. These products range from blinds used in the houses to the filter products used in the vacuum cleaners. They are an important component in the mattress and pillows as well. They are made of both natural and synthetic fibres. For example, carpet backing cloth is made from jute as well synthetic fibres.

The technical textile products covered under Hometech are as give below:-

- Fiberfil
- Mattress and pillow components
- Carpet backing Cloth (Jute & Synthetic)
- Stuff Toys
- Blinds
- HVAC Filters
- Filter cloth for vacuum cleaners
- Nonwoven wipes
- Mosquito nets

Technical textiles consumption under Hometech is estimated at around Rs 3,200 crore in 2007-08. Fiberfil and pillow and mattress components together constitute over 50% of the technical textile usage under the Hometech segment followed by blinds with a share of around 20%, stuffed toys with a share of 13% and carpet backing cloth with around 9% share. The HVAC and vacuum filter fabrics and non woven wipes segments are very small and constitute less than 1% of the total Hometech segment.

Most of the demand for these products is satisfied by domestic production with imports of only around Rs 50 crore. But, in certain segments like nonwoven wipes, the percentage of imports is very high and the domestic production is low. Exports of Hometech products from India are very low except Fiberfil of which around 10% of the domestic consumption is exported. The exports of all the other products (excluding Fiberfil) are less than Rs 10 crore.

The domestic consumption of technical textiles under Hometech is expected to increase from around Rs 3,191 crore in 2007-08 to around Rs 5,300 crore by 2012-13. The demand for the hometech products

depends on the growth of the disposable incomes. In the medium term (next 5 years), the hometech segment is expected to achieve growth at the rate of almost 11% year on year.

The stuffed toys segment is expected to grow at around 20% y-o-y over the next 5 years. The HVAC filters are another segment which is expected to have a growth of over 20% y-o-y. With the increase in commercial infrastructure (office buildings) and the real estate development the consumption of blinds is also expected to increase drastically.

Non-woven wipes is one of the key applications of non-wovens in Hometech segment. Though the market for non-woven wipes is quite small, the segment has high growth potential over the next 5 years. The market for nonwoven wipes is estimated at 1.8 million square meters valued at Rs 10 crore and is expected to double over the next 5 years.

Fiberfil and carpet backing fabrics are fairly well developed segments in India. Most of the production of these products takes place in India with negligible imports. Hence, these products are not expected to grow substantially (a stable growth rate of around 5% expected).

Summary of the market-sizing for Hometech

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
Fiberfil	**Quantity**	120,400 MT	500 MT	10,950 MT	109,950 MT	140,300 MT	
	Value	Rs 720 crore	Rs 2 crore	Rs 60 crore	Rs 660 crore	Rs 840 crore	Rs 76.6 crore
Carpet backing Cloth (Jute & Synthetic)	**Quantity**	145 million sq m	2.5 million sq m	0.3 million sq m	145 million sq m	180 million sq m	
	Value	Rs 280 crore	Rs 5.5 crore	Rs 1.5 crore	Rs 285 crore	Rs 360 crore	Rs 1.5 crore
Stuffed toys	**Quantity**	55 million pieces	5 million pieces	0.2 million pieces	60 million pieces	120 million pieces	
	Value	Rs 416 crore	Rs 5.5 crore	Rs 1.5 crore	Rs 420 crore	Rs 1050 crore	Rs 1.5 crore
Blinds	**Quantity**		0.6 million sq meters*	0.05 million sq meters	30 million sq meters	60 million sq meters	

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
	Value		Rs 9 crore*	Rs 4 crore	Rs 630 crore	Rs 1270 crore	Rs 4.6 crore
HVAC Filters	Quantity		1 million square meters		1.5 million square meters	3.5 million square meters	
	Value		Rs 12 crore[$]	-	Rs 16 crore	Rs 45 crore	-
Mattress and pillow components	Quantity	270 million square meters	9500 square meters	1.5 lakh square meters	270 million square meters	310 million square meters	
	Value	Rs 945 crore	Rs 0.3 crore	Rs 1.2 crore	Rs 945 crore	Rs 1350 crore	Rs 3 crore
Nonwoven wipes[@]	Quantity			-	1.8 million square meters	3.5 million square meters	
	Value	Rs 2 crore	Rs 8 crore	-	Rs. 10 crore	Rs. 20 crore	-
Filter fabrics for vacuum cleaners	Quantity	33,800 square metres		-	33,800 square metres	62,280 square metres	
	Value	Rs 0.35 crore		-	Rs 0.35 crore	Rs 0.80 crore	-
Mosquito nets	Quantity		0.75 million nos.	0.12 million nos.	90 million meters	145 million meters	
	Value	Rs 225 crore	Rs 7.5 crore	Rs 3.5 crore	Rs 225 crore	Rs 364 crore	Rs 4.1 crore
TOTAL	Value	**Rs 2,584 crore**	**Rs 50 crore**	**Rs 72 crore**	**Rs 3,191 crore**	**Rs 5,300 crore**	**Rs 92 crore**

** In addition, coated fabric are imported and fabricated into blinds in India*

[$] This includes filter media used for filter applications other than that of HVAC filters

[@] In addition non woven fabric is imported and converted into wipes in India.

As per ECTT report, the potential market sizing for 2007-08 was as given below:-

Market size (ECTT report)		2001-02	2007-08 (P)
Fiberfil	**Quantity**	48000 T	95,000 T
	Value	Rs 288 crore	Rs 570 crore
Jute carpet backing cloth	**Quantity**	2900 MT	13,900 MT
	Value	Rs 9.86 crore	Rs 41.7 crore
Stuffed toys	**Quantity**		
	Value	Rs.60 crore	Rs.96 crore
Blinds	**Quantity**		
	Value	Rs. 400 crore	Rs. 1190 crore
TOTAL	**Value**	**Rs. 757.86 crore**	**Rs. 1897.7 crore**

The key impediments to growth of Hometech products are:-

1. The acceptance of Fiberfil is low in India because the usage of traditional cotton fill is still prevalent on account of the lower level of awareness of the benefits of Fiberfil and higher cost
2. The domestic jute carpet backing industry is facing stiff competition from synthetic carpet backing and cheaper jute imports from Bangladesh
3. The domestic stuffed toys market consists of several small players as compared to Chinese counterparts who are contract manufacturers for US multinationals. In the export markets, the products manufactured by smaller Indian players do not conform to international standards.
4. The Indian stuffed toys market is suffering from cheaper Chinese imports (dumping)
5. Availability of cheaper imports for products like coated blinds
6. Lack of awareness of benefits of non-woven products and non-availability of quality products at desired price points has resulted in lower demand for wipes

Fiberfil

Fiberfil refers to Polyester Staple Fibres used as filling for pillows, decorative pillows, cushions, bolsters, quilts & comforters, mattresses, mattress toppers, mattress pads, sleeping bags, furniture cushions, furniture backs, insulated garments and soft toys.

Traditionally cotton has been used as a filling material in India. Though with rapid development in synthetic fibre production technology special synthetic fibres have been developed as an alternative to cotton for filling purpose.

Product characteristics

Fiberfil is available in deniers ranging from 2 to 20 however the most common types of Fiberfil used for stuffing purpose are 6 D and 15 D. The fibres are available in cut lengths of 32mm, 40mm, 44mm, 51mm, 64mm, 76mm, 88mm, 108mm and 128mm. However, the normal cut lengths used for filling are 32mm (for blow filling), 51mm and 64mm. Fiberfil can be classified based on the method of production, cross section of the staple fibres, type of finishing etc.

Classification of Fiberfil

Based on Manufacturing Process	Based on Cross section	Based on Finish
•Virgin PSF •Regenerated PSF	•Hollow •Solid	•Siliconised •Non siliconised

Virgin PSF is manufactured from a combination of Terypthalic Acid (PTA) and Monoethylene Glycol (MEG). The regenerated PSF is made by recycling polyester waste such as PET bottles and any other 100% polyester scrap. Majority of the Fiberfil produced from recycled waste has solid tubular cross section whereas virgin PSF has a hollow core which gives a higher diameter for the same denier and hence higher bulk, particularly for filling end uses. As a result hollow PSF can give the same support level of recycled fibres with 15-20% less filling quantity. Moreover the hollow PSF Fiberfil is more soft and comfortable, does not form lumps, retains bulk and shape after wash and is more durable. Siliconised PSF has more bounce than non siliconised type.

Conjugated Fiberfil is another kind of product available which is a bi component fibre with natural crimp (unlike other fibres which need to be imparted crimps in the manufacturing process). PSF non siliconised

Fiberfil with solid cross section is the most widely used type in the Indian market. Fiberfil is also available in the form of wadding which is a soft web of fibre in sheet form.

Fiberfil has the following advantages over cotton as a filling material.

- Better filling and greater softness than cotton and other fibres of equivalent weight. The filling quantity required with Fiberfil is 70-80 % of the filling quantity with cotton
- Moisture and mildew resistance which avoids infestation
- Enhanced air circulation (especially for hollow PSF)
- Better bounce and does not become flat with repeated usage.
- Durability
- Washability (hollow PSF retain bulk and shape after wash)

Market dynamics and key growth drivers

Fiberfil being an input for filling application, the demand for Fiberfil is derived from that of pillows, cushions, bolsters, quilts & comforters, mattresses, mattress toppers, mattress pads, sleeping bags, furniture cushions and backs, non woven roof liners and carpets for automobiles, etc.

Fiberfil has to compete with cotton and cotton waste which is the traditional material for filling. Inter fibre competition is a key factor for the industry thus, demand for Fiberfil is significantly impacted by the changes in cotton prices. Moreover, the end consumer of the various products like mattresses, pillows etc is unaware of the benefits of using various kinds of filling material thus, initial cost is the key factor in the purchase decision for majority of the customers. The prices of Fiberfil are volatile in nature and were between Rs 55-70 per Kg in the last few months

The value chain of regenerated PSF and virgin PSF products is depicted in the following figures:

Value Chain of Regenerated PSF

Value Chain of Virgin PSF

Market size of Fiberfil and future forecast

Fiberfil has low penetration in the Indian industry. The installed capacity of Polyester Staple Fiberfil in India is 47400 MT (*Source: Report on Performance of Chemical & Petrochemical Industry at a Glance, Department of Chemicals & Petrochemicals, Ministry of Chemicals & Fertilizers, Government of India*)**.** The production of virgin PSF in 2007-08 is estimated at 42400 MT.

As per industry sources the current installed capacity of Regenerated PSF in India is 500 MT/day. Most of these players are operating at a capacity utilisation of 50 – 60% thus, the production of regenerated PSF in 2007-08 is estimated at 78,000 MT. Considering the export and import data the domestic consumption of Fiberfil in 2007-08 is estimated at 109,950 MT valued at Rs 660 crore. The installed capacity and production of Fiberfil has remained fairly stable over the last two years. However, with increasing awareness about the product benefits its penetration is expected to increase in future. Thus, the domestic market size of Fiberfil is estimated to increase to 140,300 MT by 2012-13 (growing at 5 – 6% year on year). The market potential in 2012-13 is estimated at Rs. 840 crore. No change (upwards or downwards) in the price of Fiberfil has been assumed for deriving the projected market size. The current and future forecast of Fiberfil consumption is given below:-

Domestic Market size for Fiberfil	2007-08	2012-13
Quantity	109,950 MT	140,300 MT
Value	Rs 660 crore	Rs 840 crore

Source: Industry survey, IMaCS Analysis

Key manufacturers

Reliance Industries Limited is the largest manufacturer of Virgin PSF Fiberfil in India. The company markets its product under the brand name Recron. Some other major manufacturers engaged in manufacture of virgin PSF and regenerated PSF are Ganesh Polytex, Arora Fibres limited, Alliance Fibres, Nirmal fibres Private limited.

Manufacturer	Product	Year	Capacity (MT/annum)	Production (MT/annum)	Sales (Rs. crore)
Reliance Industries	Hollow PSF	2006-2007	42000	42797	-
	Hollow PSF	2007-2008	42000	42304	-
Ganesh Polytex	PSF	2006-2007	32400	17005.07	81.21
	PSF	2007-2008	15000	9494.68	40.09
Arora Fibres	PSF	2006-2007	6000	3794.8	19.3
	PSF	2007-2008	6000	3109.8	14.9
	Hollow PSF	2006-2007		87.78	0.85
	Hollow PSF	2007-2008	6000	92.48	0.1
Alliance fibres Pvt Limited	PSF	2007-2008	7200	-	-
Nirmal Fiber Ltd	PSF	2006-2007	3600	-	-

Imports & Exports of Fiberfil

The import figure of Fiberfil is given in the following table.

HS Code	Description	Quantity (MT)	Value (Rs crore)
		2007-08(E)	**2007-08 (E)**
55032000	Hollow Polyester staple fibre	~500 MT	~ **Rs 2 crore**

Source: IBIS, IMaCS Analysis

The Fiberfil is imported from China.

The export figure of Fiberfil is given in the following table.

HS Code	Description	Quantity (MT)	Value (Rs crore)
		2007-08(E)	**2007-08 (E)**
55032000	Hollow Polyester staple fibre	~10950 MT	**~ Rs 60 crore**

Source: IBIS, IMaCS Analysis

Reliance Industries Ltd. is the largest exporter of Fiberfil. Argentina and USA account for more than 80% of the exports**.** These exports are estimated to be Rs 76.6 crore for the year 2012-13.

Carpet Backing Cloth

A carpet is any loom-woven, felted textile or grass floor covering. The global carpet market for domestic and industrial end use is dominated by several varieties of carpet such as Hand Knotted Carpets, Hand Woven Carpets, Tufted carpets, Needle felt carpets, Flat weave carpets, etc. Carpet Backing Cloth (CBC) is used as the backing material for both woven and tufted carpets as depicted in the figure below:

CBC is generally classified into two categories:

- **Primary Carpet backing**: The base fabric on which pile yarns are tufted and anchored to make a carpet
- **Secondary Carpet backing**: Fabric bonded on the backside of the carpet forming an underlay.

Primary backing is used for making the carpet in which yarn is woven or tufted. Carpet after being dyed is send for secondary backing. Here the surface is smoothened and backing is applied. Latex is applied on the back of the carpet by passing the carpet through the puddle of latex. Latex is forced down by the blade around all the yarn on the back of the carpet, which locks the yarn into the backing. A second coat of latex is applied thereafter which holds the secondary backing onto the tufted material. The secondary backing provides dimensional stability while locking individual tufts in place.

Product Characteristics

Primary backing is manufactured mainly from synthetic fabric. Secondary backing is made of both jute and woven polypropylene. Jute carpet backing cloth is approximately 104" wide with gsm varying between 180 and 407. Jute backing has certain limitations such as potential for browning and rotting. Thus, the secondary backings used today are majorly woven polypropylene made of a leno weave of slit film and spun olefin yarns that forms a stretchable secondary backing fabric. Synthetic carpet backing cloth is available in many varieties of which some are:

Application	Fabric characteristics	
Primary Backing Fabric	spun polyester warp, spun polyester weft; 40 ends per 10 cm and 40 picks per 10 cm	149 gsm
Primary Backing Fabric	spun polyester warp, spun polyester weft; 70 ends per 10 cm and 70 picks per 10 cm	266 gsm
Secondary Backing Fabric	polypropylene warp, acrylic weft; 32 ends per 10 cm and 40 picks per 10 cm weft	78 gsm
Secondary Backing Fabric	cotton yarn nm 40/2 warp, nm 3.6/1 weft; 35 x 2 ends per 10 cm warp and 32 picks per 10 per cm	135 gsm

Carpet backings without latex are also being produced by some manufacturers. This system eliminates delamination and thus, such carpets are light weight, more flexible, easier to install and can be recycled easily. This also eliminates the "new carpet odor".

Market dynamics and key growth drivers

CBC is used as primary and secondary backing for carpets. Thus, growth in the carpet industry is the key demand driver for CBC. The Indian carpet industry is mainly driven by exports. Around 95% of the carpets made in India are exported majorly to USA. The carpet export witnessed a decline in recent years because of rupee appreciation against dollar. As per discussions with industry experts and key industry players the carpet exports are expected to remain stagnant in future thus, limiting the growth potential of CBC. However, marginal growth is expected in the synthetic CBC only because of replacement of jute by the synthetic category.

Consumption pattern and market size

CBC is used in majority of the carpets. In 2007–08, approximately 75 million square meters of non-jute carpets were exported of which 70 million square meters of carpets are expected to have carpet backing. Since 95% of the carpets manufactured in India are exported, the production of carpets with carpet backing is estimated at 73 million square meters. As per industry sources approximately 10 % of the carpets have jute carpet backing. The average GSM of jute backing is 300.

The current market size of jute CBC is estimated at 4750 MT valued at Rs 17 crore. The demand for jute CBC is expected to fall because of its replacement by synthetic CBC. The market for jute CBC is expected to decrease to 3673 MT by 2012-13 (falling at 5% year on year). The market potential for jute carpet backing in 2012-13 is estimated at Rs 12.86 crore.

The market size of synthetic carpet backing cloth is estimated at 128 million sq m valued at Rs 269 crore. The demand for synthetic carpet backing is expected to increase on account of replacement of jute CBC by synthetic. Thus, the demand for synthetic CBC is expected to increase to 164 million sq m by 2012-13 registering a growth of 5% year on year.

The market potential in 2012-13 is estimated at Rs 345 crore. The current and future forecast of CBC consumption is given below:-

Market size for CBC		2007-08	2012-13
Jute CBC	Quantity	4700 MT or 15 million sq m*	3600 MT or 12 million sq m*
	Value	Rs 15 crore	Rs 13 crore
Synthetic CBC	Quantity	130 million sq m	165 million sq m
	Value	Rs 270 crore	Rs 345crore
Total	**Quantity**	**145 million sq m**	**~180 million sq m**
	Value	**Rs 285 crore**	**~Rs 360 crore**

Source: Industry survey, IMaCS Analysis
** The average gsm of jute backing is 300*

Key manufacturers of CBC

The major manufacturers of Jute CBC are:

Manufacturer	Year	Quantity (MT)	Value (Rs crore)	Unit Price	Installed capacity
Ludlow Jute	2007-08	46360	155.21	Rs 33.48/kg	57,500 MT
Birla Corporation*	2007-08	33317	113.95	Rs 34.20/kg	32 + 822 looms**
Gloster Jute*	2007-08	45362	156.96	Rs 34.61/kg	1045 looms

Source: Capitaline, Annual reports ,Company website Industry survey
** This includes all the jute products besides carpet backing fabric as well*
*** Narrow + Broad looms*

Other players include

- Auckland International
- Prabartak Jute
- India Jute & Ind
- Champadany Industries Ltd etc.

Imports & Exports of CBC

The estimated import figures for jute CBC and synthetic CBC are as given below:-

HS Code	Description	Imports Quantity	Imports (in Rs crore)
		2007-08(E)	**2007-08(E)**
53101011	Jute CBC*	~ 0.5 million sq m	**~ Rs 1.5 crore**
54072010	PP Woven Backing	~ 2 million sq m	**~Rs 4 crore**

Source: DGCIS,IBIS, IMaCS Analysis

** This may include other hessian fabrics*

Import of Jute CBC takes place mainly from Bangladesh. Around 60% of the imports of synthetic CBC are from Germany while the balance from Belgium and Saudi.

The estimated export figures for jute CBC and synthetic CBC are as given below:-

HS Code	Description	Exports Quantity	Exports (in Rs crore)
		2007-08(E)	**2007-08(E)**
53101011	Jute CBC*	89,280 sq m	**~ Rs 0.5 crore**
54072010	Woven PP fabric	~ 0.2 million sq m	**~ Rs 1crore**

Source: DGCIS,IBIS, IMaCS Analysis

** This may include other hessian fabrics*

India has very low export of jute CBC as compared to Bangladesh which has the highest share in the export market. Exports of synthetic CBC are mainly to USA. These exports are estimated to be the same at Rs 1.5 crore for the year 2012-13.

Stuffed toys

Stuffed toys, also referred to as plush toys and soft toys, are made up of soft knitted fabrics stuffed with filling material. Stuffed toys are popular for a variety of reasons – as toys for kids, as gifts among youngsters for Valentine's Day, birthdays, other kind of special days or just as an expression of thought.

Product characteristics

Stuffed toys are entirely textile material. The outer fabric or skin of stuffed toys is made of fur, fleece, polyester felt, acrylic plush fabrics, etc. The skin is stuffed with a variety of materials such as polyester staple Fiberfil, foam, cloth scrap, paper foam or cotton. The toys are manufactured in different shapes, sizes and colours, the height varying from 6 cm to 200 cm.

Market dynamics and key growth drivers

Stuffed toys are very popular among kids. Besides this, stuffed toys are also used by youngsters for decoration at home or work place, as gifts on occasions such as Valentine's Day, birthdays, other special days, etc. The young demography, rising disposable income and people's preference for stuffed toys as a gift item augur well for the industry.

The industry is seasonal with demand picking up during festive season, Valentine's Day and during vacations. The demand is more or less limited to urban area with metros and other big cities accounting for majority of the demand.

Market size of Stuffed toys and future forecast

Based on interaction with the industry experts and key industry players the domestic market size for stuffed toys is estimated at Rs. 420 crore or 60 million pieces. On account of rising disposable income and increasing preference for stuffed toys amongst both youngsters and kids the stuff toy manufacturers have been witnessing double digit growth rates in the recent years and the industry is expected to grow at a CAGR of 15%. Thus, the market size of stuffed toys is expected to increase to 120 million pieces by 2012-13. The market potential in 2012-13 is estimated at around Rs. 1,050 crore. An inflationary increase of 5% is considered for estimating the market size.

The current and future forecast of stuff toy consumption is given below:-

Market size for Stuffed toys	2007-08	2012-13
Quantity	60 million pieces	120 million pieces
Value	Rs 420 crore	Rs 1050 crore

Source: Industry survey, IMaCS Analysis

Key manufacturers of Stuffed toys

The industry is characterised by a few leading players in the organised sector and large number of unorganised home based units. Some of the leading manufacturers are Hanung toys, Sunlord apparels, and Kridnak Udyog.

Hanung Toys & Textiles Ltd was set up in technical collaboration with South Korea and is India's largest manufacturer and exporter of soft toys, decorative cushions & children's room furnishings. The company manufactures soft toys made of acrylic plush fabric stuffed with hollow PSF. Besides this the company also manufactures decorative cushions in various shapes, sizes, designs and colours, home furnishings in various fabrics, colours and designs and products like bed sets, duvet covers, curtains, throws, quilts, sleeping bags, bolsters/long cushions, cushion covers, floor rugs & carpets, sit sacks (bean bags). The company's products are exported to USA, Latin America, Europe and Middle East. Some of the key customers of Hanung are Wal-Mart, IKEA, Debenhams, American Pacific, Springs Industries, Mohawk Home, Home Centre, etc. The company markets its soft toys under the brand *Play'N'Pets*. The company has agreement with Walt Disney India that allows it to manufacture soft toys resembling Disney characters like Mickey Mouse, Donald Duck, Goofy, Nemo and Lion King among others.

Company	Capacity	Production (2007-2008)	Sales 2007-2008
Hanung Toys	20 million pieces	21 million pieces	Rs. 213.97 crore
Kridnak Udyog		0.045 million pieces	

Source: Industry survey, Hanung annual report

Besides this, stuffed toys also manufactured by unorganised home based units. These manufacturers are concentrated in Noida and Kolkata.

Imports & Exports of Stuffed toys product

The estimated import figure for stuffed toys is given in the following table:

HS Code	Description	Quantity	Value (Rs crore)
		2007-08(E)	**2007-08 (E)**
95030010, 95030030, 95030090,	Stuff Toy/Soft Toy	~ 5 million pieces	~ **Rs 5.5 crore**

Source: IBIS, IMaCS Analysis

Majority of stuffed toys are imported from China. Some soft toys are also imported from France, Singapore, Srilanka, Thailand, etc.

The estimated export figure for stuffed toys is given in the following table:

HS Code	Description	Quantity	Value (Rs crore)
		2007-08(E)	**2007-08 (E)**
95021090/9900, 95034100 95034990, 95051000,	Stuff Toy/Soft Toy	~ 0.2 million pieces	**~ Rs 1.5 crore**

Source: IBIS, IMaCS Analysis

The stuffed toys are exported to USA, Denmark, Tanzania, Saudi Arabia etc. These exports are estimated to be the same at Rs 1.5 crore for the year 2012-13.

Raw materials and machineries

The outer skin of the stuffed toys is made from knitted pile fabrics/artificial fur as they have the desired soft feel. These fabrics are mostly made of polyester or polyester cotton blends. The knitted fabrics have different pile lengths ranging from 1 mm to 16 mm. These fabrics are primarily imported from China, Korea, and Hong Kong as the locally available fabric is not of desired quality.

The filling can be done with cotton, cotton waste, paper or Fiberfil. The high value products use Fiberfil for stuffing. Siliconised Fiberfil is used when higher bounce is desired. Reliance Industries limited is the leading supplier of Fiberfil in the country.

Production of stuffed toys is carried out manually in the unorganised home based units. As a result the products do not meet the international quality standards. The organised players are equipped with modern

tools and machines to facilitate mass production. The machineries used for the manufacturing stuffed toys are:

- Cutting machine such as fire cutting machine, press die cutting machine, bend knife cutting machine
- Eyes and nose punching and sealing machine
- Sewing machine
- Carding and Fiberfil stuffing machine
- Metal detectors
- Vacuum press machines for final packaging

Quality Control and standards

The stuffed toys should be Azo free and also free from harmful substances like lead and cadmium which can be very harmful to the kids. The quality standards applicable to stuffed toys are:

BIS Code	Description
IS 9873: Part 1: 2001	Safety Requirements for Toys - Part 1: Safety Aspects related to Mechanical and Physical Properties
IS 9873: Part 2: 1999	Safety Requirements for Toys - Part 2: Flammability Requirements
IS 9873: Part 3: 1999	Safety Requirements for Toys - Part 3: Migration of Certain Elements

In addition, the standards applicable to the toy industry are EN-71, ASTM, BS-5665, AS1647, CPSC etc.

Blinds

A window blind is a window covering composed of long strips of fabric or rigid material. A blind limits observation and thus "blinds" the observer to the view.

Product Characteristics

Blinds are made of variety of materials; the material chosen depends on the aesthetic and functionality required. The desired functional performance include light and glare control, desired outside view, ease in handling and maintenance, acoustic performance, etc. The most common window blinds are Slat blinds, which consist of many horizontal slats, usually of metal or vinyl, connected with string in such a way that they can be rotated to allow light to pass between the slats, rotated up to about 170 degrees to hide the light, or pulled up so that the entire window is clear. Vertical blinds consist of slats of stiffened fabric, plastic, or metal hanging by one end from a track. Like the horizontal versions, the slats can be rotated 90 degrees to allow light to pass through or to fold up on one side of a door or window. Vertical blinds exhibit better control over the extent of natural or exterior light entering the room because of the ability of slats to close tightly.

Venetian blinds have horizontal slats, one slat above another. They are suspended by strips of cloth called tapes or by cords which are able to tip them each at the same time up to 180 degrees. There are also lift cords passing through holes in each slat. When these cords are pulled, the bottom of the blind moves upward causing slats to rest on each other as the blind is raised. Venetian blinds are basic slatted blinds made of metal or plastic; wooden slats are sometimes used but these are usually referred to as wood blinds or bamboo blinds. Slat width varies between 16 mm and 120 mm, the most common width being 50 mm.

Other varieties of window blinds include Mini blinds (venetian blinds with very narrow slats usually 25 mm wide), Micro blinds (with slats usually 12 mm wide), Louvers (fabric or poly vinyl), Jalousies, Brise Soleil, Holland blinds, Pleated blinds, Honeycomb blinds (similar to pleated shades except that there are two or more layers joined at the pleats to form compartments that trap air, providing insulation), Roman shades, and roller shades. The Louvers vary in width from 50 mm to 125 mm, but the most popular ones are the 100 mm louvers.

Key growth drivers

The commercial establishments like offices, hospitals, hotels etc. account for majority of domestic demand for blinds. Vertical blinds are the most popular in offices whereas Roman blinds are used in

hotels. Roman blinds are also preferred for farm houses. The growth in domestic demand for blinds is expected to be driven by the infrastructure development planned in the country.

Market size of Blinds and future forecast

Industry survey reveals that blinds are of typically the same width and height as the window itself or slightly wider and taller depending on whether they are fixed inside or outside the window's reveal. The fabric requirement in a blind for a window size of 6 ft X 6 ft is approximately 4.2 square meters.

As per industry sources the market size for blinds is estimated at Rs 1050 crore. The technical textile component constitutes 60% by value of total blind. Thus, the market size for fabric used in blends is estimated at Rs 630 crore. The current demand for fabric is estimated at 30 million square meters. The demand for blinds is expected to increase on account of enhanced construction activity. Moreover, the penetration of blinds is expected to increase in the domestic market. Thus, the demand of fabric for blinds is expected to increase to 60 million sq m by 2012-13 (growing at 15% year on year). The market potential in 2012-13 is expected to be Rs 1270 crore. The current and future forecast of market size blinds is given below:-

Market size for Blind fabric	2007-08	2012-13
Quantity	30 million sq m	60 million sq m
Value (TTC – 60%)	Rs 1050 crore Rs 630 crore	Rs 2110 crore Rs 1270 crore

Source: Industry survey, IMaCS Analysis

Key manufacturers of Blinds

The fabric and non-fabric components of blinds are manufactured by different producers and finally assembled by one dealer for final installation. The industry has a large number of players in unorganized sector with organized sector accounting for approximately 15% of the total market. The major manufacturers of blinds in the organized sector are:

- Hunter Douglas,
- Mac Décor Ltd.,
- Aerolux India Private Limited and
- Viesta

Various blind manufacturers are only fabricators and do not manufacturer fabric. These players do contract manufacturing for production of coated fabrics. There are various players in Uttar Pradesh,

Hyderabad, Nasik etc who manufacture these fabrics. The other players in this industry are Bagga Enterprises, Jain Venetion Blinds Ind., Growrich Horivert Private etc.

Imports & Exports of Blinds

Various components used in a blind such as hangers, spacers, head rails, interlocking chain, sliding channel, runner, end cap set, bottom weight, tilting chain, etc. are domestically procured as well as imported from Taiwan, China and few European countries. Synthetic coated fabrics strips are imported from Taiwan and China. Ready blinds are also imported from Germany, Australia and USA. All the players in the organised segment import over 95% of their sales. The estimated import figures for Blinds are as given below:-

HS Code	Description	Imports Quantity	Imports (in Rs crore)
		2007-08(E)	**2007-08(E)**
70195900	Venetian Blinds	70115 sq m	**~ Rs 2 crore**
54078119, 54071029	Roller Blind Fabric	9250 sq m	**~ Rs 0.15 crore**
58063190	Vertical Blind Fabric	122120 sq m	**~ Rs 0.15 crore**
59031090, 59039010/90, 59070099, 59119090	Blind Fabric	319750 sq m	**~ Rs 2 crore**
63031900, 63039200, 63039910/90, 63049990, 63061930	Blind Fabric	70210 sq m	**~ Rs 4 crore**
39189090 & 39219010	Blind Fabric*	9380 sq m	**~ Rs 0.5 crore**

Source: IBIS, IMaCS Analysis

** Blind covers under the HS code of 39269099 have been excluded here*

Around 41% of the imports (included under HS Code 63) take place from China. The imports under the HS code 70 are from France, which has a share of around 20%. Around 15% of blinds are imported from Taiwan under the HS codes 54, 59 & 63. Other main countries from where blinds are imported are Spain, Germany, USA and Australia. In addition to this, coated fabric for making blinds is also imported.

Blinds from India are also exported to countries like Netherlands, UK, Germany, Italy, Ghana, Senegal, France, Singapore etc. The estimated export figures for Blinds are as given below:-

HS Code	Description	Exports Quantity	Exports (in Rs crore)
		2007-08(E)	**2007-08(E)**
36253000	Blinds	Approx. 3600 sq.m.	**~ Rs 0.8 crore**
63031100, 63039100, 63039990, 63049190/290, 63049990, 63061920, 63071090, 63072010, 63079020/90	Blinds*	Approx 44500 sq m	**~ Rs 3 crore**

Source: IBIS, DGCIS, IMaCS Analysis
** These blinds are mainly of silk, cotton & polyester*

Over 20% of exports take place to France and Maldives each. Ghana had around 16% of share in exports while Norway has half of it around 8%. Rest major countries to which blinds are being exported include USA, Austria, Germany, Sweden and Netherlands. These exports are estimated to be Rs 4.6 crore for the year 2012-13.

Raw materials

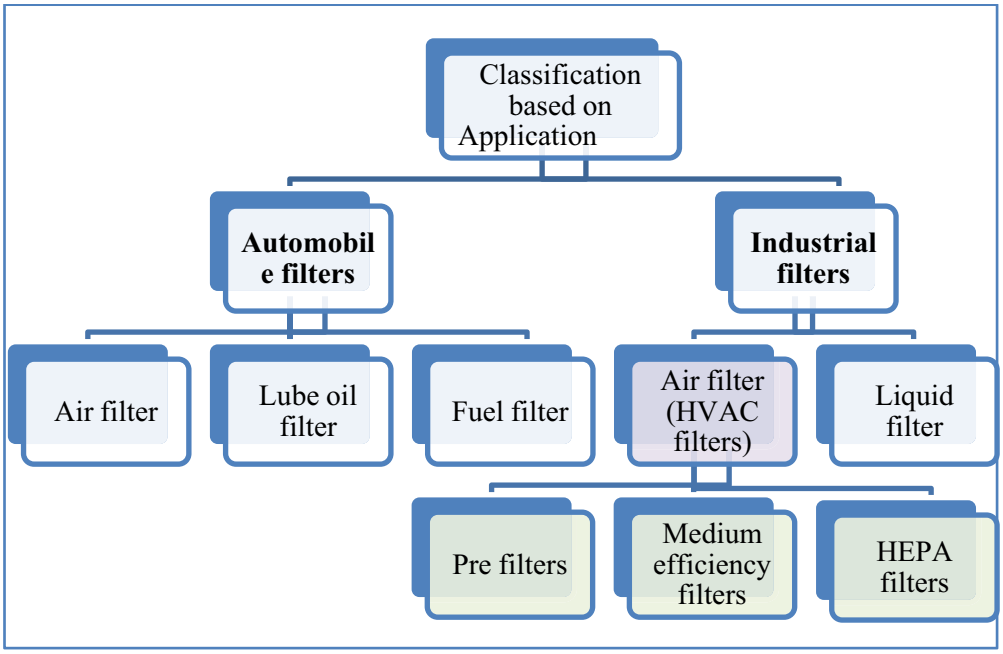
The fabric louvers are mostly woven on handlooms or power looms from polyester, viscose, cotton, acrylic and blended yarns. There are also other varieties including glass fibre fabrics, black-outs, Jacquards, etc. The fabric used in roller blinds is made of either 100 % polyester or polyester-viscose blend. In a few cases special fabrics for blackouts or acoustic performance are also used.

Different types of coatings are done on the fabric for blinds to make it water resistant, dust repellent or stain free. Coating is done on one side (facing the sun for reflecting the light) or both the sides of the fabric. The coating is also done to prevent the fading of colour due to excess exposure to sunlight.

HVAC filters

HVAC stands for heating, ventilating, and air conditioning. The HVAC systems are used in industries, commercial and residential buildings where humidity and temperature need to be closely regulated.

The filtration systems in general can be classified as Liquid -Solid separation (e.g. vacuum and pressure filters), Air-Gas separation (e.g. activated carbon filters) and Air-Solid separation (i.e. filters that remove particulate matter from air). HVAC filters belong to the category of air filtration products. The filtration products are also classified based on their end application as depicted below:



The HVAC filters include pre filters, medium efficiency filters and HEPA filters. HEPA or High Efficiency Particulate Air filters are high efficiency filters capable of removing 99.97% of airborne particles of 0.3 micrometers (µm) diameter. Filters capable of removing 99.999% of dust, pollen, mold, bacteria and any airborne particles of size 120 nano metres or larger from the air are categorised as ULPA or Ultra Low Penetration Air filter.

Product Characteristics

Filter media used in air filters are nonwoven fabrics laid perpendicular to the air flow to arrest the solid particulate matter. Air filters can be either mechanical filters or electrostatic filters (electrostatically enhanced filters). Most of the filters fall under the category of mechanical filters and depend on four

primary filtration mechanisms - sieving, impaction, interception, and diffusion. Filters are characterized by their filtration efficiency, MERV rating and Micron size.

Filtration efficiency: Filtration efficiency can be calculated using the following formula

$$\text{Filter Efficiency} = 1 - \frac{\text{Particles Downstream}}{\text{Particles Upstream}}$$

MERV Rating or Minimum Efficiency Reporting Value is a number from 1 to 16 that is relative to an air filter's efficiency. The higher the MERV, the more efficient the air filter is. A higher MERV creates more resistance to airflow because the filter media becomes denser as efficiency increases. The table below gives the application areas of various types of filters.

Filter Efficiency	MERV ratings	Application
95%	>14	Final filter in hospital and other clean room HVAC systems.
85%	>13	Commercial applications like research Labs.
65%	>11	Standard commercial buildings, such as office space.
25%	>6	Pleated panel filters, used in office environments, and as prefilters.
<20%	1 to 5	Pre filters, used in window and split air conditioners

Micron size: The micron size is indicative of the size of particles which can be removed by a particular type of filter. Based on this filters can be classified as follows:

Micron size	Classification
>10	Pre filter
5 to 10	Medium efficiency filters
< 5	High efficiency filters

The filter media should have appropriate anti static properties to prevent build up of static charge due to dust particles which can lead to an explosion.

The pre filters are generally re-usable as they can be washed when the filter medium gets choked. The HEPA filters on the other hand are disposable type.

Market dynamics and key growth drivers

The demand for HVAC filters is derived from the demand of HVAC systems. The HVAC industry can be broadly classified into the following two segments:

Split and window type air conditioners

The type of filter used varies with each manufacturer. Most of the air conditioners use pre filters. The manufacturers have to balance the conflicting objectives of minimizing the power consumption and maintaining the air quality.

Centralized air conditioners

The demand for centralized air conditioning is derived from various commercial and industrial buildings .Not much attention is given to the quality of air in most cases; cost minimization is the primary goal and hence pre filters are used. HEPA and microvee filters find application in Pharma & Electronics industries, nuclear installations, and hospitals etc where the quality of air is critical.

In a centralized air conditioner the filters are housed in the Air handling unit. An air handler, or air handling unit (often abbreviated as AHU), is a device used to condition and circulate air as part of a heating, ventilating, and air-conditioning (HVAC) system. Usually, an air handler is a large metal box containing a blower, heating and/or cooling elements filter racks or chambers, sound attenuators, and dampers. Air handlers usually connect to ductwork that distributes the conditioned air through the building, and returns it to the AHU. The AHU can have different combinations of pre filter, medium and high efficiency filters .The pre filters remove the large sized particles hence the higher efficiency filter is subject to lesser load.

Air conditioning products are now considered more as a necessity rather than a luxury. The rising disposable incomes and awareness among the people of the respiratory diseases, allergies etc indicate a huge potential for the industry.

Market size of HVAC filters and future forecast

HVAC filters are used in split and window type air conditioners as well as centralized air conditioning. The requirement of filter media for split/window type air conditioners varies from manufacturer to manufacturer and this media is generally washable. As per industry sources approximately 2 million air conditioners were manufactured in 2007-08. Considering an average requirement of 0.35 square metres of filter media per air conditioner the demand for HVAC filters for split/window type air conditioners is

estimated at 0.7 million square meters valued at Rs 6 crore. Based on trends over last few years the demand of air conditioners is estimated to grow at 15 % per annum which functions as a key driver for growth in HVAC filters. Thus, the market size is estimated to increase to 1.5 million square meters by 2012-13. The market potential in 2012-13 is estimated to be Rs 15 crore. An inflationary increase of 5% has also been considered to estimate the market size.

The requirement of filter media for centralized air conditioning is dependent on various factors like desired quality of air, air flow rate, number of air handling units etc. The replacement demand of throw away type filters depends on the quality of air handled. The filters are available in different sizes and use different filtration media based on these parameters. As per industry sources the medium and high efficiency filters require around 2 - 2.5 square metre of filter media per filter.

The filters are housed in the Air handling unit. The AHU can have different combinations of pre filter, Medium and high efficiency filters. A typical 3000 CFM AHU requires 2 - 4 filters.

Usage of HVAC for centralised air conditioners

Average requirement of filter media per AHU	5 square meters
Average price of filter media	Rs 120 per square metre
Replacement frequency of filter media	Annual

As per industry sources the demand for AHU in 2007-08 is estimated to be around 32,000 units. In addition the total number of AHU in 2006-07 is estimated to be 1.3 lakhs. Thus, the demand for HVAC filters for centralized air conditioning is estimated at 0.8 million square meters valued at Rs. 10 crore. The HVAC industry has witnessed a growth rate in excess of 25 % over the last few years. Segments such as IT/ITES, retail, industrial, entertainment, pharma, healthcare, hospitality, telecom and banking fuelled the growth of the commercial air-conditioning industry. With continued investments in infrastructure, the commercial air-conditioning industry is expected to grow at 20% per annum over the next few years. Thus, the market size is expected to increase to 2 million square meters by 2012-13. The market potential in 2012-13 is estimated to be Rs. 30 crore. An inflationary increase of 5% has also been considered to estimate the market size.

The current and future forecast of HVAC filters consumption is given below:

Doemstic market size for HVAC filters		2007-08	2012-13
HVAC filters for split and window type Air conditioners	Quantity	0.7 million square meters	1.5 million square meters
	Value	Rs 6 crore	Rs 15 crore
HVAC filters for centralized Air conditioners	Quantity	0.8 million square meters	2 million square meters
	Value	Rs 10 crore	Rs 30 crore
Total	Quantity	1.5 million square meters	3.5 million square meters
	Value	Rs 16 crore	Rs 45 crore

Source: Industry survey, IMaCS Analysis

Key manufacturers

The major manufacturers of split and window type air conditioners are LG, Samsung, Videocon, Voltas, Blue star etc .Blue star and Voltas are also the leaders in centralized air conditioning industry with Blue star having a market share of around 30%.

Some of the major manufacturers of Air filtration products are

- Thermadyne Private Limited **(**Faridabad),
- Spectrum Filtration Pvt. Ltd (Kolkata),
- Anfilco Limited(Gurgaon),
- CRE Industries (Delhi),
- John Fowler (Bangalore)

The filter manufacturers source the filter media from outside. Nonwoven filter media requirement is primarily met by imports. Some of the indigenous manufacturers /suppliers are

- Dinesh Mills,
- Supreme Nonwoven,
- Mech Tech Industries (Ahmedabad),
- Biyani Industrial Fabrics (Indore)

Imports & Exports

HS Code	Description	Imports (Quantity)	Imports (Rs crore)
		2007-08 (E)	2007-08 (E)
56039400, 6090090, 56031300, 6031200	Synthetic Non Woven Filter Media *	1 million square meters*	Rs 12 crore*

Source: IBIS, DGCIS, IMaCS analysis

**This includes filter media used for filter applications other than that of HVAC filters*

The filter media is imported from Germany, Netherlands, Taiwan, China and USA. The imports from Netherlands account for around 40% of the imports. The HEPA filters are imported from Malaysia, China, USA, and Netherlands.

The exports from India of HVAC filters and filter media are negligible.

Type of Raw materials

The major filter media used in HVAC filters are nonwoven and made of polyester, polypropylene and glass fibre. These nonwoven media are generally needle punched and have a GSM of 200-250.

Quality Control and standards in India

The relevant BIS standards is

IS 7613: 1975	Method of testing panel type air filters for air conditioning and ventilation purposes

The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) standards are also relevant for the Indian market.

Filter fabrics for Vacuum cleaners

Vacuum cleaners have a filter to remove the dust from the exhaust air. The dust is collected in a paper bag which can be disposed off. Some of the vacuum cleaners also use HEPA filters.

Market dynamics and key growth drivers

The demand for vacuum cleaner filters is driven by the demand for vacuum cleaners. The use of vacuum cleaners is mainly concentrated in the urban areas. The demand for vacuum cleaners is triggered by increasing urbanisation & disposable incomes, increasing health awareness, unavailability and rising cost of domestic help and increasing number of working women. As per industry sources the demand is also getting a boost because of number of offices and households using carpets which necessitates use of vacuum cleaners.

Market size of vacuum filters and future forecast

As per industry sources most of the vacuum cleaners sold in India are imported along with the filter media. The domestic market for vacuum cleaners is estimated to be around 2.6 lakh units per annum which amounts to 33,800 square metres of filter media valued at Rs 35 lakh. The replacement demand of the filter media is also small and these are also reported to be imported.

The demand for vacuum cleaners is estimated to have a growth rate of 13% based on the sales trends of Eureka Forbes. Thus, the demand for filter media in 2012-13 is estimated to be 62,280 square metres. The market potential in 2012-13 is estimated to be Rs 80 lakh. An inflationary increase of 5% per annum is assumed to estimate the market potential.

The current and future forecast for consumption of filter fabric is given below:-

Market size of filter fabrics for vacuum cleaners	2007-08	2012-13
Quantity	33,800 square metres	62,280 square metres
Value	Rs 35 lakh	Rs 80 lakh

Source: Industry Survey, IMaCS Analysis

Key manufacturers

Filter fabrics used in vacuum cleaners are not manufactured by vacuum cleaner manufacturers and are outsourced. The filter fabrics are majorly imported.

Imports and Exports

The import of filter fabric used in vacuum cleaners is negligible. The filter fabric is imported as a part of vacuum cleaners. The exports from India of HVAC filters and filter media are also negligible.

Key importers & exporters

Eureka Forbes is the key importer of vacuum cleaners. Filters for vacuum cleaners are imported as a part of vacuum cleaners.

Raw materials

The major filter media are nonwoven and made of polyester, polypropylene and glass fibre. These nonwoven media are generally needle punched and have a GSM of 200-250.

Mattresses and pillows

A mattress is a mat or pad usually placed atop a bed. Mattresses can be broadly classified as:

- Foam mattresses
- Coir mattresses
- Spring mattresses

Mattresses are made of a filling material like coir, foam etc which provides support to the body. Traditional Indian mattresses are thick quilts made up of cotton stuffing. The protective fabric cover which encases the mattress is called ticking. Ticking fabric holds the filling material in place. It is usually made of cotton and comes in a wide variety of colours and styles. The GSM of the fabric varies from 80 to 200.

The typical sizes of mattresses are given in the following table:

Mattress sizes			
Class	**Dimensions in inches**	**Class**	**Dimensions in inches**
Divan	72"X30" 75"X30" 78"X30"	Queen	72"X60" 75"X60" 78"X60"
Single	72"X36" 75"X36" 78"X36"	King	72"X72" 75"X72" 78"X72"
Twin	72"X48" 75"X48" 78"X48"		

The most commonly available mattresses are 72” X 36” in Northern India and 78” X 36” in rest of the country. The typical value and quantity wise break up of a mattress is given in the following table.

Raw Material	**% by Value**	**Average Weight per Mattress**
Foam + Coir	75%	Ranges from 5-6 Kgs (Foam only) to 10-15 Kgs*(Foam & Coir)
Fabric	10%	1-2 Kgs
Packaging and Others	15%	1-2 Kgs

**Depends on the ratio of foam and coir used in the mattress and the density. Sleepwell manufactures the mattresses with densities varying between 10 and 85. Density of 1 indicates that the material carries 1 Kg weight per cubic meter. Generally 60:40 Coir: Foam ratio is used since this reduces the product price and also helps save excise duty as coir based products (i.e. products with more than 50% by weight of Coir) are exempted from excise duty.*

Pillows can be made of variety of filling material like cotton, feathers and foam etc. Pillows are available in variety of sizes i.e. 21"X14'', 24''X16'' and 26''X17". The ticking fabric used for pillow is also generally made of cotton with a GSM lesser than that of the fabrics used for mattresses.

Market dynamics and key growth drivers

The market for mattresses and pillows can be broken down into three segments:

- Households
- Hotels
- Hospitals

The demand from the household segment accounts for 90-95 % of the total market. Mattresses are typically purchased with purchase of a new bed which in turn is dependent on the number of marriages, increasing family size etc. As per industry experts mattresses are generally replaced in 8-10 years. Awareness about the pros and cons of different type of mattresses is low, thus, cost plays an important role in the purchasing decision.

Distribution network is a key factor in this industry. Mattresses and pillows are bulky leading to high transportation and ware housing costs. The presence of a number of regional players and relatively less exports and imports are explained by this fact.

Market size and future forecast

Each mattress requires 5 square meters of ticking fabric. Mattress tapes are used in a few mattresses. The consumption norms for the same are given in table below:

Usage of various mattress components

Ticking fabric	5 square metre
Price per square metre of ticking	Rs 40 per square meter
Tape	13 meter

Usage of various pillow components

Ticking fabric	0.4 square meter
Price per square metre of pillow ticking fabric	Rs 30 per square meter

The domestic demand for mattresses is estimated at 35 million pieces. This translates into a demand of 175 million square meters of mattress ticking fabric valued at Rs 700 crore. Considering that 10% of the mattresses use tapes, the demand of tapes for mattresses is estimated at 45 million meters valued at Rs 90 crore.

The domestic demand for pillows is estimated at 130 million pieces thus, demand for pillow ticking fabric is estimated at around 50 million square meters valued at Rs 155 crore. As per industry sources the demand for all kind of mattresses and pillows is expected to have a moderate growth rate of 3%. The current and future forecast of mattresses and pillow components is given below. An inflationary increase of 5% is considered to estimate the market potential.

Doemstic market size for components of Mattresses and pillows			2007-08	2012-13
Mattress components	Mattresses ticking fabric	Quantity	175 million square meters	200 million square meters
		Value	Rs 700 crore	Rs 1000 crore
	Mattress tape	Quantity	45 million meters	50 million meters
		Value	Rs 90 crore	Rs 130 crore
Pillow components	Pillow ticking fabric	Quantity	50 million square meters	60 million square meters
		Value	Rs 155 crore	Rs 225 crore

Source: Industry survey, IMaCS Analysis

Key manufacturers of the product

Kurlon Ltd. and Sleepwell are the major manufacturers of mattresses. Kurlon is the market leader with a market share of 40-45 % of the organized market**.** Kurlon's products include mattresses, pillows and home furnishings. Kurlon is also involved in trading home finishing imported from Taiwan, China, Malaysia, and procured from Ahmadabad, Meerut, Mumbai and Erode. The company has manufacturing facilities at Bangalore, Bhubaneswar and Gwalior and has plans of setting up a new facility in Northern India. Kurlon sources the required fabric for ticking from various fabnric manufacturers in Meerut, Kanpur and Mumbai.

Company	Production	Capacity	Sales turnover
Kurlon	NA	13 lakh mattresses	Rs 339 crore *
Sleepwell	Coir mattress - 1 lakh per month	NA	Rs 3000 crore*
	Flexipuff mattress - 0.5 lakh per month	NA	
	Pillows - 1 lakh per month	NA	

**Includes other products apart from mattresses*

Imports and Exports

The import figures are given in the following table:

HS Code	Description	Imports Quantity	Imports (Rs crore)
		2007-08 (E)	**2007-08 (E)**
52083250, 52084140, 52084250, 52084330, 52103230, 52095160,	Bed ticking , Domestic	9500 square meters	Rs 0.3 crore

Source: DGCIS, IMaCS analysis

The export figures are given in the following table:

HS Code	Description	Imports Quantity	Imports (Rs crore)
		2007-08 (E)	**2007-08 (E)**
52083250, 52084140, 52084250, 52084330, 52103230, 52095160,	Bed ticking , Domestic	1.5 lakh square meters	Rs 1.2 crore

Source: DGCIS, IMaCS analysis

These exports are estimated to be Rs 3 crore for the year 2012-13.

Quality Control and standards

The relevant BIS standards are given in the following table

BIS Code	Description
IS 7933: 1975	Specification for Flexible Polyurethane Foam for Domestic Mattresses
IS 9491: 1980	Specification for mattress, air
IS 13013: Part 1: 1990	Code of practice for packaging thermal insulation materials: Part 1 Slabs, mattresses and pipe-sections made of fibrous materials
IS 13489: 2000	Textiles - Bed Mattress - Specification

Nonwoven wipes

A wipe is a small piece of cloth used for the purpose of cleansing or disinfecting. Wipes could be woven, knitted or nonwoven. Nonwoven wipes have recently gained popularity on account of their excellent absorption and softness. The product is available as dry wipe as well as wet wipe wherein the nonwoven fabric is impregnated with a solution.

Wet wipes are designed for specific application e.g. Baby wipes, Facial wipes, Cleansing wipes, Hand & body wipes, Moist towelettes, Personal hygiene wipes, Feminine hygiene wipes, Antibacterial wipes and Medicated wipes. The usage of baby wipes is well accepted as a convenient, portable, hygienic way to keep babies clean. Antibacterial wipes help to sanitise shopping trolleys, restaurant tables, etc. to reduce the exposure to germs. They also provide an easy way to maintain clean hands more effectively. Personal care wipes are specifically designed to carry cleansing cremes with specific ingredients to help remove makeup. Wipes also find application in manufacturing and service industries especially in food service and health care. The success of nonwoven wipes is driven by their ease-of-use, disposability, portability and reduced risk of cross-contamination.

Product characteristics

Non-woven wipes are made from viscose, polyester and polypropylene and are available in variety of sizes ranging from 2 X 5 square cm to 30 X 40 square cm. Majority of nonwoven wipes are manufactured by Spunlace technology. The wipes are expected to have the following properties:

- Smooth and soft texture
- Good absorbance characteristics
- Good moisture retention properties

Market dynamics and key growth drivers

Busy lifestyle and high disposable income are the key factors for the acceptance of wipes. Wet wipes obviate the need for the use of separate ‘wet and dry’ combinations in cleaning tasks thus, allowing people to perform daily tasks in substantially less time. Currently the demand for wipes is limited in India but with growing number of middle class families, increasing disposable income and changing lifestyle the demand for wipes is expected to increase in the urban areas. Moreover, product innovations are further likely to boost the demand. Consumption of wipes in foodservice and health care applications is also expected to grow because of heightened health and hygiene concerns.

Market size of wipes and future forecast

Based on discussions with industry experts, the current market size for nonwoven wipes is estimated at 1.8 million square meters valued at Rs. 10 crore. The penetration of wipes in the Indian household sector is very less as compared to the developed countries. With increasing awareness about the benefits of these products and changing lifestyle the consumption of consumer wipes is expected to increase. In addition the demand for industrial wipes is also expected to grow. New product innovations and expanding applications are further expected to boost the demand. The market size for nonwoven wipes is expected to increase to 3.5 million square meters by 2012-13 (growing at a CAGR of 15%). The market potential for wipes in 2012-13 is estimated to be Rs. 20 crore. No inflationary increase has been assumed for the price of the product.

The current and future forecast of non-woven wipes market is given below:

Market size of non-woven wipes	2007-08	2012-13
Quantity	1.8 million square meters	3.5 million square meters
Value	Rs. 10 crore	Rs. 20 crore

Source: Industry survey, IMaCS Analysis

Key manufacturers of nonwoven wipes

Ginni Filaments Ltd. manufactures wipes made of spunlace non-woven fabric. The company started production in 2006-07. Anjani Nonwovens, a part of Anjani Udyog Pvt. Ltd. is also reported to enter into the manufacturing of spunlace nonwoven fabric. The company is reported to invest Rs. 120 crore to set up a spunlace plant at the Mundra Special Economic Zone (SEZ) in Gujarat. The 7000 MT/annum capacity plant will produce cotton pads and wipes.

Birla Cellulose, the fibre division of Aditya Birla group has also entered the disposable natural wipes category. With a special focus on the institutional segment, Birla Cellulose is planning to tie up with airlines, travel agencies, pharma companies and schools to promote and build this sector. The company is currently sourcing the nonwoven fabric and marketing its disposable wipes under brands '*Kara*' (skincare), '*Purreta*' (baby care), '*Prim*' (homecare) and '*Handy*' (hand santizers).

Manufacturer	Year	Installed capacity	Production	Sales (Rs crore)
Ginni Filaments	2006-07	649 lakh pieces	90 lakh pieces	Rs 1 crore
	2007-08	649 lakh pieces	397 lakh pieces	Rs 3.6 crore

Source: Industry Survey, Annual reports of listed players

Import and Exports of wipes

The estimated import figure for wipes is given in the following table:

HS Code	Description	Value (Rs crore)
		2007-08 (E)
63071090/9090, 56031300/1200, 48189000, 48182000,	Baby wipes, Wet wipes, refreshing wipes, wipes, etc	~Rs 8 crore

Source: IBIS, IMaCS analysis

In addition non woven fabric is imported and converted into wipes in India.

Over 50% of the imports take place from China and Singapore. Wipes are also imported from Canada, Germany, USA and UAE.

The export of nonwoven wipes is negligible.

Key importers and exporters

Kimberly-Clark Lever Ltd.is a leading player in wipes. The company markets its baby wipes under the brand name '*Huggies'*. In addition Kimberly-Clark has specialized wipes marketed under the brand name '*Wypall'* and '*Kimtech*'.

Raw-materials and machinery

Viscose is the preferred fibre for wipes on account of its high absorbency coupled with softness. Birla Cellulose is a supplier of hollow, chlorine-free, zinc-free and anti-bacterial fibres, which are environment friendly and are especially suited for applications like wipes. Wipes are also manufactured using other synthetic fibers as polypropylene, polyester, etc.

Over 50% of the nonwoven wipes are manufactured by Spunlace technology. The web formation for Spunlace production line utilizes carded web making technique.

The key machinery used for production of wipes is given below:

- Blow room
- Injection Cards
- Spunlace hydro entanglement line

- Dryer
- Winder
- Slitter
- Folding and cutting line

The key machinery suppliers are:

- Rieter Perfojet, France
- Fleissner GmbH & Co. (Germany)

Mosquito nets

The Mosquito net is an essential item used all over the country for protection from mosquitoes; therefore the market of the item exists through out the year. As other precautions in practice like Mosquito Repellent Mats, Ointment and coils have various side effects; people prefer the use of Mosquito Nets therefore the demand is increasing day by day.

Consumption norms and the market size

Nylon net constitutes around 96% of the raw material cost of the mosquito net. The process of manufacture of Nylon Mosquito Net is very simple. A piece of Net cut in rectangle size as per required size. The required rectangle size Net along with Cotton Tape is spread on sewing Machine and stitch from one corner to the end.

Nylon net consumption norm (Mosquito nets industry)

Mosquito nets production (MT)	Approx 16,000
No of mosquito nets produced	9 million
% of nylon net by weight	96%
Average Nylon net usage per net	10 m
Total nylon net usage (Rs crore)	**Rs 225 crore**

Source: Karur HDPEmono-filaments yarn & fabrics Manufacturers Association, Industry survey, IMaCS Analysis

On an average, around 10 metres or 1.5-2 kg of nylon net is used for manufacturing 1 mosquito net. Around 80-100 lakh mosquito nets are manufactured every year in India for domestic use. Assuming a wastage of 5% (as per industry standards), total nylon net usage in the mosquito nets industry is estimated as Rs 225 crore approximately.

The mosquito nets industry in India has been growing at around 10-15% per year and is expected to maintain its growth trend in the future.

The current and future forecast of Nylon net consumption in the mosquito nets industry is given below:-

Market size of mosquito nets	2007-08	2012-13
Nylon net (in million metres)	90 million meters	145 million meters
Nylon Net value (in Rs. crore)	Rs 225 crore	Rs 364 rore

Source: Industry survey, IMaCS Analysis

The potential market for nylon net in the mosquito nets industry in 2012-13 is estimated at Rs. 462 crore up from Rs 225 crore in 2007-08 (E). No inflationary increase has also been assumed for the price of nylon net. In volume terms, the usage of nylon net in the mosquito nets industry is expected to grow from 90 million metres in 2007-08 to 145 million metres in 2012-13.

The production of nylon tyre fabric in India is limited to a large number of small-scale producers. There are as many as 75 small-scale units manufacturing mosquito nets in Karur, Tamil Nadu itself producing around 170-180 MT of mosquito nets per annum (per unit).

Raw-materials for mosquito nets

All the machineries required and raw materials are available locally from local traders. The nylon is sourced from local players like Reliance and Haldia.

Imports & Exports of mosquito nets

The estimated import figures for mosquito nets are as given below:-

HS Code	Description	Imports Quantity	Imports Value
		2007-08(E)	2007-08(E)
63049270	MOSQUITO NETS	**0.75 million nos.**	**Approx. Rs 7.5 crore**

Source: DGCIS, IMaCS Analysis

The estimated export figures for mosquito nets are as given below:-

HS Code	Description	Exports Quantity	Exports Value
		2007-08(E)	2007-08(E)
63049270	MOSQUITO NETS	**0.12 million nos.**	**Approx. Rs 3.5 crore**

Source: DGCIS, IMaCS Analysis

These exports are estimated to be Rs 4.1 crore for the year 2012-13.

Quality Control and Standards -- As per IS 14953:2001

PROTECH

Protech is an ensemble of textile products and related material used in the manufacture of various protective clothing for personnel working in hazardous environment. The protective clothing includes garments and related paraphernalia for protection from harmful chemical environment, extreme temperature environments, low visibility, ballistic protection, etc.

Defence is one of the largest consumers of protective textiles. The Indian Defence Forces with a total strength of around 1.5 mn individuals comprising the army, navy, air force. Approximately 25-30 % of the troops are involved in high risk, counter insurgency & special operations in super high attitude areas and require protective clothing. In addition, around 1.2 mn individuals are present in paramilitary forces and other security forces. In addition, defence also requires uniforms / special uniforms which have not been classified as technical textiles.

The usage of protective textiles in defence comprises the following:-

5. Bullet proof jackets
6. NBC suits
7. High altitude clothing
8. Fire retardant apparel

The annual requirement of these products for defence installations is given below:-

Items	Defence requirement (units)
High altitude clothing	Around 1.5 - 2 lakh
NBC suits	Around 50,000
FR suits	Around 1 - 2 lakhs
Bullet proof jackets	Over 2 lakhs

The total usage of protective technical textiles in defence is estimated as around Rs 1,000 crore. With increasing terror threats, the usage of bullet proof jackets and other protective clothing is set to rise. For example, additional orders were placed in Jan 2009 to procure 20,000 bullet proof jackets on an emergent basis by the Ministry of Home Affairs (MHA) for central police organisation including the National Security Guards and the Central Reserve Police Force.

Most of these requirements are catered to by imports and part of it is supplied by domestic players among which Ordinance Factory Board (OFB) is the largest supplier. OFB receives orders from Director General of Ordinance Supplies (DGOS) which in turn are given based on the requirements of Master General of Ordnance (MGO). OFB receives orders for these products from the MGO on an annual requirement basis. OFB manufactures NBC suits, high altitude clothing (also known as Extreme cold climate clothing or ECC clothing), fire-retardent clothing and tents. High altitude clothing includes jackets, trousers, caps and gaiters. At present, only two types of tents are made - Tent extendable and Arctic tents. By 2010, OFB also has plans to manufacture Bullet proof jackets to meet the growing domestic demand. In addition, OFB also manufactures parachutes (supply dropping parachutes, aircraft brake parachutes, parachutes for paratroopers and aircraft pilot ejection parachutes), sleeping bags and mattresses which are not classified under protech applications.

OFB is the only indigenous manufacturer for the NBC suits and high altitude clothing in India. The total fabric consumption of OFB is estimated as around 25,000 metres. OFB has a turnover of Rs 700 crore. Non woven and rubberized fabrics consumption is less than 2% of total fabric consumption. Non woven fabric requirement is only for NBC suits.

Production details of OFB

Items	Production (2007-08)	Expected growth rate
High altitude clothing	5,000-7,000 nos.	15%
NBC suits	22,000 nos.	15%
Sleeping Bags	50,000 nos.	5%
Mattresses (Kapok)	1.5 lakh nos.	5%
Tents	15,000 nos.	8-10%

Source: Industry survey

The technical textile products covered under Protech are as given below:-

9. Ballistic protective clothing – Bullet-proof jackets
10. Fire retardant apparels
11. Fire retardant fabrics (for furnishings)
12. Radiation protection textile/NBC suits
13. High visibility clothing/Foul weather clothing
14. Chemical protection clothing
15. Industrial gloves/Cut. Slash protection
16. High altitude clothing

The products in the Protech category are typically 100% technical textile products with the exception of industrial gloves (where technical textile is fully or partly used in the end product). The technical textile consumption under Protech is estimated as around Rs 1,259 crore. The key Protech products are high altitude clothing, bullet-proof jackets and fire retardant fabrics which account for 52%, 20% and 14% of the technical textile consumption respectively in Protech segment. The fire retardant apparels and high visibility clothing each accounts for around 5% of the usage of technical textiles under Protech, rest NBC suits, chemical protection clothing and industrial gloves constitute less than 2% each.

The domestic consumption of technical textiles under Protech is expected to increase from around Rs 1,259 crore in 2007-08 to around Rs 2,021 crore by 2012-13.The demand for the Protech products is dependent on the improvements in worker safety practices, fire protective standards for construction and increase in defence sector spending on protective clothing. In the medium term (next 5 years), the protective textiles industry is expected to achieve growth at the rate of 9-10% year on year.

Amongst Protech products, high growth is expected in the fire retardant fabric, high visibility clothing material and chemical protective clothing.

Summary of the market-sizing for Protech

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
Ballistic Protective Clothing	**Quantity**	1.1 lakh pieces	< 100 pieces	0.1 lakh pieces	Around 1 lakh pieces[#]	Over 2 lakhs[#]	
	Value	Rs 253.6 crore	Rs 0.64 crore	Rs 4.2 crore	Rs 250 crore[#]	Rs 500 crore[#]	Rs 4.6 crore
Fire Retardant Apparels	**Quantity**	7.7 lakh pieces	0.25 lakh pieces	0.42 lakh pieces	7.9 lakh pieces	11.6 lakh pieces	
	Value	Rs 72.8 crore	Rs 2.6 crore	Rs 4.4 crore	Rs 71 crore	Rs 104 crore	Rs 5.6 crore
Fire Retardant fabrics	**Quantity**	6 million meters	-	-	6 million meters	15 million meters	
	Value	Rs 180 crore	-	-	Rs 180 crore	Rs 450 crore	-

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
NBC suits	**Quantity**	22,000 pieces	-	-	22,000 pieces[#]	50,000 pieces	
	Value	Rs 22 crore	-	-	Rs 22 crore[#]	Rs 50 crore	-
High Visibility Clothing / Reflective wear*	**Quantity**	-	6 million nos. *Fabric equivalent*	-	6 million nos.	12.1 million nos.	
	Value	-	Rs 66 crore	-	Rs 66 crore	Rs 132.7 crore	-
Chemical Protection Clothing (CPC)*	**Quantity**	-	78,000 pieces *Fabric equivalent*	-	78,000 pieces	1,14,000 pieces	
	Value	-	Rs 10.87 crore	-	Rs 10.87 crore	Rs 20 crore	-
Industrial gloves (TT component)	**Quantity**	100.6 million pieces	2.1 million pieces	80.5 million pieces	22.2 million pieces	35 million sq m	
	Value	Rs 43.1 crore	Rs 0.4 crore	Rs 34.5 crore	Rs 9 crore	Rs 14.1 crore	Rs 44 crore
High Altitude Clothing*	**Quantity**	7,000 pieces	0.18 million pieces *Fabric equivalent / garments*	-	0.18 million pieces	0.21 million pieces	
	Value	Rs 0.25 crore	Rs 650 crore	-	Rs 650 crore	Rs 750 crore	-
TOTAL	**Value**	**Rs 571 crore**	**Rs 731 crore**	**Rs 43 crore**	**Rs 1,259 crore**	**Rs 2,021 crore**	**Rs 54.3 crore**

** Predominantly, the fabric is imported under HS codes 5602 / 5603 and the protective apparel is manufactured in India*

 # Potential demand, actual demand is constrained by supply shortage

As per ECTT report, the potential market sizing for 2007-08 was as given below:-

Market size (ECTT report)		2001-02	2007-08 (P)
Fire Retardant Textiles			
(A) F. R. Apparels	**Quantity**	1.00 million pieces	1.4 million pieces
	Value	Rs 27.50 crore	Rs 38.50 crore
(B) Speciality F. R. Apparel for Defence	**Quantity**	50,000 nos.	1,75,000 nos.
	Value	Rs 150 crore	Rs 525 crore
(C) F. R. Upholstery / Furnishing (General public)	**Quantity**	0.5 million metres	5 million metres
	Value	Rs 20 crore	Rs 200 crore
Ballistic Protective Clothing			
Bullet Proof Jackets	**Quantity**	50,000 nos.	1,75,000 nos.
	Value	Rs 150 crore	Rs 525 crore
Total	**Value**	**Rs 347.5 crore**	**Rs 1,288.5 crore**

The key impediments to the growth of Protech products in India are:-

1. Lower level of awareness and lack of stipulations mandating usage of protective textiles (industrial gloves / workwear, flame retardant apparels/fabric)
2. Demand for several Protech products like high altitude clothing, bullet proof jackets is inconsistent across years leading to low capacity utlisations
3. Most of the production is made-to-order
4. The entry barriers are quite high as these are high technology products
5. The raw material fibres like aramid, nylon-66 etc. are primarily imported resulting in higher production costs

Bullet-proof jacket

Ballistic protection involves protection of the wearer's body and eyes against projectiles and fragments of various shapes, size and impact velocity. The projectiles are a part of ammunition shot through weapons such as pistols, revolvers and rifles. Ballistic protection equipments have been used for ages, the earliest form of protection was metallic suit. The ballistic protection equipments evolved from metallic to natural fibre fabric (layers of silk). With the advent of synthetic fibres, all the ballistic protection equipment was made using synthetic fibres like aromatic polyamide (Aramid), Ultra High Modulus Polyethylene (UHMPE) and p - phenylene-2, 6-benzobisoxazole (PBO).

The bullet-proof jackets protect the bearer by dissipating the kinetic energy of the projectile into the equipment layers by deformation of the fabric layer cutting across yarns. For example, when a projectile hits a woven fabric a shock wave or strain wave is introduced in the fabric, which spreads through its yarns. The primarily impacted yarns interact with other yarns by means of couplings at the cross over points of the fabrics. The strain wave can thus be pushed over a large number of yarns. The positive effect of this mechanism is that the energy will be absorbed over a large area. The velocity of the strain wave dissipation of energy would depend upon the modulus of the constituent of the fabric

Product characteristics

The bullet-proof jackets are made from Aramid, Nylon 66, UHMPE, Carbon fibres or PBO. Each jacket weighs about 5 kilograms and is expected to have the following properties:

1. Light weight
2. Comfortable to wear
3. Facilitate body movement
4. Ability to spread the projectile energy efficiently

Each jacket has about 0.6 square metres of non-woven material weighing around 750 GSM. Bulk of the jacket is made from woven material as the combination of weave and the fibre characteristics influence the energy absorption characteristics of bullet-proof jacket. The synthetic fibre (Aramid) used in production of bullet-proof jackets is primarily imported (DSM Netherlands/DuPont etc) with the exception of carbon glass fibre.

Market dynamics and key growth drivers

With the rising trend of crime, violence and terrorism, the demand for bullet-proof jackets is rising as well. The major customers of bullet-proof jackets are Defence, Paramilitary forces engaged in counter terrorism/insurgency operations and Law enforcement agencies (police). Despite high demand, there are only a few suppliers in the market. The demand from Indian paramilitary forces alone is estimated as up to 2 Lakh pieces per annum. But, most of the demand is unmet due to supply shortage. After the recent terrorist activities, the ministry of home affairs (MHA) ordered the purchase of 20,000 bullet-proof jackets for central police organisation including the National Security Guards and the Central Reserve Police Force. In addition, several police departments are in the process of tendering for these jackets, though the demand from police departments is quite small, usually between 5 to 200 jackets only. The North-eastern states procure over 1,500 bullet proof jackets, though the purchases differ across years. In addition, the retail demand of these jackets is estimated at around 500 to 1,000 jackets per annum.

Though there is considerable potential demand for these jackets, the supply shortage is leading to demand build-up over the years. There is a strong need to increase the supply of bullet proof jackets to keep pace with the growing demand.

Key manufacturers of bullet-proof jacket

The key manufacturers of bullet-proof jacket are given below:

1. Tata Advanced Material Limited (TAML) – Sales: Approximately 70,000-75,000 pieces per annum.
2. Anjani Technoplast
3. Southern Group of Industries Pvt. Limited
4. M Kumar Udyog
5. Isolar India – Glass based bullet-proof jackets
6. Secure Mobile

TAML has a market share of 80% in the bullet-proof jacket market in India.

Market size of and future forecast

The market for bullet-proof jacket is more from the supply perspective as compared to demand. The total domestic size in India is around 1 lakh pieces of bullet-proof jackets valued at Rs 250 crore.

The current and future forecast of the domestic usage of bullet-proof jacket is given below:

Market size				
	2007-2008		2012-2013	
	Quantity (No. of pieces)	Value (Rs crore)	Quantity (No. of pieces)	Value (Rs crore)
Bullet proof jackets	Around 1 lakh pieces	Rs 250 crore	Over 2 lakhs*	Rs 500 crore

Source: Industry survey, IMaCS Analysis

** Potential demand, actual demand is constrained by supply shortage*

The potential demand of bullet proof jackets is already more than 2 lakh pieces per annum. But, the supply shortage has constrained the actual demand (satisfied by production) is only around 1 lakh pieces of bullet proof jackets (estimated). Even at conservative levels, the potential demand for bullet-proof jacket is expected to be far in excess of 2 lakh pieces by 2012 – 13. The market potential in 2012 – 13 is estimated to be at least Rs. 500 crore. However, the actual demand will be constrained by the supply availability in India (as these jackets are generally not imported). This assumes no spikes in demand due to sudden jumps in Defence spending (influenced by events like deteriorating internal security situation, border conflict etc)

Import and Exports of Ballistic Clothing

The import figures for protective jackets are as given below:-

HS Code	Description	Value (Crore Rs)		Imports (Quantity)		
		2006-07	2007-08	Unit	2006-07	2007-08
62104010	Personal protective garments (Bullet proof jackets, bomb disposal jackets etc)	0.27	0.64	Pieces (thousands)	0.02	0.03

Source:IBIS, IMaCS Analysis

The export figures for bullet-proof jackets are as given below:-

HS Code	Description	Value (Rs Crore)		Exports (Quantity)		
		2006-07	2007-08	Unit	2006-07	2007-08
62104010	Personal protective garments (Bullet proof jackets, bomb disposal jackets, etc)	27.00	3.63	Pieces in thousands	28.32	9.92

Source: IBIS, IMaCS Analysis

These exports are estimated to be Rs 4.6 crore for the year 2012-13.

Quality Control and Standards

NIJ standards are followed for production of bullet-proof jackets. The NIJ standards are based on specific threat levels.

Fire/Flame retardant fabric (for furnishings)

The normal textile consists of highly ignitable materials and turn into primary source of fire percolation in case of a break-out. However fabrics are required for aesthetic appeal. Fire retardant fabrics per form both the task of providing aesthetics to the surroundings and preventing spread of fire. The there are typically two major categories of fire retardant fabrics which are coated fabric and inherently fire retardant fabric.

Product characteristics

The fire retardant fabrics are primarily of two types:

1. 100% cotton fabric with coating of fire retardant chemical.
2. Inherently fire retardant fabric.

The cotton fabrics are coated with fire retardant chemical in a bath which results in a layer of fire retardant getting formed on the cotton surface. Generally, PYROVATEX® from CIBA is generally used as fire retardant coating. The weave and the basis weight of the cotton fabric too decide the performance of this fabric. However, incomplete coverage of fire retardant chemical reduces the performance with wear and tear, cracking, flaking, bending and aging.

The other type of fabric is the one which uses inherently fire retardant fibres. These are modified polyester fibre with permanent fire retardant properties. The world leader in fire retardant fabric is Trevira® a Reliance Netherlands B.V. brand. The fibre is obtained after high level of polyester modification. The fabric made from inherently fire retardant fibres results in uniform fire retardant features. The other fibres used for fire retardant fabric are:

Generic name	Fibre	Manufacturer
Aramid (Meta)	Nomex	DuPont
Aramid (Para)	Kermel/Kevlar/Twaron	Rhone-Poulence/ DuPont/ Akzo (Holland)
Modacrylic	SEF/ Kanecaron	Monsanto (Italy)/ Kaneka (Japan)
Polyamide	P84	Lenzing (Austria)
Vinal	Vinex FR9B	Westex

Source: Journal of Textile Association, May-June 2007

The typical characteristics of the fire retardant fabric are:

1. Very low fume toxicity in fire
2. High tear and abrasion resistance
3. Breathable and comfortable
4. Anti decay and Anti mould
5. Crease resistance
6. High dimensional stability
7. No fading and excellent colour tone

Market dynamics and key growth drivers

The key industries which drive the off-take of fire retardant fabric are given below:

1. All building and constructions need to get fire safety clearance from the fire department. However these clearances are more from the construction perspective rather than furnishing perspective. With boom in retail and real estate there has been rapid emergence of shopping complex, malls, cinema multiplex etc. There is need of fire retardant fabrics in these areas from the security point of view.
2. Airlines, Railways and Ships are another key market
3. Office furnishings and hospitals and another key sector

The fabrics find application in curtains, sheers, upholstery, stage curtains, blankets, bedding, wall coverings and blinds.

However the awareness of these materials is low and there is no regulation on usage of these materials from the safety perspective which hinders the market off-take.

Key manufacturers of fire retardant fabric

The key manufacturers of fire retardant fabric are given below:

1. Chemical coated fire retardant fabrics
    a. Rajasthan Weaving and Spinning Mills Limited – 70% of fire retardant fabric protection is coated fabric. The company had a production of 1.7 lakh metres in 2005-2006.
    b. Jaya Shree Textile – Capacity: 2 million meters per annum

    The chemical used in fire retardant treatment is imported. 'Pyrovatex' is the chemical used for coating and supplied by CIBA in India.

2. Inherently fire retardant fabric
    a. Trevira from Reliance Netherlands B.V – these fibres are primarily imported
    b. Rajasthan Weaving and Spinning Mills Limited – Produces Curtains and upholstery fabric with a product mix of 70% curtains and 30% upholstery fabric. Of the total fire retardant fabric production 30% is inherently fire retardant. The source of fire retardant fibre is Trevira.

In addition, Delkon Textile Pvt. Ltd., Haryana has been manufacturing and supplying fire retardant fabrics since the year 2000. Till date, they have supplied 50,000 mts of fire retardant textiles. In 2008-09 (9 months), they have supplied 21,000 mts (approx.) of fire retardant curtain fabric woven from inherent fire retardant yarns. They have capacity to manufature 2,75,000 mts per year of Fire Retardant Fabrics.

Market size and future forecast

The market for fire retardant fabric is estimated to be around five lakh meters per month based on the inputs of industry players. The average price of fire retardant fabric is approximately Rs. 300 per meter.

The current and future forecast of the domestic usage of fire retardant apparels is given below:

Market size		
Fire Retardant fabrics	**2007-08**	**2012-13**
Quantity (million metre)	6	15
Value (Rs. Crore)	Rs 180 crore	Rs 450 crore

Source: Industry survey, IMaCS Analysis

The market size for fire retardant fabrics is estimated at approximately 6 million meters valued at Rs. 180 crore. The demand for fire retardant fabric is expected to grow at a rate of 20% per annum to increase to around 15 million meters by 2012–13. The market potential in 2012–13 is estimated to be around Rs. 450 crore.

Import and Exports

The chemical required for coating is imported where as the base fabric is source locally. In case of inherently fire retardant fabrics, the discussion with industry players has revealed that the required yarn is imported and the fabrics are manufactured locally.

Raw-materials

Coated fire retardant fabric: The base cloth is 100% cotton generally. The strength of the fabric is dictated by the cotton yarn and basis weight of the cotton fabric. By using higher GSM of the fabric, its weight strength loss can be delayed. The cotton fabric of desired weave and basis weight is treated with fire retardant chemicals and a chemical bath and processed further to give the finished fabric. The chemicals used are PYROVATEX® and PYROGUARD®.

Inherently fire retardant fabric: The fabric is made from fire retardant fibre like Trevira. The fabric characteristics are decided by the weave and basis weight. The filament yarn used is in the range of 50 – 1350 dtex.

Quality Control and Standards

Fire retardant furnishing fabrics are covered under BIS: IS: 13501:1992 and IS: 11871:1986 and IS: 12777:1989. However major manufacturer of fibre and fabric adhere to British and other European standards.

Fire /Flame retardant apparel

The fire/flame retardant apparels have an industrial need as they offer protection from fire and other heat intensive tasks. Flame, heat and splashes of molten metal etc. are hazards in many heavy engineering working conditions. The fire retardant apparels are used in refineries, iron and steel plants, aluminum plants and welding industries.

Product characteristics

The fire retardant apparels can be manufactured from two varieties of fabric: 100% cotton fabric with flame retardant coating or fabric made of inherently flame retardant fibre. The typical characteristics of the apparel are:

1. Flame resistance – must not catch fire
2. Should be breathable
3. Easy to wear
4. Light weight
5. Should have high abrasion resistance

The chemical generally used for coated fire retardant fabric is PYROVATEX® from CIBA. The apparel made from coated fabric generally has a basis weight of 250-350 GSM. The fabric used could be either woven or knitted. The coated fabric which accepted worldwide could have flaws due to incomplete coverage of fire retardant chemical on the fabric surface which would pose threat with aging.

The other type of fabric used for flame retardant apparel is a one which is inherently flame retardant. Following are a few fibre retardant fibres used of this production of apparel:

Generic name	Fibre	Manufacturer
Aramid (Meta)	Nomex	DuPont
Aramid (Para)	Kermel/Kevlar/Twaron	Rhone-Poulence/ DuPont/ Akzo (Holland)
Modacrylic	SEF/ Kanecaron	Monsanto (Italy)/ Kaneka (Japan)
Polyamide	P84	Lenzing (Austria)
Vinal	Vinex FR9B	Westex

Source: Journal of Textile Association, May-June 2007

Market dynamics and key growth drivers

The market of fire retardant apparels is primarily driven by increased awareness, international level of safety standard in industrial workplace and mandatory safety norms for protection of workers. The fire retardant apparels are generally used in:

1. Iron and steel industry-some of the big steel producers such as Tata Steel, Steel Authority of India Ltd, Ispat Industries and Essar Steel are making significantly higher investments in this area.
2. Welding industry
3. Oil Refineries

Large Heavy Industry establishments such as SAIL require around 10000 pieces per annum on an average. Defence establishments require around 2 lakh pieces of fire retardant apparels.

The manufacturers of fire retardant apparels in India generally tend to export a major part of their production (two-third or more). The awareness level being low only leading heavy industries follow necessary safety standards. With increasing emphasis on safety standards fire retardant apparel industry is expected to grow at around 8% per annum.

Key manufacturers of fire retardant apparels

Ordinance Factory Board manufactures the FR apparels for defence usage in India. For fire retardant fabrics, inherently flame retardant fabrics are used for clothing (while chemical coatings are used for tents). The other key manufacturers of fire retardant apparels are given below:

Company	Capacity	Production	Units
Tara Lohia Pvt. Limited	2.5-3	2.5-3	Lakh pieces per annum
Mallcom India Limited	6	1-2	Lakh pieces per annum
Chandramukhi Impex	-	0.1-0.15	Lakh pieces per annum
Modern Apparels	-	0.1	Lakh pieces per annum

In addition to these key players there is large number of small producers of fire retardant apparels however the quality and standards followed by these units is usually suspect. Several manufacturers like Kusumgar Corporates supply fire retardant fabrics for defence purposes.

Market size of and future forecast

The market for fire retardant apparels is driven by demand from few big players in refining, iron and steel and other heavy engineering companies. The price of good quality fire retardant apparel manufactured using inherently fire retardant fabric (using specialty FR yarn) ranges from Rs. 1500 to Rs. 3000, which are predominantly used by defence forces. The normal fire retardant apparel ranges from Rs 250 to Rs 500 per piece. The domestic market in India is estimated at 7.9 lakh pieces worth Rs. 71 crore.

The current and future forecast of the domestic usage of fire retardant apparels is given below:

Market size		
Fire Retardant Apparels	**2007-08**	**2012-13**
Quantity (Lakh pieces)	7.9	11.6
Value	Rs 71 crore	Rs 104 crore

Source: Industry survey, IMaCS Analysis

The demand for fire retardant apparel is expected to increase to 11.6 lakh pieces by 2012 – 13 registering a growth rate of 8% per annum. The market potential in 2012 – 13 is estimated at Rs 104 crore.

Import and Exports of fire retardant apparels

The import figures for fire retardant apparels are as given below:-

HS Code	Description	Value (In Rs. Crore)		Imports (Quantity)		
		2006-07	2007-08(E)	Unit	2006-07	2007-08(E)
62104090	Other personal protective garments *	0.5876	2.6112	Number of Pieces in thousands	12.98	25.08

Source:DGCIS, IMaCS Analysis

**Other products are also imported under this HS code*

The export figures for fire retardant apparels are as given below:-

HS Code	Description	Value (In Rs. Crore)		Exports (Quantity)		
		2006-07	2007-08(E)	Unit	2006-07	2007-08(E)
62104090	Other personal protective garments*	5.1573	4.418267	Number of Pieces in thousands	117.56	42.03

Source: DGCIS, IMaCS Analysis

**Other products are also exported under this HS code*

These exports are estimated to be Rs 5.6 crore for the year 2012-13.

Raw-materials

The manufacturing process generally involves cutting the fabric and stitching/sewing the fabric together based on the requirement. The thread used for sewing is also fibre retardant. The threads generally used are – Nomex, Kevlar, Fibreglass, Carbon and Quartz. The work-in-progress apparel is further fixed with reflective tapes and other materials as per the specifications.

Quality Control and Standards

The companies in India follow the European Standard like EN 512 based on the level of protection need to be offered to the person wearing the apparel.

Nuclear Biological and Chemical (NBC) suits/Hazmat suits

Hazardous material (Hazmat) suits were designed to protect users handling hazardous waste material such chemicals, radioactive material etc. A more specialized variety of these suits are NBC (Nuclear Biological and Chemical) suits. Developed to protect soldiers, these are designed to protect the user in a hostile environment with chemical/biological agents and against radioactive fallout dust. The suits are designed to be worn for extended periods while continuing to operate in a combat environment.

Product characteristics

The NBC suit consists of a trouser and jacket and can be used directly over the under garments. The suit is permeable and allows evaporation of sweat (breathable). The suits are made in different sizes, generally these sizes are: small, medium, large and extra-large.

The suit is made of three layers:

1. Inner layer: Fabric cotton
2. Middle layer: Active charcoal treated non-woven
3. Outer layer: Fabric with chemical and fire retardant fibres (inherently retardant). The outer fabric has disruptive printing to camouflage the soldiers and the base material for this coated fabric is polyester

The physical characteristics of the NBC suit are given below:

1. Fire/Heat/Cold/Water repellent outer fabric
2. Breathable
3. Effective in the temperature range of -35'C to +55'C
4. Resistance to wear and tear – high abrasion resistance
5. Can be decontaminated atleast two times
6. Washable
7. Shelf life of five to seven years

Market dynamics and key growth drivers

The major market for these products is primarily the Armed Forces and to a lesser extent NBC Emergency response units (National Disaster Management Authority)/Central Paramilitary Units/Other Civil Defence units etc. The Indian Army has around 1.5 million soldiers; out of these around 25% (0.375 million) are active in strike formations on the western border in normal deployment. These strike units can, in time of conflict with a hostile western neighbor, be potentially involved in combat in a hostile NBC environment. The Indian Army has been training to operate in such environments in exercises over the past few years and equipment and protocols are being developed. Thus NBC suits, while not new as a concept, would have a gradual growth going ahead.

Key manufacturers

The Ordnance Factory is the only indigenous manufacturer and supplier of NBC suits in India managed by the Government of India. The technology is developed by the Defence Research Development Organisation and suits are manufactured by Ordnance Factories. Ordnance Factory has supplied around five lakh NBC suits to the army.

Market size of and future forecast

The Indian Defence forces have around 1.5 million soldiers, out of these around 25% (0.375 million) are tasked with operating in an environment with potentially high radiation and chemical/biological threats. The Ordnance Factory has supplied around five lakh NBC suits to the army. The current level of penetration indicates that the domestic demand is going to be more of a replacement demand. The average life of a NBC suit is assumed to be 7 years. Although the demand for these suits is not steady and products are generally built-to-order or tender, it is assumed that the demand would be uniformly distributed over the years as more units are also equipped. These suits cost around Rs 10,000 per piece.

The current and future forecast of the domestic usage of NBC suits is given below:

Market size		
NBC suits	**2007-08**	**2012-13**
Quantity (Lakh Pieces)	0.22	0.50
Value (Rs crore)	22	50

Source: Industry survey, IMaCS Analysis

The market size for NBC suits is estimated at approximately 22,000 pieces valued at Rs. 22 crore (though the initial demand was for 50,000 suits, the available capacity was only for 22,000 suits). The demand for NBC suits has been conservatively estimated at 50,000 suits in 2012–13 (same as the potential demand for 2007-08). Hence, the market potential in 2012–13 is estimated to be around Rs. 50 crore. No inflationary increase is considered for estimating the market size.

Import and Exports of NBC suits

The export and imports of these NBC suits are negligible.

Quality Control and Standards

No specified quality standards, usually specification driven as per Defence Research Development Organisation.

High-Visibility clothing

High visibility clothes (also known as Reflective-wear) have become very essential for the protection of people working in poorly lit environments like mines, highways, airport runways, cyclist etc. In the dark, the high visibility clothing increases the ability to spot working and guiding personnel.

Product characteristics

There are broadly three types of high visibility clothing:

1. Reflection materials which shine when struck by light
2. Photo luminescent material which give yellow light in dark
3. Fluorescent material which is more visible even during the day

Photo luminescent materials absorb the artificial light and emit green-yellow light in the darkness. Zinc Sulphide crystals which are not radioactive and non toxic pigments. Fluorescent materials convert energy from non-visible UV rays into visible. These are useful during daylight but offer little protection in the dark as they do not emit or reflect light.

The high visibility clothing is available in two classes:

1. Suits with plastic tapes
2. Suits with glass beads – or retro-reflective tapes – these give visibility up to 600 meters. Retro-reflective tapes are based on the principle that if the incident rays of light fall on concave glass, the reflected rays travel back in the same direction. This enhances the visibility of the person wearing garments consisting of retro reflective tapes. The technology involves coating of highly reflective glass beads with density as much as 50,000 tiny glass beads per square inch light.

Ideal high visibility apparel should have the following characteristics

- Light weight
- Both day and night visibility.
- Air and moisture permeability to ensure wearer comfort (Breathing perforated cloth mesh allows air and moisture through, enabling the vest to be worn over clothing in any weather.)
- Universal one-size-fits-all design features so that jackets/Vests can be shared by the employees working n different shifts.
- Hemmed edges for durability and neatness

The fabric used for high visibility clothing is generally 120gsm fluorescent polyester tricot fabric material with reflective micro prison sheeting. The reflective tapes are typically 5 cm in width. Each piece of vest requires 1.2 to 1.5 square meters fabric.

Market dynamics and key growth drivers

The key driver for high reflective clothing is the requirement of personnel visibility in ill-light areas of work both from service delivery and safety perspectives. The awareness of these products is low however is growing gradually with usage is airport, police, municipality, mining construction etc. The market in India is nascent and almost all the products are imported and marketed in India.

Key manufacturers of High visibility clothing

The high visibility clothing manufacturers source the clothing and tape and fabricate the jacket/vest**.** There are no manufacturers of these fabrics in India and these are sourced from Korea and China.

Some of the key suppliers of high visibility clothing are given below:

1. Reflectosafe, Mumbai – Production: 2 Lakh pieces per month
    a. Imports material from South Korea
2. Intech Safety Private Limited, Kolkata
3. Safety Solution Inc., Bangalore
4. Delkon Textiles Pvt. Ltd., Faridabad

Delkon manufactures woven base fabric of safety jackets (as per EN 471) and then fabricates safety jackets. They have supplied them to Govt. Organisations in the past. The retroreflective tape used during fabrication is usually imported. They have a capacity to manufacture and fabricate 3 lakh saftey jackets as per EN 471 per year.

In addition to these key producers, various small importers also cater to a portion of domestic demand.

Market size of and future forecast

As per Industry research, the market for High-Visibility is approximately around 60 lakh pieces per annum. The average price of high visibility vests is Rs. 110. The current and future forecast of the domestic usage of high visibility clothing is given below:

Market size		
High visibility clothing	**2007-08**	**2012-13**
Quantity (Lakh pieces)	60.0	120.7
Value (Rs. Crore)	66.0	132.7

Source: Industry survey, IMaCS Analysis

The market size for high visibility clothing is currently estimated at approximately 60 Lakh pieces valued at Rs. 66 Crore. The demand for high visibility clothing is expected to grow at 15% per annum to around 120 Lakh pieces by 2012 – 13. The market potential in 2012–13 would accordingly be around Rs. 132 Crore. Inflationary increase is not taken into consideration as the prices are likely to reduce as the various players gain economies of scale with increase in demand.

Import and Exports of high visibility clothing

The fabric required for high visibility clothing is entirely imported from Korea and China.

Quality Control and Standards

Usually European EN standards are followed.

Chemical protection clothing

Chemical Protective Clothing (CPC) is used for protection from chemical and physical hazards. The chemicals get absorbed into the human body by two ways:

- Physical contact-The chemicals gets absorbed through the skin
- Inhalation: The chemicals in gaseous state get absorbed in to the body through breathing.

Chemical protective clothing is used for protection of the whole body against toxic chemicals which manifest their effect by absorption through skin.

Product characteristics

The CPC suits can be classified into two categories:

a. **Durable:** The durable Chemical protective clothing is made of non-permeable textile fabrics (PVC/Rubber coated fabrics).The protection is achieved by blocking the penetration and permeation of the chemicals through the fabrics in the clothing. This is an effective method for providing sufficient protection to professionals from contact of toxic chemicals. These fabrics do not allow air or moisture permeability which leads to stress and drop in productivity.

b. **Disposable:** The disposable CPC is made of non woven fabric and can be used for 3-4 times .The disposable CPC provide better air and moisture permeability. Permeable type of clothing is preferred over impermeable type due to low heat stress and comfort, enabling use for a longer duration. The carbon-containing material developed so far includes carbon-coated non-woven fabric, carbon-impregnated polyurethane foam, hard carbon microsphere-adhered woven fabric and activated charcoal cloth.

The non woven fabrics are also used as overalls in various industries and the demand of such products is picking up. The CPC clothing includes gas masks, hoods etc to prevent against airborne toxic agents.

Market dynamics and key growth drivers

The demand for CPC in India is almost entirely of the durable type. Typically PVC coated fabrics are used. The base fabric is made up of cotton or a mix of polyester cotton. The demand of CPC is from Chemicals and Chemical Products, Paints, Dyestuff, Petroleum industries etc. These suits are required by the workers engaged in the chemical handling section. The demand from Chemicals and Chemical Products industry accounts for 70 % of the total demand of the chemical protection suits. The suits used in Petroleum industries are coated with neoprene rubber as other coated fabrics are not suitable. The other

fabrics swell after repeated exposure to oil. The key demand drivers are the growth of chemical and chemical product industry and increasing awareness of occupational health and safety issues.

Key manufacturers

The suppliers of CPC suits are mostly unorganized. They source the coated fabric from the dealers and fabricate the CPC suits according to the specifications of the end users. These suppliers tend to have related products like rain coats in their product line. Some of the larger suppliers include **Northstar Safety Products Pvt. Ltd. (Chandigarh), Intech (Kolkata),** and Jyotech Engineering Co. Pvt. Ltd (Delhi).

Tobit Engineers (Bombay) are distributors for Kimberly Clarke's range of non woven overalls.

Market size of and future forecast

The Industry-wise factories carrying on operations declared Dangerous and workers employed in such operations in India for the year 2002 is given in the Annexure 5. The demand of chemical protection suits is found out using this data and extrapolated to 2007-08.

The highest number of working factories carrying on dangerous operations was reported in 'Manufacture of Chemicals and Chemical Products' (NIC- Code 24), cumulatively employing over 13.13 million workers involved in dangerous operations. As per Industry research, the demand from this industry accounts for 65% of the total demand. While most of the process based industries typically require only gloves, boots and goggles (due to automated nature of their manufacturing), certain operations in these industries require entire work-wear to be protective.

The total market for chemical protection suits is given below:

Market size						
	2007-08			2012-13		
Product	Quantity (number of pieces)	Fabric requirement (Million Linear M)	Value (Rs Crore)	Quantity (Number of pieces)	Fabric requirement (Million Linear M)	Value (Rs Crore)
Durable Chemical protection suits	78,000	0.3	10.87	1,14,000	0.4	20

Source: Industry survey, IMaCS Analysis

Note: Based on discussions with Chemical Industry experts, and comparing data on workforce employed in hazardous activities, a penetration of 0.1% is assumed in the Chemical Industry workforce. The demand volume in 2007-08 is found out by assuming a CAGR of 8% over base year 2000. The average

life of a CPC suit is assumed to be 1 year. Based on Industry survey, we have assumed average price of a suit at Rs 1400 currently and consumption of 4 running metres of fabric per suit in order to derive the Market value and fabric requirement.

The demand for disposable CPC is yet to pick up in India. The current demand for non woven overalls is estimated to be 2500-3000 pieces per annum worth 25 lakh Rs. However, these products have a huge potential and growth depends upon the acceptance of these products.

Imports and exports

The disposable type overalls are imported from USA. The current levels of imports are negligible. Some chemical protection suits are imported under the following head:

HS Code	Description	Value (Rs. Crore)		Imports (Quantity)		
		2006-07	2007-08	Unit	2006-07	2007-08
62101000*	Garments, made up of non-woven fabrics under HS codes 5602/5603	1.29	0.76	No's in thousands	65.08	42.7

*Note: * Other products are also imported under this segment.*

Source: DGCIS

There are no exports of such products for India.

Major machinery manufacturers

The basic machinery required is cutting and stitching machines. There are number of local manufacturers of these machines in India.

Quality Control and Standards

Code	Description
IS 15071: 2002	Chemical Protective Clothing Specification

High altitude clothing

High altitude clothing are used for protection against extreme weather conditions like extremely low temperature, high velocity winds, snow fall etc. especially in critical combat areas like Siachen. The clothing at high altitudes needs to meet both functional and comfort properties. High altitude clothing is also known as Extreme cold climate clothing (ECC).

Product characteristics

The high altitude clothing consists of jacket, waist coat, trousers, glacier cap, rappelling gloves and glacier gloves. The gear typically weight of special clothing is around nine to ten kilograms. The typical characteristics of high altitude clothing are:

1. Hydrophilic - Waterproof and moisture resistant
2. Breathable
3. Abrasion resistance
4. Maintain high integrity
5. Resistance to quick wear and tear.

The material used for these clothing is typically hydrophilic polyurethane coating, Gore-Tex coating or Sympatex coating. The hydrophilic properties are introduced by these coatings or laminates. Microporous coatings or laminates can be produced by mechanical fibrillation, phase separation, solvent extraction or solvent exchange.

Indigenous Technology for high altitude clothing

1. Ordnance Factory: The Ordnance Factories in India have indigenously developed high altitude clothing as substitute for Gore-Tex suit. The suit called the *Suit Yeti* consists of three layers of clothing conforming to an extended cold weather clothing system (ECWCS). Full ensemble has application for glacier region under extreme cold & wind chill condition. All the different layers can be worn as per the weather conditions and individuals metabolic response to cold climate.

   The construction details of the *Suit Yeti* are as follows:

   Outermost garment is made of a three layer fabric having PTFE sandwitched between two layers of Nylon Fabric, which acts as Breathable Membrane. This outer most Garment is seam sealed to make it fully waterproof and windproof garment, which keeps inner shell's thermal insulation

intact however moisture is transmitted out wards from the intermittent shell. Middle layer is made up of Wind Stopper Fleece. This wind proof material is extremely breathable due to ePTFE membrane which transmits body moisture received from inner most layers to the outer shell. Very high level of thermal insulation is achieved by this middle garment. Innermost layer is made up of Terrypile Knitted Polypropylene Fabric which facilitates fast evaporation of sweat by wicking action. Being anti-fungal and anti bacterial Polypropylene is best suited next to skin.

2. The National Institute of Design (NID) is also developing technology for the manufacture of new special clothing for high altitude Army troops using materials that will be lighter, warmer, more flexible, durable and cheaper than the default merino wool. The fabric made from this technology would be superior to imports of similar material.

   NID would modify angora fibre (used in making suit fabric) at the micro and nano level which would give the yarn greater friction and resistance, instantly making it pack in more heat than merino wool. Fine angora fabric will replace merino in all special clothing between the inner layer of fine polyester and the outer layer of nylon. It will reduce the overall weight of troop clothing by about a quarter. The weight of the gear would be nearly two and half kilograms.

Key manufacturers

The key manufacturers of high altitude clothing are given below:

1. Ordnance Factory Board – Around 7000 complete high altitude clothing sets
2. Entermonde Polycoaters – Plans to produce breathable high altitude fabric and clothing in the next three years.

Market size of and future forecast

The Indian defence forces have around 1.5 million soldiers, out of these around 10% are involved in high altitude and extreme cold weather combat which would be around 0.15 million soldiers. On an average every high altitude combat soldier has two uniforms – one for use and the other as standby. The annual demand in 2007-08 is estimated to be 0.18 million pieces considering an average life of 2.5 years.

The current and future forecast of the domestic usage of high altitude clothing is given below:

Domestic use of high altitude clothing	2007-08	2012-13
Quantity (pieces)	1.8 lakh pieces	2.09 lakh pieces
Quantity (tonnes)	1,620 MT	1,880 MT
Value	Rs 650 crore	Rs 750 crore

Source: Industry survey, IMaCS Analysis

The market size for high altitude clothing is estimated at approximately 1.8 lakh pieces valued at Rs. 650 crore. The demand for high altitude clothing is expected to increase to around 2.09 lakh pieces by 2012 – 13 registering a volume growth rate of 3% per annum. In tonnage, the demand for the technical textiles material is expected to increase from 1,620 tonnes in 2007-08 to 1,880 tonnes in 2012-13. The market potential in 2012–13 is estimated to be around Rs. 750 crore. No inflationary increase has been considered to estimate the market size.

Import and Exports of high altitude clothing

In addition to Ordnance Factory, the high altitude clothing demand is also met through imports. The key suppliers from Western Europe are M/s Carinthia and M/s Aptec. The fabric is imported from Switzerland, Italy and Australia.

There are no exports in this category.

Quality Control and Standards

No specified quality standards usually specification driven as per Defence Research Development Organisation.

Industrial Gloves

Industrial hand gloves serve as an item of protective apparel for workers in factories. They are classified under Cut-Slash Protection as well as Thermal Protection. Gloves are best for protection from rough objects, sparks and heat, and for cushioning from blows in heavy-duty work requirements. Hand gloves are of various types (leather, knitted, nitrile) and sizes (varying gauges). The materials that go in the production of hand gloves vary from cotton fabrics and asbestos to variety of leathers, p-aramid etc. Gloves are widely used in Industry and Defence (Cut-Slash protection). Due to rapid industrialization, the use of industrial hand gloves is expected to grow considerably.

Product characteristics

The gloves used for industrial and general purposes are typically classified into following broad categories:

1. Leather gloves
2. Knitted gloves
3. Non-latex gloves e.g. Nitrile gloves
4. Rubber/Latex gloves

The leather, knitted and nitrile gloves are used in industrial applications for protection and have accordingly been discussed in this section. The rubber/latex gloves are used for surgical purpose.

The typical characteristics of gloves are as given below:

1. Mild heat resistance
2. High abrasion protection
3. Better grip with anti slip coating
4. Comfortable and durable
5. Protection against cut and hot splash
6. For gloves made from Aramid (para) –temperature tolerance ranges from 250 to 750 Centigrade
7. Nitrile gloves provide chemical splash protection

Other than leather gloves the artificial fibres used for industrial gloves include: Kevlar (Para-aramid), Spectra, Basofil and Dyneema.

Market dynamics and key growth drivers

The market of work gloves or industrial gloves is primarily driven by increased awareness, international level of safety standard in industrial workplace and mandatory safety norms for protection of workforce. Some of the key end-use applications are:

1. Iron and steel industry, where some of the big steel producers such as TISCO, SAIL, Ispat Industries and Essar Steel have been investing further.
2. Welding applications
3. Oil Refineries
4. Construction
5. Pharmaceuticals and Chemical Industries

The awareness and usage level of these gloves in the Indian industry is limited compared to International worker safety standards. Majority of the Indian production gets exported with little demand from domestic market

Key manufacturers of gloves

The key manufacturers of industrial gloves are given below:

Company	Production (lakh pairs per annum)
Mallcom India Limited	
Leather gloves	90
Knitted gloves	36
Nitrile gloves	80
Rajda Industries and Exports Pvt. Limited	70
Lumens India	36
KDM Impex Pvt.	35

These manufacturers account for more than 30 % of the market. The rest is covered by smaller unorganized players located in leather goods clusters in/around Mumbai, Calcutta and Vellore.

Market size of and future forecast

The market for industrial gloves is driven by demand from few big players in Refining, Iron and Steel and other heavy engineering sectors. Gloves are in the range from Rs. 16 (nitrile-pair) to Rs. 100 (Leather and coated fabric, along-with aramid for enhanced protection). Exports account for 80% of the total production in India.

The current and future forecast of the domestic market of gloves is given below:

Domestic usage		
Industrial gloves (Nitrile + Leather)	**2007-08**	**2012-13**
Quantity (million pieces)	22.2	35.0
Value (Rs crore)	150	237
Contribution of TT (Rs crore)	8.98	14.13

Source: Industry survey, IMaCS Analysis

The domestic consumption excluding imports is around 222 lakh pairs which amount to Rs 150 crore. The domestic demand is expected to increase to 350 lakh pieces by 2012–13 registering a growth rate of 9.5% per annum. The domestic market potential in 2012–13 is estimated to be Rs 237 crore. Nitrile-gloves are 100% TT while only some of Leather Gloves which are used for Industrial protection have a TT component (p-aramid lining/other non-woven lining). Based on discussions with Industry players, we have estimated the weighted average contribution from technical textiles by value (cumulative of coated fabric/nitrile gloves, p-aramid used in industrial gloves etc) at 6%. The same has been used to estimate the total potential for technical textiles in this segment for the two years.

Likewise, by including exports, we can arrive at an estimate of the total potential for use of Technical Textile in Industrial Gloves as shown below:

Market size including exports		
Industrial gloves	**2007-08**	**2012-13**
Quantity (million pieces)	102.7	158.5
Value (Rs crore)	727	1134
Contribution TT (Rs Crore)	43.5	67.5

Import and Exports

The import figures for gloves are as given below:-

HS Code	Description	Value (Rs. Crore)		Imports (Quantity)		
		2006-07	2007-08(E)	Unit	2006-07	2007-08(E)
40159030	Industrial gloves	4.95	6.36	Pairs in thousands	1944.48	2053.11
42032910	Gloves for use in industry	0.77	0.35	Pairs in thousands	62.72	34.64
Total		5.72	6.71	Pairs in thousands	2007.20	2087.75

Source:DGCIS, IMaCS Analysis

The export figures for gloves are as given below:-

	Description	Value (Rs Crore)		Exports (Quantity)		
		2006-07	2007-08(E)	Unit	2006-07	2007-08(E)
40159030	Industrial gloves	2.62	0.61	Pairs in thousands	1,469.37	147.29
42032910	Gloves for use in industry	525.96	576.38	Pairs in thousands	73407	80385
Total		528.58	576.99	Pairs in thousands	74876.37	80532.29

Source:DGCIS, IMaCS Analysis

These products are exported to Australia, Austria, China, Belgium, Canada, USA and other western European countries.

The technical textile elements in the gloves exported is expected to value Rs 34.5 crore. These exports are estimated to be Rs 44 crore for the year 2012-13.

Raw-materials

Leather gloves: The leather is checked for uniform thickness, holes and flying cuts, if any. It is then marked with the pattern and then cut with the help of scissors or clicking knife into different components. The inner lining material is cut in the dimensions of the glove. The leather lining material is stitched together. After stitching all the components suitably, the gloves are turned inside out. The gloves are then ready for packing and dispatch.

Knitted gloves: The glove fabric is manufactured by knitting synthetic fibre like para-aramid (or blends of p-aramid with other fibers such as nylon and polyester) with weave properties in consonance with the desired end product characteristics. Yarn denier can vary from 0.85 to 4.2 dpf with 2.25 dpf the predominant product. The fabric is cut to desired size and so is the lining material. The parts are stitched together and gloves are turned inside out.

Nitrile Gloves are manufactured by coating nitrile compound on knitted gloves of synthetic fibre or cotton fibre. The nitrile coating offers good abrasion and cut resistance

Quality Control and Standards

The companies in India follow the EN or the European Standard like EN 512 based on the level of protection need to be offered to the person wearing the gloves.

GEOTECH

Geotech segment comprises of technical textile products used in Geotechnical applications pertaining to soil, rock, earth etc. This class of products is loosely called Geotextiles. However Geotextiles specifically refers to permeable fabric or synthetic material, woven or non-woven, which can be used with geotechnical engineering material).

The principal functions performed by Geotextiles are confinement /separation, reinforcement, filtration and drainage, and protection. Application areas include Civil Engineering (roads and pavements, slope stabilization and embankment protection, tunnels, rail-track bed stabilization, ground stabilization and drainage etc), Marine Engineering (Soil Erosion control and embankment protection, breakwaters) and Environmental Engineering (landfills and waste management).

Other specialized Geotech products comprise Geogrids (plastics filaments and tapes etc formed into a very open, grid like configuration having large apertures), Geonets (extruded polymer ribs set in net like fashion with small apertures), Geomembranes (impermeable fabric as barrier) and Geocomposites (products using two or more Geotextiles e.g. Pre-fabricated Drains-PVD).

Current Geotextiles Market in India (Imports and domestic production) is around Rs 226 Crore, comprising imports of an estimated Rs 105 Crore and domestic production of around Rs 121 Crore. In terms of product category, the market includes Rs 226 Crore of synthetic woven/non-woven Geotextiles (85 Crore of woven and 67 Crore of Non-woven) as well as other products like Geogrids and Others (Geomembranes, Geonets and Geocomposites). Agro-based Geotextiles (made of Jute and Coir) are also developing and finding acceptance as a class of products. Market size for these products was around Rs 31 Crore.

Market Size including imports (Rs Crore)	
Synthetic Geotextile products	**226**
Woven Geotextiles	85
Non Woven Geotextiles	67
Geogrids/Others	35
Geomembranes/Geocomposites (PVD etc)	39
Agro-based Geotextiles	**31**
Total	**257**

Out of this, current consumption is around Rs 170 Crore. The consumption of Geotextiles is expected to be driven by the investments in the Infrastructure sector (both public, private as well as PPP mode investments). Consumption of Geotextile products is expected to grow at 12% to reach Rs 300 Crore by 2012-2013.

Market size estimates are as shown below:

Geotextiles (total)	*2007-08*				*2012-2013*	
	Production	*Imports*	*Exports*	*Consumption*	*Consumption*	*Export Potential*
Rs Crore	**152**	**105**	**87**	**170**	**300**	**128**

The market size for Geotextiles as per the ECTT report is as given below:

Market Size from ECTT's estimates (Rs Crore) for 2007-2008	
Geotextiles	**2640**
Total Roads	**1816**
Railways	**400**
Pavement Infrastructure	**200**
Other Infrastructure	**224**
Geogrids	**214**

1. Introduction of the product / application areas

Geotextiles can be defined as any permeable fabric or synthetic material, woven or non-woven, which when can be used in association with soil, rock, earth or any other geotechnical engineering related material. The principal functions performed by Geotextiles are confinement /separation, reinforcement, filtration and drainage, and protection. These functions can be described thus:

a) Confinement / Separation:

Confinement provides a media between the aggregate and the subsoil which absorbs the load in the form of tension and prevents change in alignment of the aggregate. Geotextile economically helps the separation concept of keeping two dissimilar materials apart to maximise the physical attributes of each of those materials. The object of separation by geotextiles is to prevent a well defined material or rich material from penetrating the sub-grade or the poor soil. If the separating media of geotextiles is absent, the infiltration of the sub-grade decreases permeability of the aggregate to the point where it cannot adequately transport the water reaching it.

Suitable geotextile fabric with good puncture/tear resistance when used as a separator media - eliminates the loss of costly aggregate material into subsoil, prevents upward pumping of subsoil, eliminates contamination and maintains porosity of different levels.

For separation purposes, both woven / nonwoven geotextiles may be used.

b) Reinforcement:

The purpose of geotextiles in the reinforcement function is to reinforce the weak sub-grade or subsoil. It helps to strengthen the soil surface and to increase the soils ability to stay put especially on the slopes. Due to this the slopes are stabilised either permanently or temporarily and creep stops or at least diminishes. Further, it helps in preventing water from permeating a slope and controlling the amount of infiltration that occurs during various rain events.

Reinforcing aspect of geotextiles can be used for roads, temporary roads, pavements, air strips, stabilised road slopes, retaining walls, containment systems, controlling reflective cracking, fibre or fabric reinforced concrete etc. Asphalt impregnated geotextile is used as a paving fabric, relieving stress and acting as moisture barrier.

For reinforcement synthetic woven fabric or spun-bond is preferred. Reinforcement is further enhanced by use of geo-grids or geo-nets.

c) Filtration:

The purpose of geotextiles with reference to drainage and filtration is simply to retain soil while allowing the passage of water. When geotextiles are used as drains, the water flow is within the plane of the geotextile itself i.e., they have high lateral permeability. At the same time, geotextiles must possess adequate dimensional stability to retain their thickness under pressure. The life of pavement of highways/air fields etc is affected by the time for which the water remains under the structural section and its drainage system which is responsible for the removal of free water which is fed directly from the stone base course beneath the structure. Needle punched nonwoven is the preferred geotextile for such applications where primary requirement is filtration.

Drainage:

The use of geotextiles in drainage has made significant strides in changing the conventional procedure of using graded filters. Outstanding advantages of geotextiles in drainage are:

- It eliminates the filter sand with the dual media backfill.
- In some cases, it eliminates the need for perforated pipes.
- In situations where only sand backfill is available, it is possible to wrap the drainage pipe with fabric to act as a screening agent. The fabric, thereby, prevents the sand from entering perforation in the pipe.
- With Geotextiles, trench excavation is considerably reduced.
- Many times the use of geotextiles eliminates the need for trench shoring.

Needle-punched nonwoven geotextile is preferred where drainage is the primary functional requirement.

d) Protection:

Lining is used for cushioning and protection of membrane used for applications such as land fill and waste containment from puncture or training by sharp stone or stress. Geotextiles can also be impregnated with polymeric or mineral sealing materials such as bentonite clay to provide flexible barriers to mixture. Usually spun bond or needle-punched nonwovens are preferred for such applications.

Each of these functions calls for highly specific textile performance characteristics. As the functional requirements are to be met over many years of the life of the civil construction, durability is often a very key requirement. Many applications require several of the above functions to be met simultaneously.

Further, the cost of the geotechnical solution is also an important factor to be taken into account in evaluating solutions.

Further, specialized segments (Geogrid, Geonet and Geomembrane) also exist within the Geotextiles space. These are as follows:

a) Geo-grids represent a rapidly growing segment within the geotextiles area. Geogrids are plastics filaments, rovings, and tapes etc formed into a very open, grid like configuration having large apertures, unlike woven, nonwoven or knit textiles. These apertures may vary in size from 1 to even more than 10 cm. They can be mono-axial or bi-axial i.e. be stretched in one or two directions for improved physical properties. Geogrids are mainly used for reinforcement – beneath aggregate in unpaved roads, reinforcement of embankment fills/earth dams, repairing slope failures/landslides, as inserts between geotextiles/geomembranes etc.

b) Geonets constitute another specialized segment within the geo-synthetic area. Geonets are usually formed by a continuous extrusion of parallel sets of polymeric ribs at acute angles to one another. When the ribs are opened, relatively large apertures are formed into a netlike configuration. Geonets are made of polypropylene (PP) or Polyethylene (PE). Geonets are used almost exclusively for their drainage capability for applications like water drainage behind retaining walls, seeping rock slopes, beneath sport fields, building foundations; leachate drainage of landfill side slopes, above landfill liners and surface water drainage within landfill caps.

c) Geo-membranes are impermeable membranes, used where the primary function is to have an impervious barrier for fluids. However, as the possibility of punctures or tears is high in many areas of use, it is common to protect these membranes by use of Geotextiles. Often the geotextiles also perform other functions besides protection of the membrane. Geomembranes are made from continuous polymeric sheets that are very flexible, but can also be made by impregnation of geotextile with asphalt or elastomer sprays or bitumen composites. Geomembranes are used in applications such as liners for water canals, waste canals, solid-waste landfills, covers for solid-waste landfills, waterproofing within tunnels, to control odors in landfills, to prevent infiltration of water in sensitive areas, and beneath asphalt overlays as a waterproofing layer.

d) Geo-composites: these consist of two or more geosynthetic products put together to increase the combinations ability to optimally address the specific application (say filtration/ reinforcement etc) at minimum cost. The best features of different materials are combined in such as way that

the benefit/cost ratio is maximized. An example of this is known as wick drains in the U.S. and prefabricated vertical drains, PVDs, in Europe. These consist of a 100 mm wide by 5 mm thick polymer cores, for conducting water, with a geotextile acting as a filter and separator socked around the core.

e) Gabions are rectangular or cylindrical containers fabricated from polymer/metal meshes, usually filled with stone and used for structural purposes (retaining walls, slope and embankment protection etc). These have been used in India since 70s.

2. Product characteristics

In general, the vast majority of Geotextiles are made from polypropylene (PP), polyethylene or polyester formed into fabrics based on type of process. The mechanical and hydraulic properties vary widely depending on type of application designed for. Depending on type (woven/non-woven), process (thermal bonded/resin bonded), desired performance specifications (load bearing ability, tear resistance etc), Geotextiles can range from under 40 GSM to over 3000 GSM (used in landfill applications). Geogrids are usually knitted and PVC coated. Products are designed to be resistant to mildew, bacteria, soil acids (PP) and alkalis (PP, PES) and most chemicals.

Apart from the above, Agro based Geotextiles (woven textiles based on Jute, Coir) are also a niche but growing segment. These have the advantage of being bio-degradable as well as being cheaper.

3. Market dynamics and key growth drivers: Infrastructure sector in India

India's economic performance, particularly over the past three years, has been robust on several counts. Economic growth accelerated and averaged over 8 per cent per annum. From Planning Commission estimates, it became obvious that to sustain this rate of growth, the country's infrastructure spending would have to increase substantially. Over the past 3-4 years, a clear political consensus has emerged on the need for speeding up the development of the country's infrastructure. A number of large infrastructure projects have received support from the government, irrespective of which political party is in power. A key Governmental step has been deregulation/ Policy Streamlining – The government has announced commitments to build large infrastructure projects through significant public expenditure and with the help of private partners - including, for the first time, foreign investors. Currently, few limits exist on foreign direct investment in infrastructure. The Government has also begun the process of privatizing significant government-owned infrastructure assets. Other initiatives in this direction include deregulation

of highways, establishing a national highway toll system (including provisions for toll increases), establishing a fair and transparent process for the award of projects in most sectors and putting a sound contractual system in place to protect investor interests (providing model concession agreements for investment in some sectors).

This has resulted in a robust flow of investments into the sector in the last few years. Basis goals set/investment planned by the Government and on sector-wise macroeconomic indicators, we can estimate the total sector-wise investment needs. This is shown below:

Table 1: ***Infrastructure needs sector wise***

Sectors	Investment Needs during 2006-07 to 2010-11 (INR Crore)	Investment Needs during 2006-07 to 2010-11 (USD million*) – approx.
Roads (excluding PMGSY)	245,000	54,400
Power	665,000	148,000
Ports	86,000	19,000
Airports	40,000	8,900
Railways	122,000	27,100
Urban Infrastructure	22,000	4,900
Others (Gas pipelines, SEZs, and tourism)	420,000	93,300
Total	16,00,000	355,550

Source: Various Programs of GoI, Reports of various Committees and IMaCS analysis

1. Power: Ministry of Power, GoI, Kohli Committee Report
2. Roads: NHAI and Ministry of Shipping, Road and Highways, GoI, Transport Sector, Vision 2021, GoI, www.infrastructure.gov.in, Report of the Sub-Group on State Roads for the 11th Five Year Plan, MoSRTH
3. Railways: Conference on Building Infrastructure, Oct 7, 2006, The Hindu, Oct 8, 2006, National Conference on Regulatory Performance in India: achievements, constraints and future action" Nov 9-10, 2006, and IMaCS analysis
4. Ports: National Maritime Development Programme, www.shipping.nic.in
5. Airports: Financing Plan for Airports, Committee on Infrastructure, Jul 2006
6. Urban Infrastructure: Planning Commission norms, Zakaria Committee norms, Xth plan document, IMaCS analysis
7. Gas Pipelines: Ministry of Petroleum and Natural Gas, CII-IBEF
8. SEZs: Business World, Nov 2006, IMaCS analysis
9. Tourism: Investment Commission Report

** Assumption: INR 45 = 1 USD*

According to our calculations, the envisaged infrastructure investment needs of India during 2006-07 to 2010-11 amount to about Rs. 16 lakh crore (USD 355.5 billion), of which the estimated investment needs

in the road sector are Rs. 245,000 crore, about 14% of the total. All sectors, especially roads, represent areas of opportunity for use of Geotextiles.

Road sector in particular represents the most obvious area of opportunity due to the direct applicability as well as the sheer scale of projects. Roads were till recently, the largest consumer of Geosynthetics in the small Indian Geotextile market. The origin of investment in the road sector in the country started with the initiation of the National Highways Development Project (NHDP) in the '90s. The largest highway project ever undertaken by the country, this was initiated in a phased manner, with National Highways Authority of India (NHAI) being set up as the implementing agency, starting with Phase I and II which focused on the Golden Quadrilateral and North-South-East-West Corridor road development. The various phases of NHDP are outlined below:

Phases	Total Length (in Km)	Phase Cost Approved (Rs Crore)
Phase I GQ,EW-NS corridors, Port connectivity & others	**7498**	**30300**
Phase II 4/6-laning North South- East West Corridor, Others	**6647**	**34339**
Phase III, Upgradation,4/6-laning	**12109**	**80626**
Phase IV , 2-laning with paved shoulders	**20000**	**N.A**
V 6-laning of GQ and High density corridor	**6500**	**41210**
VI Expressways	**1000**	**16680**
VII Ring Roads, Bypasses and ring roads/flyovers and other structures	**700 Km of ring roads/ bypass + flyovers etc**	**16680**

Source: NHAI, Ministry of Surface Transport

Note: Cost of Phase I and II are at 1999 prices and 2003 prices respectively. Phase-IV is yet to be approved by the Government.

Currently, phase III and V are being executed while later phases are in planning/feasibility stage. In the later phases, as more and more roads become multilane, with more expressways, usage of Geotextiles will clearly grow.

4. Key manufacturers of the product with information on capacity / production / sales

Some of the key manufacturers of Geotextiles in India include Techfab India, SKAPS and Shri Ambica.

Manufacturer	Year	Capacity (MT)	Production (MT)
TechFab India	2007-08	8000	2199
SKAPs	2007-08	4000	4000
Maccaferi India	2007-08	1850	740
Shri Ambica Polymers	2007-08	1260	1260
Garware Wall Ropes (Geosynthetics)	2007-08	360	291

Source: Industry Survey, IMaCS Analysis

Note: Capacity in MT estimated based on discussions with Industry players. Capacity for products determined in square or linear metres has been converted into tonnage using appropriate gsm assumptions in case of Techfab. Capacity for Maccaferi's Pune plant is largely for its Soil Embankment reinforcement products. Garware produces woven fabric and Pre-fabricated Drains, however only capacity for woven fabric is included in the above table. Capacity of Ambica Polymers is 4000 MT, but only 30% is dedicated to Geotech.

Apart from the above mentioned firms, other Technical Textile manufacturers like Supreme Nonwoven, Charminar Nonwoven also produce Geotextiles – however both are focused towards automotive textiles and Geotextiles is a small part of their business.

Apart from these, manufacturers of Jute Geo-textiles (JGT) include Gloster Jute Mill, Birla Jute Mill Premchand Jute Mill located in West Bengal. As per data from the Jute Manufacturers Development Council, around 2188 MT of Jute Geotextiles (3.8 million sq. metres) were produced and used in projects within the country. Around 5882 MT of Jute Geotextiles was exported. Coir Products are mostly manufactured by small units in southern India.

5. Market size and future forecast

Based on discussions with Industry players and analysis of imports data, the total market for Geotextile products in India is currently estimated at Rs 257 Crore. Excluding exports, the total consumption of Geotextiles in the India was around Rs 170 Crore.

The total market in 2007-2008 has been broken into the following key components:

Market Size including imports (Rs Crore)	
Geosynthetics	**226**
Woven Geotextiles	85
Non Woven Geotextiles	67
Geogrids	35
Geomembranes/Geocomposites (PVD etc)	39
Agro-based Geotextiles	**31**
Total	**257**

The major use of Geotextiles has been in roads – wherein the major function has been separation and reinforcement. Consumption of Geogrids has mostly been for Mechanically Stabilized Earth (MSE) and Reinforced Soil Slope (RSS) applications. Geogrids in NHAI projects have mostly been used in reinforced soil retaining walls and approaches to flyover. The general consumption norm is 10 sq. m. per sq. m. of wall. Other composites like PVD Drains are also being used. However major use of composites and non-woven geotextiles has been in other infrastructure (e.g. L&T alone used 1.25 million metres of PVD and 0.9 million sq. metres of nonwovens in Dhamra port project).

Agro-based Geotextiles (major contribution being Jute, Coir products being mostly exported) have been used in small patches of NHAI projects for slope and sub-grade stabilization. However their use in PMGSY (Prime Minister's Gram Sadak Yojna) projects has been successfully validated. It is expected that going forward, not only PMGSY projects but even district roads would use Jute-Geotextiles in greater quantities given the cost benefits compared to synthetic Geotextiles.

The potential for Geotextiles in India can be determined from the previously discussed total spends expected in Infrastructure in India over the next few years as shown below:

Sectors	Investment Needs during 2006-07 to 2010-11 (Rs Crore)	Projects with potential use of Geotextiles, assuming low penetration	Potential Geotech Spend @ 1-2% of project cost (Rs Crore)	Average Geotech spend per annum possible over five year period	Estimated Geotech Spend Rs Crore '07-08
Roads (excluding PMGSY)	245,000	29,400	441	88	76
Power	665,000	33,250	333	67	NA
Ports	86,000	8,600	172	34	30
Airports	40,000	800	8	2	0
Railways	122,000	7,320	73	15	4
Urban Infrastructure	22,000	2,200	33	7	2
Others (Gas pipelines, SEZs, tourism etc)**	420,000	50,400	504	101	58
Total	1,600,000	131,970	1,564	313	170

*Note:*Others overlap with Oekotech as end-use etc also occurs for waste management*

Assumptions: We have assumed conservative use of Geotextiles across sectors. Hence a certain percentage of projects (value derived from the total investment proposed) have been assumed to use Geotextiles, varying from a low of 2% in Airports (since few airport projects, wherein only runways will actually be the end-use) to a high of 12% for Roads sector. As per Industry feedback, we have assumed 1%-1.5% contribution (variance due to wide variety of end-use specifications) of Geotextiles towards the total project cost. This gives us the total potential for Geotextiles over the five year period. Since the demand is project specific, hence we have shown an average annual demand for Geotextiles.

Our estimates of current sector-wise usage are also shown in the above table. Although Railroad applications are an important market worldwide, Indian market has not seen the same demand. While Geotextiles have been sporadically used in Indian Railway track stabilization and other construction projects for a few years now, it has not been a large market. While Rail Design and Standards Organization (RDSO) has evolved guidelines on usage of Geotech products in Rail projects, they don't have any data on actual usage since usage of Geotech products in projects is decided by the Regional Railway Divisions individually. In the absence of precise user data, we have estimated usage based on discussion with Industry and analysis of railway construction tenders.

In order to predict growth of Geotextiles, we need to evaluate the possibility of the Infrastructure projects staying on course as scheduled. Due to the current financial market crisis and restricted credit availability, many Infrastructure projects are being delayed. However Infrastructure projects (being necessarily long gestation term projects) should speed up after a three-four year lag. We also expect that projects for Roads (which is a significant demand area) will come online as much of the committed spend is yet to take place. NHAI is yet to award initiate work on the majority of NHDP Phase III and Phase V (up gradation, 4/6 laning work).

NHDP & Other NHAI Projects (Status :30th September, 2008)								
	NHDP					Port Connectivity	Others	Total by NHAI
	GQ	NS - EW Ph. I & II	NHDP Phase III	NHDP Phase V	NHDP Total			
Total Length (Km.)	5,846	7,300	12,109	6,500	31,755	380	962	33,097
Already 4-Laned (Km.)	5,698	2,838	551	25	9,112	203	671	9,986
Under Implementation (Km.)	148	3,483	1,524	1,005	6,160	171	271	6,602
Contracts Under Implementation (No.)	16	141	28	2	187	8	15	210
Balance length for award (Km.)	-	821	10,034	5,470	16,325	6	20	16,351

Further, Phase VI and Phase VII (with Ring Roads, Expressways and Bridges) which by the nature of the works involved should see high-usage of Geotextiles are still in the pipeline. Keeping the above factors in mind, we have assumed a growth of 12% for Geotextiles given the possibility of Infrastructure projects getting delayed in the short term. We expect currently planned projects to pick up speed after three years (e.g. Pending NHAI projects are also expected to be released in due course as part of Government

initiatives to boost the economy). The Consumption of Geotextiles can thus be expected to grow to Rs 300 Crore by 2012-2013.

6. Imports & Exports of TT product

Geotextiles are imported under HS codes shown below:

HS Code	Description	Total Imports Value (Rs Crore)	Estimated Geotextiles Value (Rs Crore)
		2007-08	2007-08
39189090	FLOOR COVERING OF OTHER PLASTICS NES	21.88	1.8
39205999	OTHR SHETS ETC OF OTHR ACRYLIC POLYMER NES	2.98	1.33
39219099	OTHR PLTS,SHTS,FILM FOIL,STRIP ETC NES OTHER	272.02	10.38
39269099	OTHR ARTICLE OF PLASTIC NES	851.78	52.37
56029000	FELT,IMPRGNATED,COATED,COVERED OR LAMINATED	10.99	1.21
56031100	MAN-MADE FILMNT WGHNG<25G/SQM	19.48	0.12
56031300	MAN-MADE FILMNT WGHNG BETWN 70G/SQM AND 150G/SQM	37.48	8.74
56031400	MAN-MADE FILMNT WGHNG >150G/SQM	13.52	1.12
56039300	OTHER FILMNT WGHNG BETWN 70G/SQM AND 150G/SQM	12.14	2.82
56039400	OTHER FILMNT WGHNG >150G/SQM	77.84	19.87
56049000	OTHER RUBBER THREAD,CORD ETC	18.82	5.36
Total Imports		**1338.93**	**105.12**

Source: DGCIS, IBIS, IMaCS Analysis

Since most of these HS codes are used for a variety of products, we have estimated the import of fabric/products meant for use as Geotextiles as around Rs 105 Crore.

Geotextiles are largely exported under HS codes shown below:

HS Code	Description	Total Exports Value (Rs Crore)	Geotextiles Estimated Value (Rs Crore)
		2007-08	**2007-08**
39189090	Floor Covering of other plastics	76.60	4.20
39269080	Polypropylene articles, not elsewhere specified or included	300.65	46.00
63051080	Jute Soil Savers	10.43	10.43
56090010	Coir Products (e.g. Coir Fender)	14.84	14.44
56031100, 56031200, 56031300, 56031400, 56039200, 56039300, 56039400	Non-Woven (Various) cumulative	13.14	5.00
Total Imports		**415.66**	**80.07**

Source: DGCIS, IBIS, IMaCS Analysis

As in the case of imports, since most of these HS codes are used for a variety of products, we have estimated the import of fabric/products meant for use as Geotextiles, which is around Rs 87 Crore. These exports are estimated to be Rs 127.8 crore for the year 2012-13.

7. Key importers & exporters

Some of the key importers in the Indian market are listed below:

- Garware Wall Ropes, represents Tensar International of UK
- Maccaferi India itself imports products like geo-grids which it doesn't manufacture here.
- Terram is represented by its distributor - Terracorp situated in Gurgaon.
- Huesker is represented by its distributor – Archana Structural Engineering

Dupont also sells its own non-woven brands directly through its office. Manufacturers like Kusumgar also import on the project specific basis.

Ambica Polymers, SKAPs and TechFab export to the US and Europe

8. **Manufacturing process and Type of Raw materials**

Geotextiles are manufactured from polypropylene, polyester or polyethylene which can be either woven or non-woven. Manufacturing process for Woven products includes Weaving / Knitting and Coating (PVC). Products can be - woven multi-filament, woven slit-film monofilament and woven slit-film multifilament. The non-woven Geotextiles can be made from heat bonding or needle-punching. Geogrids are knitted, while Geonets and Geomembranes are extruded from HDPE.

9. Key machinery manufacturers/suppliers in India

Most units surveyed used Sulzer looms for manufacturing Woven Geotextiles. Knitting machines from Karl Mayer are also used. Nonwoven needle-punching lines from Hunter, Dilo Group and Trutzschler are used. In India, the leading machinery vendors are represented by ATE and Voltas.

10. Quality Control and standards in India

All manufacturers follow ASTM and EN standards. However there are no Indian Standards governing the quality of the actual product.

11. Impediments to growth in domestic and export market

The major impediments to growth in the domestic market are as follows:

- Road Projects in India have traditionally been awarded on the lowest cost bid model, based on specifications provided by the state agency (NHAI/PWD etc). Road construction projects, even in NHDP contracts, are low margin businesses. Consequently, major contractors hesitated to use significant quantity of Geosynthetics despite its clear benefits. However with changing norms such as introduction of DBFO model wherein concessionaires have the freedom to design independently, and being responsible for maintenance also have an interest in ensuring longevity of construction at optimal cost, it is likely that some of the pitfalls of the L1-system can be avoided.
- Many of key end-users and Government agencies are of the opinion that while Geotextiles may be beneficial, it is just one of many civil engineering solutions and hence its usage has to be seen on a case by case basis depending on cost, availability, time criticality. Understandably, this conservatism also impacts the adoption of Geotextiles in many projects. Otherwise, State level government agencies (PWD etc) need more awareness about the benefits of Geotextiles.

- Lack of adequate testing facilities was cited as a major impediment by most end-users. Lack of certification often leads to delay as there are no obvious means at project sites to verify if the material will actually confirm to the design specifications. Contractors often work on tight timelines and budgets and are unwilling to order material much in advance.
- Alongside awareness, availability of trained technical personnel is also critical for manufacturing to improve.

In the export market, Indian manufacturers are currently at small scale compared to European or even Chinese manufacturers who benefit from economy of scale.

- EOU Units like Ambica export their entire production. For such small units, raw material prices are a significant concern.

Most producers are of the opinion that mandatory usage only will promote demand for geotextiles, leading to greater investments and realisation of scale, in turn making the products cheaper and more competitive for both domestic usage and exports. However mandatory usage may not be feasible for the reasons - Geotextiles are just one among many geotechnical solutions, and given the conservative approach of many Government Institutions, awareness is still building up.

OEKOTECH

Oekotech segment refers to use of technical textiles in Environmental Engineering. The primary segment in this is Landfill waste management. This refers to the use of Geosynthetic products to secure landfills against leakage of municipal or hazardous waste. Other areas include secondary protection in Chemical/Oil Industries (ground covers and the like around process tanks for secondary containment should the tanks leak).

A modern engineering landfill has the following components - a basal lining system to prevent the contamination of soil, and ground water by pollutants, a capping system to seal the waste when the capacity of the landfill is exhausted, an impervious sealing layer which prevents the entry of pollutants in the ground, a leachate collection system for the collection and transmission of leachates to a collection pit, a secondary leachate collection/leak detection system.

The market is expected to grow based on spends on municipal waste disposal in accordance with Municipal Solid Wastes (Management & Handling) Rules, 2000, as well as greater awareness and government activity on Hazardous Waste in accordance with Supreme Court Guidelines. The market for Landfill management projects is currently around Rs 68 Crore.

Summary of Data

Current Market size is Rs 68 Crore. Market over the next 5 years i.e. 2007-2012 is as shown:

Category	*Annual Waste (MT)*	*Landfill Area (Sq KM)*	*Avg Cost of TT (Rs.Sq M)*	*Value (Rs Crore)*	*Volume (Million Sq M)*
Municipal Waste	14 Mn	14.2	340	482.8	28.4
Hazardous Waste	8 Mn	4.2	340	142.8	8.4

As per ECTT Report, the market size estimated was:

Period	2003-08			2007-08
ECTT Category	Land Area (Km2)	Rate Rs/Sq M	Value Rs Crore	Value Rs Crore
MSW	11.83	210	248.67	99.47
HW	2.15	210	45.24	18.1
	13.98		**293.91**	**117.57**

Introduction of the product / application areas

Oekotech application segment includes concepts in environmental protection, waste disposal and recycling. The most well known concept is the use of geosynthetic products (discussed earlier in Geotech) in Landfill management. Secure landfills are considered to be the best available technical option for the safe disposal of large volumes of solid waste/slurry. Waste management (both Municipal and Hazardous) has become a major environmental issue in India as well as other countries.

A modern engineering landfill has the following components - a basal lining system to prevent the contamination of soil, and ground water by pollutants, a capping system to seal the waste when the capacity of the landfill is exhausted, an impervious sealing layer which prevents the entry of pollutants in the ground, a leachate collection system for the collection and transmission of leachates to a collection pit, a secondary leachate collection/leak detection system.

Geosynthetics are extensively used in the design of both base and cover liner systems of landfill facilities. The products include:

- Geogrids,which can be used to reinforce slopes beneath the waste, reinforce walls as well as to reinforce cover soils above geomembranes;
- Geonets, which can be used for in-plane drainage;
- Geomembranes,which are relatively impermeable sheets of polymeric formulations that can be used as a barrier to liquids, gases and/or vapors; provide the critical functions of leachate containment, protection of ground water and Landfill Gas (LFG). They are also used in landfill caps.
- Geocomposites, which consist of two or more geosynthetics, can be used for separation, filtration or drainage;
- Geosynthetic clay liners (GCLs), which are composite materials consisting of Bentonite and geosynthetics that can be used as an infiltration/hydraulic barrier; they find application not only in landfills/waste management but also for mine rehabilitation, tunnels, secondary containment e.g. of petrochemicals, landscaping etc.
- Geopipes, which can be used in landfill applications to facilitate collection and rapid drainage of the leachate to a sump and removal system;
- Geotextiles, which can be used for filtration purpose or as cushion to protect the geomembrane from puncture.

Product characteristics

Both woven and non-woven geosynthetics are used. Geosynthetic clay liners consist of non-woven fabric layers of 180-250 GSM with an intermediate layer of Bentonite mineral (Unit Mass: 1-5 kg/sq m). Geotextiles used for filtration/cushion are typically high GSM (285 – 3000) non-woven fabrics. HDPE geomembranes are manufactured using approximately 97% high molecular weight polyethylene, 2 to 3% carbon black, and 0.5 to 1.0% stabilizers and antioxidants. Some salient features of HDPE geomembrane include chemical resistance, low permeability and ultraviolet resistance. The thickness of this geomembrane is 2 mm.

Market dynamics and key growth drivers:

Issue of waste management has seen rising public and government awareness over the years. Waste can be categorized as Municipal Solid Waste (MSW) and Hazardous Waste (HW).

The per capita MSW generated in India ranges from above 100 grams in small town to over 600 grams in large cities. In India these are collected by respective municipalities and transported to disposal sites which are normally low lying areas outside the city. Given the limited revenues of municipalities, most bodies have not been able to afford the treatment and disposal of MSW required under environmental guidelines. Not surprisingly, many urban waste sites pose a serious health hazard for the semi-urban/rural communities nearby. Municipal Solid Wastes (Management & Handling) Rules, 2000 (MSW Rules) are applicable to every municipal authority responsible for collection, segregation, storage, transportation, processing and disposal of municipal solid. In early 2007, only a handful of urban areas – Surat, Pune, Ahmedabad Urban Development Authority, Puttur, Karwar, Navi Mumbai and Bangalore had engineered landfill sites.

Hazardous waste consists of corrosive, reactive, ignitable and toxic wastes. India produces at least 8 million tones of HW every year (CPCB data submitted to Supreme Court Monitoring Committee, 2006). These in turn are currently dumped at over 118 known sites in India. Waste Management/Pollution Control was largely under the purview of Central Pollution Control Board at the central level and State Pollution Control Boards/ Pollution Control Committees. This is under the ambit of the Hazardous Waste (Management & Handling) Rules, 1989 notified by the Ministry of Environment & Forests (MoEF) under Environment (Protection) Act, 1986 (further amendments made in the year 2000 and 2003)

In 2003, basis the hearings of a PIL filed in the Supreme Court of India, the Supreme Court directed major changes in the Waste Management system in India. Amendments were made in the Hazardous

Waste Rules and a monitoring committee set up. Subsequently, as per those directives, all states have to set up suitably prepared landfill sites and Treatment, Storage and Disposal Facilities (TDSF). For Municipal Waste, CPCB and MOEF have instituted a scheme for setting up of demonstration project for solid waste management in accordance with MSW Rule, with 12 projects across 12 states. The Twelfth Finance Commission has recommended devolution of grants for Urban Local Bodies to the tune of Rs.5000 crore for the period 205-2010 of which Rs.2500 crore have to be devolved upon local bodies exclusively for setting-up of solid waste management systems in Urban areas to ensure management of MSW in accordance with MSW Rules. CPCB's annual report ('07) states that as per information provided by SPCBs, landfill facilities have been constructed at Bangalore, Mangalore, Karwar, Puttur, Ankola, Surat, Alang, Nashik, Ambad, Sonpeth, Viziaanagaram (AP), Jodhpur, Sirsa and Ambala. Regional/common landfill facilities are under construction at Ahmedabad, North Dum-Dum, New Barrackpore and Chandigarh.

Clearly most states are yet to develop significant number of landfills for both categories of waste. At the same time, as the Indian economy develops further, waste generated will increase (due to greater retail consumption of use and throw products, ready to eat etc). However, given the required regulatory framework already in place, once the State Government agencies get the basic groundwork in place by identifying sites, going forward these sites will represent a significant opportunity for use of Technical Textiles.

Key manufacturers of the product with information on capacity / production / sales

Currently, only one player – Ashapura group is manufacturing Geosynthetic Clay Liners in India. Ashapura Volclay Limited has set up India's first Geosynthetic Clay Liner Plant using technology from CETCO (A subsidiary of AMCOL International), with an estimated capacity of 5 million square meter per annum.

Market size of TT product and future forecast

Some of the prominent engineering contractors active in waste management include UPL Environmental Engineers, Ramky, MEPL, Baruch Enviro & Surat Infrastructure. Garware's Geosynthetics division has also executed projects in this space. Basis discussions with Industry, waste management contracts in 2007-2008 used up an estimated Rs 68 Crore worth of Technical Textile products.

Components of Landfill	Lakh Sq M	Approx Rate/ Sq M	Cost Rs Lakh
Non woven needle punched geotextile	40	56	2240
Woven Geotextile	0.7	32.5	22.75
HDPE Liner	20	120	2400
Geocomposite	11.7	185	2164.5
Total	72.40		6827.25

Source: Industry survey, IMaCS Analysis
Assumptions: All projects have been assumed as double liner landfills

This market is growing at around 6%-7% per annum as per Industry experts since Municipal spends on engineered landfills have been much behind schedule.

We can also estimate the total potential for Landfill applications by arriving at the total area required for waste management. As per data from a CPCB study (2006) covering 59 Urban Agglomerations (Metros/major cities/state capitals, UTs), India cumulatively generated around 14 million MT of waste. Likewise, an estimated 8 million MT Hazardous waste is also generated by Industrial units. We have accordingly estimated the area required for the same and assuming an average per unit area technical textile component cost of a landfill, arrived at the total potential usage to be achieved over the next 5 years:

Category	Annual Waste (MT)	Landfill Area (Sq KM)	Avg Cost of TT (Rs.Sq M)	Value (Rs Crore)	Volume (Million Sq M)
Municipal Waste	14 Mn	14.2	340	482.8	28.4
Hazardous Waste	8 Mn	4.2	340	142.8	8.4

Note:

1. *Engineered Landfills are assumed tohave a height of 15 m, for estimating average landfill area.*
2. *Life of landfill is estimated at 20 years, post which it would have to be capped.*
3. *Average Cost/Sq M assumes use of double liner - non-woven, HDPE liner and geocomposites as discussed in previous section. This however may vary from site to site depending on engineering specifications, topography*

We estimate this to be potential to be realized over the next five years as greater municipal spends on landfills drives growth. The market size is accordingly expected to reach Rs 160 Crore by 2012-2013.

Category	2012-2013 (Rs Crore)
Municipal Waste	123.48
Hazardous Waste	36.52

We have not taken into account other potential application areas such as landscaping (Golf courses, Ponds etc), Mine rehabilitation, Tunnel linings etc since these applications do not represent predictable, recurring usage currently.

Imports & Exports of TT product

HS Codes for GCLs are usually – 39269099, which is also used for Geotextiles.

Key importers & exporters

Currently, key importers of GCL in India include Geofabrics India, Garware Wall Ropes (Geosynthetics Division).

Manufacturing process and Type of Raw materials

GCLs are manufactured from quality polypropylene geotextiles and premium grade Sodium Bentonite powder. The upper and base layers of geotextiles can be of non-woven and wove fabric respectively. Typically, Bentonite clay is placed on a woven Geotextile, with the non-woven cover then being placed. They are fibre-reinforced by needle-punching the composite across the entire surface area of the product, and are then thermally-locked to ensure high long-term shear strength.

Key machinery manufacturers/suppliers in India

Machinery used for Geotextiles is used for manufacturing liners used in GCL.

Quality Control and standards in India / other countries

No BIS Code is currently applicable in India. The typical properties of GCL which need to be checked are Swell Index, Fluid Loss, Bentonite Mass/Unit Area, Tensile Strength and Mid-Plane Shear Strength (all of which have defined values under ASTM test methods).

Impediments to growth in domestic and export market

Landfills need to be recognized as the last solution for waste management, after options of reduction/segregation, recycling, treatment, incineration for energy etc have been utilized. At the same time, diversion of land for waste disposal is often difficult due to serious scarcity of vacant land as well opposition from local communities. Naturally lack of progress on landfills would impede the use of geo-textiles. Further, lack of adequate enforcement of laws and delay on part of Government bodies (as discussed in previous sections) also impacts growth in the domestic market. For smaller urban local bodies, financial constraints and lack of knowledge also act as barriers since economy of scale may not be realized in smaller landfills.

INDUTECH

Indutech includes technical textile products used in the manufacturing sector. The technical textile products covered under Indutech are given below:-

- Conveyor belts (TT component)
- Drive belts (TT component)
- Cigarette filter rods
- Decatising cloth
- Bolting cloth
- AGM glass battery separators
- Coated abrasives (TT component)
- Ropes & cordages
- Composites (technical textiles component)
- Printed circuit boards (TT component)
- Computer printer ribbon
- Paper making fabrics
- Filteration Products

Technical textiles consumption under Indutech in India is estimated at around Rs 2,326 crore. Prineted circuit boards, AGM battery separators and other applications of fibre glass constitute around one-third of the technical textiles usage in Indutech valued at Rs 743 crore in 2007-08 and are expected to grow at over 17% year on year. Ropes and cordages account for around 30% share in the Indutech segment valued at Rs 669 crore in 2007-08. Computer printon ribbon, filteration products, conveyor belts & drive belts, cigarette filters are the other key products in the segment each accounting for around 8-10% of the segment.

Overall, the domestic consumption of technical textiles under Indutech is expected to increase from around Rs 2,326 crore in 2007-08 to around Rs 4,090 crore by 2012-13 growing at a CAGR of around 12%.

The total segment imports are Rs 859 crore and account for one third of the total domestic consumption. The exports are worth Rs 762 crore and account for around 35% of the total production.

Summary of the market-sizing for Indutech

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
Conveyor belts (TT component)	**Quantity**	6,040 MT	400 MT	2,500 MT	3,940 MT	6,062 MT	
	Value	Rs 160 crore	Rs 11 crore	Rs 66 crore	Rs 105 crore	Rs 162 crore	Rs 106 crore
Drive belts (TT component)	**Quantity**	6,018 MT	1,237 MT	2,178 MT	5,067 MT	7,288 MT	
	Value	Rs 86 crore	Rs 34 crore	Rs 36 crore	Rs 84 crore	Rs 121 crore	Rs 40 crore
Cigarette filter rods	**Quantity**	Approx 14,310 million nos.	Approx 90 million nos.	Around 400 million nos.	14,000 million nos.	17,000 million nos.	
	Value	Rs 157 crore	Rs 2 crore	Rs 7 crore	Rs 152 crore	Rs 182 crore	Rs 7.7 crore
Decatising cloth	**Quantity**	1.15 million meters	0.05 million meters	-	1.2 million meters	1.4 million meters	
	Value	Rs 26 crore	Rs 4 crore	-	Rs 30 crore	Rs 35 crore	-
Bolting cloth	**Quantity**	2 lakh sq m	4 lakh sq m		6 lakh sq m	7 lakh sq m	
	Value	Rs 10 crore	Rs 15 crore		Rs 25 crore	Rs 30 crore	-
AGM glass battery separators	**Quantity**	-	20.1 million sq m	-	20.1 million sq m	51.6 million	
	Value	-	Rs 60.3 crore	-	Rs 60.3 crore	Rs 150.8 crore	-
Coated abrasives (TT component)	**Quantity**	16.7 million meters	-	-	16.7 million meters	26.9 million meters	
	Value	Rs 89 crore	-	-	Rs 89 crore	Rs 143 crore	-
Ropes & cordages	**Quantity**	126,371 MT	10,000 MT	21,000 MT	115,371 MT	170,066 MT	
	Value	Rs 704 crore	Rs 165 crore	Rs 200 crore	Rs 669 crore	Rs 1,037 crore	Rs 402 crore

		2007-08				2012-13	
		Production	Imports	Exports	Domestic Consumption	Domestic Consumption	Export Potential
Composites (TT component)	**Quantity**	73,000 MT	60,000 MT	33,000 MT	1,00,000 MT	1,75,000 MT	
	Value	Rs 651 crore	Rs 443 crore	Rs 434 crore	Rs 650 crore	Rs 1,400 crore	Rs 609 crore
Printed circuit boards (TT component)	**Quantity**	-	6,615 MT	-	6,615 MT	35,577 MT	
	Value	-	Rs 33 crore	-	Rs 33 crore	Rs 178 crore	-
Computer printer ribbon	**Quantity**		554 nos.	519 nos.	12.9 million sq m	18.4 million sq m	
	Value	Rs 184.4 crore	Rs 16.5 crore	Rs 7.1 crore	Rs 193.8 crore	Rs 290 crore	Rs 7.1 crore
Filteration Products	**Quantity**		3.75 million sqm	0.1 million sqm			
	Value	Rs 86crore	Rs 60 crore	Rs 4 crore	Rs 142 crore	Rs 243 crore	-
Paper making fabrics	**Quantity**		1128 pieces	540 pieces	5,300 MT	12,500 MT	
	Value	Rs 85.5 crore	Rs 15 crore	Rs 7.5 crore	Rs 93 crore	Rs 119 crore	Rs 10 crore
TOTAL	**Value**	**Rs 2,239 crore**	**Rs 859 crore**	**Rs 762 crore**	**Rs 2,326 crore**	**Rs 4,091 crore**	**Rs 1,182 crore**

As per ECTT report, the potential market sizing for 2007-08 was as given below:-

Market size (ECTT report)		2001-02	2007-08 (P)
Conveyor belts	**Quantity**	3,230 MT	4,847 MT
	Value	Rs 94 crore	Rs 140 crore
Hoses	**Quantity**		
	Value	Rs 99 crore	Rs 157 crore
Ropes & cordages	**Quantity**	74,000 MT	114,160 MT
	Value	Rs 407 crore	Rs 628 crore

Market size (ECTT report)		2001-02	2007-08 (P)
Drive belts	**Quantity**	2,000 MT	2,680 MT
	Value	Rs 50 crore	Rs 67 crore
Computer ribbons	**Quantity**	3 million sq m	14.5 million sq m
	Value	Rs 30 crore	Rs 145 crore
Battery separators	**Quantity**	8.83 million sq m	21.63 million sq m
	Value	Rs 23 crore	Rs 56.33 crore
Filtration media	**Quantity**		
	Value	Rs 81 crore	Rs 132 crore
Decatising cloth	**Quantity**	1 million meters	1.26 million meters
	Value	Rs 25 crore	Rs 31.6 crore
Bolting cloth	**Quantity**		
	Value	Rs 10 crore	Rs 12 crore
TOTAL	**Value**	**Rs 819 crore**	**Rs 1,368.93 crore**

Decatising Cloth

Decatising cloth, also known as *Decatising wrapper* is an industrial fabric used in Decatising machines. The fabric is an integral part of both Open Decatising and Kier Decatising machines that are majorly used for mechanical finishing of woven fabrics.

Product characteristics

Decatising cloth is a polyamide/cotton or polyester/cotton blended woven fabric available in weights ranging from 400 gsm to 600 gsm.

Market dynamics and key growth drivers

Decatising wrapper is used for mechanical finishing of synthetic fabrics or synthetic rich blends. Industry survey reveals that textile manufacturers are switching to other finishing machines thus, reducing the demand of the wrapper. Moreover, because of changing fashion trends cotton and cotton rich blends have become popular. The shift in demand towards cotton and cotton blends has also affected the demand of decatising wrapper.

Market size of decatising cloth and future forecast

Decatising cloth is used for the finishing of woven fabrics. For this purpose, it is used as a wrapper on the beam of Decatising machine; the consumption per beam depends on the diameter of the beam and varies from 400 meters to 850 meters. The wrapper is replaced after finishing certain length of fabric; the replacement depends on severity of treatment. Replacement frequency of decatising wrapper for different fabric varieties being decatised is given below:

Replacement frequency of decatising wrapper	
Fabric variety	**Average length after which the wrapper is replaced**
Worsted suiting	Every 9 lakh meters
Synthetic suiting	Every 18 lakh meters
Shirting	Every 25 lakh meters
Sarees	Every 0.95 lakh meters
Dress materials	Every 30 lakh meters

Source: Industry survey

All suiting fabric manufactured in India is decatised whereas only a certain percentage of other fabrics are decatised. As per industry sources the share of each variety of fabric that is decatised is given below:

Fabric variety	Share of the total production that is decatised
Suiting	100%
Shirting	50%
Sarees	15%
Dress materials	15%

Source: Industry survey

The market for decatising wrapper is estimated at 1.2 million meters valued at Rs. 30 crore. Based on the industry trends the demand for decatising wrapper is estimated to grow at a CAGR of 3% over the next five years. Thus, the market size of wrapper is expected to increase to 1.4 million meters by 2012-13. The market potential in 2012-13 is estimated to be Rs. 35 crore. No inflationary increase has been assumed for the price of the product.

The current and future forecast of the consumption of decatising wrapper is given below:

Market size of decatising wrapper	2007-08	2012-13
Quantity	1.2 million meters	1.4 million meters
Value	Rs 30 crore	Rs 35 crore

Source: Industry survey, IMaCS analysis

Key manufacturers of decatising wrapper

Bombay Dyeing is the largest manufacturer of decatising wrapper with a market share of around 50%. The company manufactures polyester/cotton (70/30) blended decatising wrapper in several varieties with an average gsm of 400. Other manufacturers are:

- JKT Fabrics, Mumbai
- Noor Textiles, Panipat

In addition, a few players in Tarapur and Surat also manufacture this fabric.

Manufacturer	Year	Production quantity	Installed capacity
Bombay Dyeing	2007–08	0.66 million meters	0.78 million meters

Source: Industry survey

Imports and Exports of decatising wrapper

The estimated import figures for decatising wrapper are given below:-

HS Code	Description	Imports Quantity	Imports Value
		2007-08(E)	2007-08(E)
59113290, 59119090	Spare parts for Kier decatising (Blowing wrapper)	**Around 0.5 lakh meters**	**~ Rs. 4 crore**

Source: IBIS, IMaCS Analysis

Manufacturers of premium suiting fabrics like Raymonds are the importers of decatising wrapper. The imports are primarily from Italy.

The exports of decatising wrapper from India are negligible.

Raw materials

Polyester/cotton decatising wrapper is woven from polyester cotton blended yarn. Warp yarn of $3/48^{s}$ and weft yarn of 34^{s} is used for the same. The fabric is woven on Sulzer looms.

Quality control and standards

The parameters tested for decatising wrapper along with the test method are mentioned in the table below:

Parameter	Test Method
Air Permeability	IS 11056:1984
Strength	IS 1969-1985, ASTM D 5035-95
GSM	IS 1964-2001, ASTM D 3776-96
EPI/PPI	IS 1963-1981, ASTM D 3775-03

Bolting Cloth

Bolting cloth is a mesh fabric used primarily for screen printing in Textile industry. The fabric also has applications in filtration.

Product characteristics

Bolting cloth is a woven fabric manufactured from polyester and nylon yarns and is available in a variety of mesh sizes.

Market dynamics and key growth drivers

Bolting cloth is majorly used for screen printing in textile processing industry. The advent of new printing technology in India has reduced the use of screen printing, thus, impacting the demand for this fabric negatively.

Market size of Bolting cloth and future forecast

Based on discussions with the industry experts, the market size for bolting cloth is estimated at around 6 lakh square meters valued at Rs. 25 crore. According to industry trends, the demand for bolting cloth is estimated to grow at 3% year on year. Thus, the market size of bolting cloth is expected to increase to 7 lakh square meters by 2012-13. The market potential in 2012-13 is estimated to be Rs 30 crore.

The current and future forecast of bolting cloth consumption is given below:

Market size for Bolting Cloth	2007-08	2012-13
Quantity	6 lakh square meters	7 lakh square meters
Value	Rs 25 crore	Rs 30 crore

Source: Industry survey, IMaCS analysis

Key manufacturers of Bolting Cloth

The manufacturers of bolting Cloth are:

- Bombay Bolting Centre, Mumbai
- Surat Bolting, Surat
- Khanna Bolting, Surat
- Mithil Corporation, Mumbai
- Biyani Industrial Textile (P) Limited, Indore

- Deekay Nylobolt Industries Pvt. Ltd., Pune
- Tejas Fabrics, Surat
- Sur Syntex Pvt. Ltd., Surat

In addition, many filter manufacturing units in Surat also manufacture bolting cloth.

Imports & Exports of bolting cloth

The estimated import figures for bolting cloth are given below:-

HS Code	Description	Imports Quantity	Imports Value
		2007-08(E)	2007-08(E)
59112000 59119090	Bolting Cloth, Screen mesh	Around 4 lakh square meters	Rs 15 crore

Source: DGCIS, IMaCS Analysis

Majority of Bolting Cloth is imported from China and Germany. Bolting cloth is also imported from Switzerland in small quantities. Screen mesh is majorly imported from Italy.

The exports of bolting cloth from India are negligible.

Raw materials used

Polyester and nylon mono-filament yarn is used as the raw material.

Absorbent Glass mat Battery separators

Battery separator is a porous sheet placed between the positive and negative electrodes in a liquid electrolyte, a gel electrolyte or a molten salt battery. Its function is to prevent physical contact of the positive and negative electrodes while serving as an electrolyte reservoir to enable free ionic transport. According to the structure, the separator can be divided as micro porous and non-woven.

An ideal battery separator should have the properties of high porosity, small mean pore diameter, oxidation resistance, puncture resistance, thermal dimensional stability and freedom from harmful chemical contaminants, favourable voltage characteristics, retardation of antimony transfer, electrochemical compatibility and prevention of dendrite growth.

The battery separators are made of PVC, PE and non-woven glass mats (Absorbent glass mats or AGM). The glass mats are known as AGM (Absorbable Glass Mat). The battery separator market is dominated by PVC although there is a gradual migration to PE separators. In India, the storage battery industry is slowly shifting from PVC separators to Polyethylene separators. Glass mat with PVC or polythylene is mostly used in all industrial batteries and in a few cases in automobile batteries depending on the function, customer requirement and price.

Market dynamics and key growth drivers of batteries market in India

The storage batteries industry can be classified as Industrial batteries and automotive batteries.

Industrial batteries

Industrial batteries with a market size of Rs 4,000 crore include Lead-acid batteries (including VRLA or valve-regulated lead acid batteries), Lithium and nickel-cadmium batteries. Of this market, 40% is unorganised. The Industrial Batteries Segment can be broken up into the Infrastructure market (Railways, Telecom and Power), Submarine batteries and fast-moving industrial batteries (UPS and Inverters). VRLA batteries are the most important kind of batteries used in the Industrial Segment. The growth in this sector has been driven by surge in demand from the telecom and UPS segment, which is likely to continue in the coming years.

The Industrial batteries i.e., VRLA type of batteries are the prominent users of non-woven Glass mat battery separators, since such batteries are used for heavy-duty works.

Automotive batteries

Automotive batteries with a market size of Rs 2,700 crore include lead-acid batteries and VRLA batteries and are required in almost all automobiles for applications like horn, light, self-start, etc. The automotive batteries market can be further divided into OEM and aftermarket, of which the former constitutes about 40%.

The market for 2 wheeler OEM batteries is around 6.7 million in 2007-08 while 2 wheeler replacement batteries market is estimated to be around 7.5 million in 2007-08. This is expected to more than double to around 12 million OEM batteries and 17 million replacement batteries in next 5 years.
The market for passenger cars/MUVs/MPVs OEM batteries is around 1.76 million in 2007-08 while the replacement batteries market is estimated to be around 3.5 million in 2007-08. This is expected to almost double to 3.5 million OEM batteries and 6.5 million replacement batteries in next 5 years.
The market for CVs (passenger and goods carriers) OEM batteries is around 0.55 million in 2007-08 while the replacement batteries market is estimated to be around 1.05 million in 2007-08. This is expected to increase to 0.75 million OEM batteries and 1.45 million replacement batteries in next 5 years.
The market for three-wheeler OEM batteries is around 0.5 million in 2007-08 while the replacement batteries market is estimated to be around 1 million in 2007-08. This is expected to increase to 0.75 million OEM batteries and 1.5 million replacement batteries in next 5 years.

In Automotive batteries, PVC or Polyethylene type separators are used. VRLA batteries are also used in some of the four-wheelers. Amara Raja and few other players have introduced VRLA batteries for two-wheelers as well. But, the penetration of VRLA batteries in two-wheeler segment is very low. Non - woven micro porous absorbent glass mat with PVC or Polyethylene separators are used mainly in high priced customer specified auto batteries.

Key battery manufacturers

The major manufacturers of batteries in organised sector are Exide Industries (and group companies), Amara Raja Batteries, AMCO batteries (and group companies), Tudor India, HBL Power Systems, etc. Exide is the market leader in the automotive batteries segment with 75% market share in the branded batteries market. Exide is the market leader in the branded industrial batteries segment with around 45% market share. HBL and Amara Raja are the market leaders in the industrial VRLA batteries segment. The usage of battery separators for some of the key battery manufacturers is given below:-

End-user	Year	Quantity	Value (Rs crore)	Unit Price	Battery production	Battery sales (Rs crore)
Amara Raja	2007-08	636 MT	9.77	Rs 154/kg	4.195 million	1350
	2007-08	5.28 mn. sq. m.	15.94	Rs 30.2/sqm		
AMCO batteries	2006-07	26.27 mn. Nos.	1.57	Rs 0.6/unit	2.7 million	113.86
Tudor India	2007-08	34.56 mn. Nos.	3.73	Rs 1.08/unit	0.384 million	143
HBL Power Systems	2007-08	1260 MT	17.78	Rs 141/kg	838 million AH	Around Rs 1000 crore
Total*			**Rs 48.79 crore****			**Around Rs 2700 crore**

Source: Capitaline

** Data on Battery separators for Exide, the largest manufacturer of batteries in India and other battery manufacturers is not available*

*** The value of battery separators includes Absorbent glass mat (AGM) based separators as well as other battery separators*

Key players - Battery separators

Daramic products dominate the PE segment and the company has started operations in India. Daramic is the world's leading manufacturer and supplier of battery separators for automotive, industrial, and specialty applications. Daramic operates six manufacturing facilities with a combined annual capacity of over 350 million square meters of battery separator products. The company is importing AGM separators as of now and plans to setup a factory in India for the manufacture of these separators by next year.

In addition, there are numerous convertors in the battery separator market concentrated in Bangalore, Bombay, Delhi and Kolkata. These players import the AGM separators sheets/rolls and supply separators to battery manufacturers after cutting/processing.

Market size of AGM Battery separators

Automotive batteries

The AGM glass separators are typically used in high-end passenger cars – Segments A3 (Executive), A4 (Premium) & A5 (Luxury) and MUVs/MPVs as per SIAM classification. These vehicles account for around 45% of all passenger cars sales. In addition, 5-6% two-wheelers also use VRLA batteries with AGM separators. Hence, total number of VRLA automotive battery sales (OEM + replacement) using AGM separators is around 2.9 million.

Around 0.75 sq. m. of AGM battery separator is used in an automotive battery on an average. Also, usage of AGM separator in a two-wheeler battery is around 70-80% of the usage in car batteries (as two-

wheeler batteries are 6-9V batteries while car batteries are typically 12V batteries). Hence, total estimated size of AGM battery separators usage in automotive segment is around 2.1 million sq. m. in 2007-08.

In the next 5 years, the percentage of passenger cars/MUVS/MPVs using AGM separators is expected to increase by 15-20%. In addition, marginal shift of two-wheeler batteries towards VRLA batteries is expected. Hence, the usage of AGM battery separators is expected to increase to around 8 million batteries per annum i.e. around 5.6 million sq. m. of AGM separators.

Industrial batteries

Industrial batteries with a market size of Rs 4,000 crore include Lead-acid batteries, VRLA batteries and nickel-cadmium batteries. 40% of the market is unorganized. VRLA batteries account for 70-75% of this market. Around 6,000 square meter of AGM glass separators are consumed per crore sales of industrial batteries. Hence, the estimated size of AGM battery separators usage in industrial segment is around 18 million sq. m. in 2007-08.

The industrial batteries market has witnessed rapid growth over the past few years. The industry is likely to grow at the rate of 20-25 % over the next five years. In the next 5 years, the usage of AGM battery separators in industrial segment is expected to increase to around 45 million sq. m. per annum.

Hence, the current and future forecast of AGM separators usage in India is given below:-

Contact lens usage in India	**2007-08**			**2012-13**		
	Automotive	**Industrial**	**Total**	**Automotive**	**Industrial**	**Total**
AGM battery separators (million sq m)	2.1	18	**20.1**	5.6	45	**51.6**
AGM battery separators value (Rs crore)*	6.3	54	**60.3**	16.8	134	**150.8**

Source: Industry survey, IMaCS Analysis

The potential market for AGM separators in 2012-13 is estimated at Rs. 150.8 crore up from Rs 60.3 crore in 2007-08 (E). No inflationary increase has been assumed for the price of AGM separators.

Imports & Exports of AGM separators

The estimated import figures for glass-fibre based battery separators are as given below:-

HS Code	Description	Imports (in Rs crore)
		2007-08(E)
70193900, 70199010, 70193100, 70191900	GLASS FIBRE SHEETS FOR BATTERY SEPARATORS*	~ 3 - 4
85079010, 85079090	AGM (ABSORBENT GLASS MAT) BATTERY SEPARATORS**	~ 55 - 60

Source: IBIS, IMaCS Analysis

** Apart from these HS codes, Battery separators of fibre glass are also imported in nominal amounts under the HS codes - 70109000, 70199090 (included in Imports value above)*

*** Under these HS codes as well as under 39201019 & 39042110, Battery separators made of PVC/PE without glass-fibre mats valuing over Rs 100 crore are also imported*

China accounts for over 70-80% of imports of fibre-glass battery separators of India with HS code 70X followed by Thailand with 20-25% share. Singapore, Germany & Japan account for less than 5% of fibre-glass battery separators imports of India.

Under the HS code 85X, China accounts for 40-50% of imports of battery separators of India followed by Thailand, Hong Kong, Taiwan, Indonesia & France accounting for around 40-50% imports. The remaining imports of glass-fibre based battery separators are from UK, Germany, US, Japan and Philippines.

The glass-fibre based battery separators are not exported from India.

Raw materials

The absorbent glass mats (AGM) are manufactured by dry-laid process, wet-laid process, spun-bond process or melt-blown process using glass fibre / glass wool.

All these processes consist of three steps:

a. making fabric webs,
b. bonding webs and
c. post-treatment

and in most cases the web making and bonding are done in one step.

Quality Control and standards

There are no standards pertaining to battery separators. The manufacturers have their own set of specifications based on the battery performance requirements.

Cigarette Filter

Cigarette filter reduces harshness of tobacco smoke by reducing the amount tar, smoke and other fine particles during combustion of the tobacco portion. The filter is primarily made-up of cellulose acetate fibres known as tow. The fibres are bonded together with a hardening agent, tri-acetin plasticizer, which helps the filter to keep its shape. The filter is wrapped in paper and sealed with a line of adhesive.

Cigarette and Cigarette filter market in India

The total size of the filter cigarette industry in India is around 120 billion cigarettes. ITC Limited has a near monopoly with around 73% volume market share followed by Godfrey Philips and Vazir Sultan Tobacco (VST).

The Union budget 2008-09 has increased the excise duty for cigarettes below length of 60 mm by 500% and non-filter cigarettes in the 60-70 mm length by 250%. In addition to excise hike a 12.5% VAT on these products has rendered the non-filter cigarette industry unviable. Hence, over the next few years the capacities of these non-filter cigarette capacities would gradually convert to filter cigarette capacities which would further boost the demand for cigarette filters. The number cigarettes manufactured per filter rod is typically 5.5 based on ITC data and this is metric is used to arrive at the number of cigarette filters market in the next five years.

Consumption norms and the market size

The cigarette filter is typically 20 mm long in each cigarette and is a 100% technical textile. Typically six cigarettes are made from one cigarette rod. The length of the cigarette rod is made to the specification of the cigarette manufacturer.

The current and future forecast of cigarette filters industry is given below:-

Market size of cigarette filter	2007-08	2012-13
Quantity	Around 14,000 million filter rods	Around 17,000 million filter rods
Value	Rs 152 crore	Rs 182 crore

Source: Industry Survey, IMaCS Analysis

The potential market for cigarette filter industry in 2012-13 is estimated at Rs. 182 crore up from Rs. 152 crore in 2007-08 (E). No inflationary increase has been assumed for the price of the material. In volume

terms, the usage of cigarette filter is expected to grow from around 14,000 million filter rods in 2007-08 to around 17,000 million filter rods in 2012-13. The cigarette industry is expected to undergo de-growth at around 3% y-o-y over the next 5 years. But, the conversion from cigarettes without filter to filter cigarettes is expected to lead to the growth of cigarette filers.

The production and sales data of major cigarette manufacturers is as given below:-

Manufacturer	Year	Production Quantity (Million)	Sales Quantity (Million)	Quantity (million filter rods)	Value of Filter rods (Crore)
ITC	2007-08	65770*	80723	11475	123
Godfrey Philips	2007-08	5364*	14376	1806	19.8
VST	2007-08	8799*	8844	644	5.6

Source: Capitaline, Industry Survey, IMaCS Analysis

** Sale is higher than production as remade cigarettes as marketed as well*

The major manufacturers of cigarette filters in India are Hind Filters and Hitkari Multifibers apart from smaller manufacturers like Nirmesh Enterprises. The production figure of key cigarette filter-manufacturers in India is given below:-

Manufacturer	Year	Quantity (Million filters)	Value	Unit Price	Installed capacity
Hind Filters	2003-04	2141*	Rs 23.9 crore	Rs 0.112/filter rod	4850 million filters
Hitkari Multifibers	2004-05	2527*	Rs 22	Rs 0.087 /filter rod	5300 million filters

Source: Capitaline, Industry Survey, IMaCS Analysis

** One filter rod is generally 0.12 metre long*

Imports of cigarette filter

The estimated import figures for cigarette filter are as given below:-

HS Code	Description	Imports Quantity	Imports (in Rs crore)
		2007-08(E)	**2007-08(E)**
56012190, 56012900	CIGARETTE FILTER	Approx. 10 million metres	**Rs 2 crore approx.**

Source: IBIS, IMaCS Analysis

The cigarette filters are imported in India from Korea, Pakistan and Indonesia.

Exports of cigarette filter

The estimated import figures for cigarette filter are as given below:-

HS Code	Description	Exports Quantity	Exports (in Rs crore)
		2007-08(E)	**2007-08(E)**
56012190, 56012900, 56012110	CIGARETTE FILTER	Approx. 45 million metres	**Rs 6.5 – 7 crore approx.**

Source: IBIS, IMaCS Analysis

Cambodia and Iran account for two-third of exports of cigarette filters from India followed by UAE and Taiwan, which account for the remaining share. These exports for the year 2012-13 are estimated to be Rs 7.7 crore.

Quality Control and Standards – There are no Indian standards.

Coated abrasives

An abrasive material is used to finish a work piece through rubbing the surface of the work piece. Abrasives are primarily used in industrial applications like grinding, polishing, buffing, honing, cutting, smoothening etc. The coated abrasives are classified into two broad categories: Woven coated abrasives and Non-woven coated abrasives.

Product characteristics

The cloths used are cotton, polyester and polyester blends, processed to obtain a suitable coated abrasives backing. These backings have special characteristics as weight, tensile strength and flexibility. The type of backing cloth used is Jeans cloth called “J” weight cloth, Drills cloth called “X” weight cloth and Sateen called “S” weight cloth. Jeans cloth is lighter and more flexible, while Drills cloth is stronger and used in the manufacturing of coated abrasives to work under medium and heavy duty pressures.

There are two sides of the drill cloth which are different from each other. One side bears a net of fine lining if seen carefully and this side is called drilled side of the cloth. Drill side is filled with fillers. The other side of the cloth is called the coating side.

"J" weight cloth typically has a weight of about 130-195 GSM."X" weight cloth typically has a weight of about 200-245 GSM and "Y" weight cloth typically has a weight of about 270-330 GSM.

The non-woven coated abrasives are made from abrasive grade fibres and made available for usage in various sizes and forms.

Market dynamics and growth drivers

The market of coated abrasives is primarily driven by growth in automobiles, auto-ancillaries, auto-after markets, castings and forging, consumer goods, tanneries, hand tool, power tools, furniture, sanitary-ware and construction.

The demand for coated abrasives from various industries as given below:

Customer segment of Coated Abrasive	Percentage share of coated abrasive sales
Auto	40%
After market, maintenance, repair and over haul	35%
Tanneries	12%
White Goods	10%

Source: SSKI, CUMI

Key manufacturers of coated abrasives in India

The two biggest manufacturers of coated abrasive in India are Carborundum Universal and Grindwell Norton. These two producers cover close to 80% of the coated abrasives market in India.

Manufacturer	Year	Quantity (Sqm)	Value (Rs crore)	Unit Price (Rs)	Installed capacity
CUMI	2007-08	10320000	146.9	145	18830000
Grindwell Norton	2007-08	3250000	146	456	5200000
Total	**2007-08**	**13570000**	**292.9**	**-**	**24030000**

Source: Capitaline

Both CUMI and Grindwell Norton have woven and non-woven coated abrasives in their product mix. However, Grindwell Norton is the only manufacturer non-woven coated abrasives in India with production of one million square meters annually. CUMI on the other hand does not have a non-woven manufacturing unit and trades in the non-woven category. However CUMI does manufacture the industrial cloth in house. The product mix of woven and non-woven is distributed as follows: Woven is approximately 65% and non-woven is approximately 35%.

Key manufacturer of backing cloth or gray cloth is as give below:

1. Madura Textiles
2. Keetex Textile, Kolhapur

Market size of coated abrasives in India

The coated abrasive market is approximately Rs.366 crore in India. The leading producers are Carborundum Universal (CUMI) and Grindwell Norton. CUMI has nearly 40% market share in the coated abrasive segment. Both CUMI and Grindwell Norton put together account for 80% of the coated

abrasive market. The coated abrasive has a diverse user base and overall market is expected to grow at 10% per annum.

The cloth backing in a coated abrasive is equal to the area of the abrasive. The market size of coated abrasives and the cloth are as given below:-

Cloth backing consumption norms (coated abrasive industry)

Coated abrasive – approx. (million square meters)	16.7
Total fabric used (million square meter)	16.7
Woven fabric (million square meter) approximately	10.9
Non woven (million square meters)	5.8
Total fabric used (M Sq. meters)	**16.7**

Source:Capitaline, Industry survey, IMaCS Analysis

The current and future forecast of coated abrasive industry is given below:-

Market size of coated abrasives	2007-08	2012-13
Coated abrasive (in million square meters)	16.7	26.9
Woven abrasive (in million square meters)	10.9	17.5
Non-woven abrasive (in million meters)	5.8	9.4
Coated abrasive value (in Rs. crore)	Rs 366 crore	Rs 590 crore
Backing Cloth (in Crore)	Rs 89 crore	Rs 143 crore

Source: Industry survey, IMaCS Analysis

The potential market for coated abrasive industry in 2012-13 is estimated at Rs. 590 crore up from Rs.366 crore in 2007-08 (E). No inflationary increase has been assumed for the price of the material. In volume terms, the usage of backing cloth is expected to grow from 16.7 million square meters in 2007-08 to 26.9 million square meters in 2012-13.

Export and Import of abrasive backing cloth

The abrasive backing cloth is traded under the HS code: 55121900. There have been no imports and exports under this category code.

Raw materials and machinery

The backing cloth is made from polyester, rayon and cotton fibres. The fabrics are generally woven at 90 degrees to each other; another method of manufacturing backing cloth is stitching together an overlay of fibre placed 90 degrees to each other. The key machinery used for manufacture of backing cloth is rapier looms.

The non-woven abrasives are manufactured using the needle punching process on needle looms.

Quality Control and Standards – There are no Indian standards. The products manufactured in India are along the European lines.

Conveyor Belts

Belt Conveyor system is a fastest, environment friendly & economical mode of bulk transportation. The conveyor belt is used to move unit loads individually and bulk loads continuously.

Product description

A Conveyor belt consists of three components: Cover, Carcass and Insulation – the bonding medium for the carcass. Belting fabrics are used for reinforcing these conveyor belts.

The carcass is sandwiched between two covers, the face cover for the carrying side and the back cover for the pulley side with the face cover being thicker as it is subject to more wear and tear. The quality of cover will depend on the material to be handled, its abrasive quality and lump size and the service conditions. The carcass provides the strength for transmitting the power to drive the conveyor and to support the load carried on the belt. The belt strength is determined by the combined strength of the plies (Generally two- or three- ply belting). The insulation medium within the carcass of any belt separates the plies to prevent chafing; permits the belt to flex, imparts good adhesion to bind the carcass, supports the load; absorbs energy on impact at the loading point and properties for the application – resistance to heat, oil or fire.

Conveyor belts can be classified as rubber conveyor belts and PVC conveyor belts. Rubber based belting can be textile reinforced or steel reinforced. Textile reinforced belts are primarily of Nylon, polyester. Most of the steel cord belts are used in the mining sector

The belts can be classified based on their application as General Purpose, Heat-resistant, Fire-resistant, Oil-resistance, Food grade etc.

Market dynamics

Conveyor belts find major application in cement, mining, thermal power plants, paper, glass, fertilizer and other process industries where there is a requirement for continuous transfer of load. The industry growth is contingent on the new projects or expansion of the existing projects in mines, minerals & metals, cement, paper, glass, fertilizer industries as well as thermal plants, OEM system manufacturers etc.

Steel reinforced belts have shown a higher growth than Textile reinforced belts due to greater lifespan of the product. The conveyer belts have a lifetime of 6 to 12 months based on the nature of material handled and thus have a huge replacement market.

Key manufacturers

Phoenix Yule, MRF, Sempertrans Nirlon are the major manufacturers of conveyor belts in India. Phoenix Yule Ltd is the leader in steel reinforced belts. Key manufacturers of belting fabrics are SRF and Nirlon Limited. Nirlon Limited supplies most of its belting fabric to Sempertrans Nirlon ltd, which is its joint venture with Serriperit A.G., an Austrian industrial rubber product multinational. (SNL) which was formed in January 2000 is planning to double its capacity.

SRF is the market leader in India with a domestic market share of over 50 per cent, and is the third largest producer of belting fabrics in the world. SRF is planning to set up a plant to manufacture Polyester industrial yarn at Gummidipoondi near Chennai. This plant, in addition to manufacturing High Modulus Low Shrinkage (HMLS) Polyester yarn, will have the capability to manufacture an assortment of high tenacity and low shrinkage yarns for various end-use applications such as belting, coated, single cord, etc. The company has a current capacity of 7500 tonnes of belting fabric per annum.

Market size

The production numbers of rubber conveyor belting in India are given in the following table

Production of Conveyor Belting in India(Tonne)								
Year	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08
Apr	1276	1381	1168	1239	1777	2162	2290	1905
May	1273	1384	942	1359	1886	2065	1934	2030
Jun	1198	1402	900	1515	1867	2236	2208	1987
Jul	1206	1287	1049	1651	1980	2179	2130	2040
Aug	1259	1178	1097	1866	2012	2121	2006	2084
Sep	958	1683	1328	1679	1914	1927	1951	1829
Oct	1288	1491	1277	1504	1914	1756	1686	1763
Nov	1105	1617	1197	1638	1969	2035	1982	1684
Dec	1074	1222	1428	1780	1989	2651	1836	1821
Jan	1098	1635	1428	1705	1796	2407	1920	1896
Feb	993	1410	1338	1573	2207	1846	1881	1943
Mar	1063	1308	1351	1916	2236	2455	1903	2196
Annual Production	13791	16998	14503	19425	23547	25840	23727	23178

The market for reinforcement material is estimated to be 3940 tonnes which amounts to Rs 105 Crore. The production of conveyor belts in the last five years has grown at around 9% annually. The industry is

expected to maintain the same growth rate over the next five years. The market for reinforcement material is estimated to be 6062 tonnes and worth Rs 162 Crore.

The current and future market size is given below.

Market size					
		2007-2008		2012-2013	
	Unit	Quantity	Value (Rs Crore)	Quantity	Value (Rs Crore)
Conveyor belts production	MT	23178	284	35662	557
Reinforcement material requirement	MT	3940	105	6062	162

Source: Industry Survey, IMaCS Analysis

Imports and Exports

The import details of conveyor belts are given in the following table.

HS Code	Description	Imports (in Rs Crore)		Imports (Quantity)		
		2006-07	2007-08(E)	Unit	2006-07	2007-08(E)
40101210	(CNVYR BLT/BLTNG)RENFRCD WTH TXTL MTRLS WHERE RUBR COMPD CONTENT LESS THAN 25% BY WEIGHT	**1.2**	**1.8**	**MT**	**19.1**	**46.7**
40101290	(CNVYR BLT/BLTNG)RENFRCD WTH TXTL MTRLS WHERE RUBR COMPD CONTENT MORE THAN 25% BY WEIGHT	**2.8**	**6.5**	**MT**	**150.8**	**164.4**
39269010	PVC BELT CONVEYOR	**70.9**	**92.8**	**MT**	**2411.3**	**1949.3**
59100010	COTTON CANVAS PLY BELTING	**0.8**	**1.2**	**MT**	**19.1**	**23.8**
59100020	RUBBERISED COTTON BELTING	**0.0**	**0.0**	**MT**	**3.4**	**1.0**
Total Imports		**76**	**102**	**MT**	**2604**	**2185**

Source: DGCIS, IMaCS Analysis

The imports are mainly from China, Taiwan and Germany. The Export details of conveyor belts are given in the following table.

HS Code	Description	Exports (in Rs Crore)		Exports (Quantity)		
		2006-07	2007-08(E)	Unit	2006-07	2007-08(E)
40101210	(CNVYR BLT/BLTNG)RENFRCD WTH TXTL MTRLS WHERE RUBR COMPD CONTENT LESS THAN 25% BY WEIGHT	**1.1**	**1.0**	**MT**	**101.6**	**50.6**
40101290	(CNVYR BLT/BLTNG)RENFRCD WTH TXTL MTRLS WHERE RUBR COMPD CONTENT MORE THAN 25% BY WEIGHT	**141.9**	**132.7**	**MT**	**11567.7**	**10592.7**
39269010	PVC BELT CONVEYOR	**43.8**	**41.9**	**MT**	**3777.0**	**3630.1**
59100010	COTTON CANVAS PLY BELTING	**1.4**	**3.3**	**MT**	**84.1**	**199.7**
59100020	RUBBERISED COTTON BELTING	**0.3**	**0.0**	**MT**	**12.0**	**0.3**
Total Exports		**188**	**179**	**MT**	**15542**	**14473**

Source: DGCIS,IMaCS Analysis

Conveyor belts are majorly exported to U S A, Australia, South Africa, Somalia, Netherland and Italy. Out of the total exports technical textiles constitutes only about Rs 66 crore. These exports for the year 2012-13 are estimated to be Rs 106.3 crore.

Key importers & exporters

SRF is the key exporter of belting fabric in India and exports account for about 50% of the revenue of belting fabrics.

Raw materials

The traditional cotton carcass has been replaced by synthetic textile constructions to meet the demand for long-haul conveyor requiring high tensile strength and adhesion, minimum stretch in service and a more flexible and thinner belt. The textile reinforced conveyer belts are made with primarily nylon and polyester. The belting fabric can be made of different fibres in the warp and weft direction. The belting fabrics are made by weaving the relevant fibres.

Quality Control and Standards

The design of a conveyor belt is determined by conditions imposed by the particular material to be carried. A belt should have adequate tensile strength, sufficient width, flexibility, dimensional stability,

good adhesion between components, tear resistance etc. **Bureau of Indian Standards (BIS) has developed standards for conveyor belts (IS: 1891).**

Drive Belts

A belt drive is a method of transferring rotary motion between two shafts. A belt drive includes one pulley on each shaft and one or more continuous belts over the two pulleys. The motion of the driving pulley is, generally, transferred to the driven pulley via the friction between the belt and the pulley.

Product description

The transmission belts can be classified as Flat, Vee, Poly-Vee, Timing/synchronous belts etc. Vee belts (or V Belts) are the most widely used belts. V belt drives replaced flat belt drives for many applications because higher power could be transmitted with more compact drive arrangements. V Belt Drives achieve drive efficiencies of about 95%.

V belts are used in alternators, air conditioning compressors, power steering pumps and water pumps, apart from fans in automobiles as well as a number of industries. There are different types of V-belts; some of them are wedge section V belts; high capacity narrow V-belts; hexagonal V-belts; multi rib poly V-belts; automotive timing belts; auto wrapped belts in wedge and classical types; and variable speed drive belts for two wheeler applications. Generally three types of V belts are commonly used: raw – edged, v-ribbed, and wrapped. They come in five standard sizes A, B, C, D and E. The top width of A is 12.7 mm (1/2 in) and that of E is mm (1) and the thickness varies between the different sizes. When power transmitted is heavy multiple belts are used in pulleys having a number of grooves as required.

The selection of the type of V belt depends on the power capacity of the drive and the small pulley's shaft speed (rev/s), acceptable limits of the speed ratio, pitch length of the belt(s), and diameters of the two pulleys etc. When correctly specified, V belts can be expected to deliver 25000 hours of service (around 3 years continuous, or 5 years normal use) before belt replacement is required.

Market dynamics

V belts find applications in textile industry (textile machinery, textile spinning, texturing, weaving units), chemical and fertilizer industry, steel, engineering, railways, pharmaceuticals, cement and paper industry (printing & packaging, paper conversion) among others. The market for V belts can be broadly divided into two segments- industrial and automotive. The industrial belts account for 55-60 % of the total market.

Key manufacturers

The major manufacturers of V belts are Fenner India, Pix transmissions, Nirlon Ltd and L. G.Balakrishnan & Bros Ltd. The production details are given in the following table.

Company	Volume (in number of pieces)	Value (Rs Crore)
Fenner	8047000	79
Pix	8225165	84
Nirlon	485721	4.4
Good Year	253000	3

Source: Capitaline, Industry survey

Market size

The current and future market size is given below.

Market size					
	Units	2007-2008		2012-2013	
		Quantity	Value(Crore Rs)	Quantity	Value(Crore Rs)
Drive belts	Nos.(Crore)	5.2	536.7	7.5	770.4
TT component	MT	5076	84	7288	121

Source:Capitaline, Industry survey, IMaCS Analysis

The market for drive belts is estimated to be 5.21 Crore pieces which amount Rs 535.65 Crore. The corresponding TT requirement is 5076 tonnes valued at Rs 84.1 Crore. The market is estimated to have a growth rate of 7.5 % per annum. The demand for TT material is estimated to 7288 tonnes worth Rs 121 Crore.

Imports and Exports

The import details of conveyor belts are given in the following table.

HS Code	Description	Imports (in Rs Crore)		Imports (Quantity)		
		2006-07	2007-08(E)	Unit	2006-07	2007-08(E)
40103110	ENDLESS TRNSMSN BLT/BLTNG OF V-BLT,V-RIBBDOF CIRCUMFRNS BETWN 180 CM & 240 CM WHERE RUBR COMPD LESS THAN 25% BY WT.	2.8	2.7	MT	52.6	91.6
40103190	ENDLES TRNSMSN BLT/BLTNG OF V-BLT/V-RIBBEDOF CIRCUMFRNS BETWN 180 CM & 240 CM WHERE RUBR COMPD MORE THAN 25% BY WT.	24.4	23.0	MT	725.1	903.1

HS Code	Description	Imports (in Rs Crore)		Imports (Quantity)		
		2006-07	2007-08(E)	Unit	2006-07	2007-08(E)
40103210	ENDLESS TRNSMSN BLT/BLTNG OF V-BLT/OTHER THAN V-RIBBED OF CIRCUM BETWN 60 CM & 180 CM WHERE RUBY COMPN LESS THAN 25% BY WT.	0.1	0.3	MT	4.2	13.1
40103290	ENDLESS TRNSMSN BLT/BLTNG OF V-BLT/OTHER THAN V-RIBBED OF CIRCUM BETWN 60 CM & 180 CM WHERE RUBY COMPD MORE THAN 25% BY WT.	0.2	0.4	MT	6.7	12.3
40103310	ENDLESS TRNSMSN BLT/BLTNG OF V-BLT/V-RIBBDOF CIRCUM BETWN 60 CM & 180 CM WHERE RUBY COMPN LESS THAN 25% BY WT.	0.0	0.1	MT	0.1	1.3
40103390	ENDLESS TRNSMSN BLT/BLTNG OF V-BLT/V-RIBBDOF CIRCUM BETWN 60 CM & 180 CM WHERE RUBY COMPD MORE THAN 25% BY WT.	0.2	1.2	MT	3.2	39.8
40103410	ENDLESS TRNSMSN BLT/BLTNG OF V-BLT/OTHER THAN V-RIBBED OF CIRCUM BETWN 180 CM & 240CM WHERE RUBY COMPD LESS THAN 25% BY WT.	0.0	0.0	MT	0.7	0.9
40103490	ENDLESS TRNSMSN BLT/BLTNGS OF V-BLT OTHER THAN V-RIBBED OF CIRCUM BETWN 180 CM & 240CM WHERE RUBY COMPD MORE THAN 25% BY WT.	0.7	0.8	MT	18.3	15.3
40103510	ENDLESS SYNCHRONOUS BELTS,OF A CIRCUMFRNCEBETWN 60CM & 150CM WHERE RUBY COMPD LESS THAN 25% BY WT.	0.0	1.2	MT	34.46	45.95
40103590	ENDLESS SYNCHRONOUS BELTS,OF A CIRCUMFRNCE BETWN 60CM &150CM WHERE RUBY COMPN MORE THAN 25% BY WT.W	0.1	0.1	MT	1.73	2.31
40103610	ENDLESS SYNCHRONOUS BELTS,OF A CIRCUMFRNCEBTWN 150CM &198CM WHERE RUBY WHERE RUBY COMPD LESS THAN 25% BY WT.	0.0	3.9	MT	69.17	92.23
40103690	ENDLESS CYNCHRONOUS BLTS,OF A CIRCUMFRNCE BTWN 150CM & 198CM WHERE RUBY COMPD MORE THAN 25% BY WT.	0.5	0.5	MT	14.08	18.77
Total Imports		**29**	**34**		**930**	**1237**

Source: DGCIS, IMaCS Analysis

Most of the drive belts are imported from China, Thailand, Czech Republic, Italy, Japan and Korea.

HS Code	Description	Exports (in Rs Crore)		Exports (Quantity)		
		2006-07	2007-08(E)	Unit	2006-07	2007-08(E)
40103110	ENDLESS TRNSMSN BLT/BLTNG OF V-BLT,V-RIBBDOF CIRCUMFRNS BETWN 180 CM & 240 CM WHERE RUBR COMPD LESS THAN 25% BY WT.	1.6	1.2	MT	91.4	122.8
40103190	ENDLES TRNSMSN BLT/BLTNG OF V-BLT/V-RIBBEDOF CIRCUMFRNS BETWN 180 CM & 240 CM WHERE RUBR COMPD MORE THAN 25% BY WT.	16.3	21.5	MT	1038.2	1174.9
40103210	ENDLESS TRNSMSN BLT/BLTNG OF V-BLT/OTHER THAN V-RIBBED OF CIRCUM BETWN 60 CM & 180 CM WHERE RUBY COMPN LESS THAN 25% BY WT.	1.2	0.0	MT	113.0	0.8
40103290	ENDLESS TRNSMSN BLT/BLTNG OF V-BLT/OTHER THAN V-RIBBED OF CIRCUM BETWN 60 CM & 180 CM WHERE RUBY COMPD MORE THAN 25% BY WT.	4.9	4.1	MT	245.8	315.7
40103310	ENDLESS TRNSMSN BLT/BLTNG OF V-BLT/V-RIBBDOF CIRCUM BETWN 60 CM & 180 CM WHERE RUBY COMPN LESS THAN 25% BY WT.	1.1	0.0	MT	86.7	0.0
40103390	ENDLESS TRNSMSN BLT/BLTNG OF V-BLT/V-RIBBDOF CIRCUM BETWN 60 CM & 180 CM WHERE RUBY COMPD MORE THAN 25% BY WT.	2.3	2.5	MT	180.5	173.0
40103410	ENDLESS TRNSMSN BLT/BLTNG OF V-BLT/OTHER THAN V-RIBBED OF CIRCUM BETWN 180 CM & 240CM WHERE RUBY COMPD LESS THAN 25% BY WT.	0.03	0.3	MT	0.8	24.8
40103490	ENDLESS TRNSMSN BLT/BLTNGS OF V-BLT OTHER THAN V-RIBBED OF CIRCUM BETWN 180 CM & 240CM WHERE RUBY COMPD MORE THAN 25% BY WT.	2.5	3.2	MT	156.5	196.4
40103590	ENDLESS SYNCHRONOUS BELTS,OF A CIRCUMFRNCEBETWN 60CM &150CM WHERE RUBY COMPN MORE THAN 25% BY WT.W	1.1	2.7	MT	52.3	131.1
40103610	ENDLESS SYNCHRONOUS BELTS,OF A CIRCUMFRNCEBTWN 150CM &198CM WHERE RUBY WHERE RUBY COMPD LESS THAN 25% BY WT.	1.9	0.2	MT	106.4	12.1
40103690	ENDLESS CYNCHRONOUS BLTS,OF A CIRCUMFRNCE BTWN 150CM & 198CM WHERE RUBY COMPD MORE THAN 25% BY WT.	1.7	0.6	MT	120.6	26.5
Total Exports		**35**	**36**		**2192**	**2178**

Source: DGCIS, IMaCS Analysis

The Export details of conveyor belts are given in the table above. The drive belts are exported to Australia, U S A, Taiwan, Denmark and South Africa. Out of the total exports technical textiles constitutes only about Rs 36 crore. These exports for the year 2012-13 are estimated to be Rs 39.9 crore.

Type of Raw materials

V belts are generally manufactured from a core of high tensile cord in a synthetic rubber matrix enclosed in a fabric reinforce rubber lining. Woven fabric or cord that is reinforced as ply in the drive belt is primarily made of polyester, Nylon, and cotton.

Premium industrial belts known as 3V, 5V and 8V belts or wedge type belts have been introduced in the market over the last few years. In these the ratio of depth to the top width is greater than in the standard sections, giving a more compact drive. These constructions are made possible by the use of high tenacity materials such as polyester cord. The technical textile requirement is 26 % of the value of the belt.

Raw Material	% by weight
Carbon black	29%
Cord	10%
Jacketing fabric	16%
Natural Rubber/ Polychloroprene Rubber	40%
Sulphur	1%
Zinc oxide	2%
Others	2%

Quality Control and Standards

The relevant BIS standards are IS 2494: Part 1: 1994, IS 2494: Part 2: 1993.

RDSO has the following standard for V belts used for alternators: RDSO/PE/SPEC/AC/0059 -2004.

Computer Printer Ribbon

The computer printer cartridge of a Dot matrix printer (DMP) consists of a cassette and inked fabric called the printer ribbon. The cartridge is replaced when no further prints can be availed, however in order to save on costs only the ribbon portion is changed which is called the refill.

Product Characteristics

The Nylon 6 yarn is woven into a fabric which is cut to required size for making computer printer ribbons. The properties essential for this fabric is

1. High tensile strength
2. Good absorption capacity and capillary action
3. Smudge resistance
4. Scratch resistance
5. Good heat resistance

These properties enable the ribbon to carry the ink and undergo stress during printing.

Market dynamics and key growth drivers

The sale of dot matrix printers (DMP) is key driver of computer ribbon demand. The dot matrix printing technology is old and has been succeeded by ink-jet and laser printer technology. However, dot matrix printers continue to thrive and grow largely due to demand from applications that require large volume printing and where duplicate copies of the print need to be generated in an automated manner. Examples of such usage areas include banks, railway booking centres, retail store billing systems etc.

The growth in sales volume of DMP in India over the last 5 years is given below:

'000 units	2002-03	2003-04	2005-06	2006-07	2007-08
Dot Matrix Printer sales	316	346	399	472	441

There also exists a replacement demand for DMPs. Typically, DMPs which are more than six years old are replaced as the operational performance deteriorates due to wear and tear of the printer head. The leading suppliers of DMP systems in India are TVS Electronics, Wipro e-peripherals and Epson.

Key manufacturers of computer ribbons

The key manufacturers of computer ribbons in India are:

1. Abee-Info Consumables

2. TVS Electronics
3. WeP (formerly Wipro e-Peripherals)
4. Lipi Data Systems
5. Inkwayz – Super Tech Ribbon Pvt. Ltd.

Market size of computer ribbon in India

The dimensions of the printer ribbon vary based on the area of application and type of printer. Computer ribbons for print cartridges are available in different lengths varying from 10 to 50 metres length. The typical width of the ribbon is one centimetre (0.01 metres). Based on the inputs received from the industry players, the average area of inked fabric used in the cartridge is around 0.4 square metres at per square metre price of around Rs.150. Replacement of ribbons is dependent on the usage pattern relating to volume of pages printed with the month is usually on a monthly basis. The current size and the future forecast of computer ribbon industry are given below:

DMP ribbon industry	2007-08	2012-13
Printer ribbon market volume ('000 units)	27840	39667
Printer ribbon usage (million square metres)	12.9	18.4
Printer ribbon market (in Crore)	193.8	290

Source: Industry survey, IMaCS Analysis

The market for computer ribbon industry in 2012-13 is expected to be worth Rs.290 Crore, up from an Rs. 193.8 Crore in 2007-08. An inflationary increase of 5% has been assumed for the price of the material as the prices are driven by price of Nylon 6. In volume terms, the usage of printer ribbon is expected to grow from 12.9 million square metres in 2007-08 to 18.4 million square metres in 2012-13. The growth in demand for computer ribbons is assumed to be 9% over the next five years driven primarily by the increased usage of DMPs as bill printing solutions in merchandise retailing. The assumed growth rate also takes into account the competition from thermal paper printing which moderates the growth of DMP systems.

Abee Info consumables is the leading producer of computer printer ribbons in India.

Manufacturer	Year	Value (Rs. Crore)
Abee Info consumables (Printer ribbon)	2007-08	1.25
TVS – Electronics (Spares and Others)	2007-08	27.9
Wipro e-Peripherals	2007-08	NA

Source: Abee Info,TVSE

The figures for import of computer ribbon over the last three years are given below:

HS Code	Description	Imports (Rs Crore)			Imports (Quantity)			
		2005-06	2006-07	2007-08(E)	Unit	2005-06	2006-07	2007-08(E)
96121010	COMPUTERS PRINTER RIBBON	15.8	15.8	16.5	NOS	672	471	554
	Total	**15.8**	**15.8**	**16.5**	**NOS**	**672**	**471**	**554**

Source: DGCIS, IMaCS Analysis

The export figures for computer ribbon are as given below:

HS Code	Description	Exports (Rs Crore)			Exports (Quantity)			
		2005-06	2006-07	2007-08(E)	Unit	2005-06	2006-07	2007-08(E)
96121010	COMPUTERS PRINTER RIBBON	15.8	9.7	7.1	NOS	784	836	519
	Total	**15.8**	**9.7**	**7.1**	**NOS**	**784**	**836**	**519**

Source: DGCIS, IMaCS Analysis

Computer ribbons are imported mainly from the following countries: Singapore – 23%, USA – 14%, Germany – 14% and France 11%. The major export market is USA which has a share of 64%. These exports for the year 2012-13 are estimated to be same at Rs 7.1 crore.

Raw-materials

The fabric is prepared from nylon yarn. It is then cut into required dimensions, soaked in ink which is of the consistency of wax or crayon, and packed in rolls.

Quality Control and Standards

There are no Indian standards.

Printed Circuit Board

The Printed Circuit Board (PCB) is a mechanical device used to electrically connect and hold electronic components. The technical textile used in the manufacture of printed circuit board is the woven glass fibre fabric which is used as reinforcement along with the epoxy resin. The glass fibre impregnated resin called 'prepregs' is used to bind the copper foils to give copper laminated boards, called laminates. These laminates are further cut into various sizes based on the requirement.

Product characteristics

The glass fabric used affects the performance of final electronic circuitry built on the PCB. The "fibre weave effect" or FWE is one of the central issues associated with the influence of the glass reinforcement fibre on the electrical performance of the PCB.

The glass fabric used for PCB is generally Style 1080 however there are various styles specified by IPC. The standard construction of this style of fabric involves 60 yarns per inch in the warp or machine direction and 47 yearns per inch in the weft or cross-machine direction. The thickness of the fabric is typically, 2.1mil (0.053mm).

The desired properties of the glass fabric required for PCB applications are as follows:

1. Dimensional stability
2. Surface smoothness
3. Ability to withstand laser and mechanical drilling
4. Superior conductive anodic filament (CAF) resistance
5. Uniform dielectric constant (generally in range of 6.6-6.9)
6. Lower dissipation factor (0.006)
7. Reduced signal skew and improved signal integrity

Market dynamics and key growth drivers

The PCB industry and hence the demand of glass reinforcement fabric is primarily driven by growth in the Electronic goods industries which includes computers and allied equipment, consumer durables, mobile phones, calculators etc. The growth production of electronic goods in India (value terms) as collated by Electronic Industry Association of India (ELCINA), during the last 5 years has been 13%, of

which computer desktops and laptops was at 29% , communication and broadcasting equipment at 13%, consumer electronics at 8% and industrial and others at 15%.

Most leading mobile brands have invested in handset and related equipment manufacturing in India- Nokia, Motorola, Samsung, LG, and Ericsson. All leading PC Brands- Lenovo, Acer, and HP have assembly plants and are aiming at expansion. The booming electronics industry leads to growing demand for glass reinforcement fabric.

Key manufacturers of glass fibre fabric

The key manufacturers of glass fibre fabric for PCBs are:

Manufacturer	Year	Capacity (MT)	Production
UP Twiga Fibres	2007-08	1200	NA
Montex Fibre Glass	2005-06	NA	2.18 million meters
Satyaluxmi International	2007-08	NA	NA
SRM International	2007-08	NA	NA

Source: Capitaline, IMaCS Analysis

Market size of printed circuit board and glass fibre fabric for printed market in India

The Indian PCB industry is small compared to the world market. The Indian market is approximately 2-3% of the Chinese PCB market in value terms. The trend in Indian PCB industry is as given below:

Year	2004	2005	2006	2007
PCBs produced (Million square metre)	15	21	31.5	44.1
Value (US$ million)	168	193	222	288.6
Value (Rs. Crore) @ Rs. 40 per $	672	772	888	1154

Source: IPCA,Ministry of Information and Technology, IMaCS Analysis

The industry has been growing at the rate of 40% by volume and 15-20% by value. PCB manufacturers in India mostly cater to the defence sector since the defence norms require local sourcing of these strategic components. However, the mobile phone, personal computers and communication technology sectors which are biggest consumers of PCBs still rely on imports however the Indian PCB industry is fast catching on. In India there are around 60 PCB manufacturers with around 15 large producers. Some of the major producers include AT&S, Cipsa, Epitome Components, Shogini Technoarts and Akasaka Electronics etc.

Consumption norms and the market size

The glass fibre fabric used for reinforcements is E-glass fibre which would be a 100-200 GSM fabric. The usage of the fabric is same as the surface area of the PCB.

The potential market for glass fibre fabric reinforcement for PCB industry in 2012-13 is estimated to be Rs.178 Crore from the current Rs 33 Crore, as shown in the following table:

Printed Circuit Board industry	2007-08	2012-13
PCBs (in million square metre)	44	237
Glass fibre fabric (in tonnes)	6615	35577
Glass fibre fabric (in Crore)	33	178

Source: Industry survey, IMaCS Analysis

An inflationary increase has not been assumed for the price of the material as the prices have dropped over the years. In volume terms, the usage of glass fibre fabric is expected to grow from 6615 tonnes in 2007-08 to 35577 tonnes in 2012-13. The growth in the industry is assumed to be 40% over the next five years based on the growth of the end-user electronics industry in the country.

The production of major PCB producers in India (single and double sided PCB) is given as follows:

Manufacturer (Single Sided)	Year	Quantity (Sq. M)
Epitome Components	2005-06	720000
Akasaka Electronics Ltd.	2005-06	480000
Ascent Circuits Pvt. Ltd.	2005-06	300000
Garg Electronics	2005-06	180000
Genus Electrotech Pvt. Ltd.	2005-06	108000
Shogini Technoarts	2005-06	66000
NSP Electronics	2005-06	60000

Source: IPCA, India

Manufacturer (Multi-sided)	Year	Quantity (Sq. M)
AT&S	2005-06	225000
Shogini Technoarts	2005-06	180000

Sonic Technology	2005-06	84000
Circuit Systems India Ltd.	2005-06	75660
CIPSA RIC	2005-06	72000
Fineline Circuits, Mumbai	2005-06	56400
Meena Circuits	2005-06	43200
Ascent Circuits Pvt. Ltd.	2005-06	41000
Genus Electrotech Pvt. Ltd.	2005-06	36000
Fineline Circuits, Baroda	2005-06	34800

Source: IPCA, India

The turnover of major PCB producers in India (single and double sided PCB) is given as follows:

Manufacturer	Year	Turnover (USD million)
AT&S	2005-06	40
Shogini Technoarts	2005-06	13.3
Sonic Technology	2005-06	9.3
Circuit Systems India Ltd.	2005-06	12.2
CIPSA RIC	2005-06	8
Fineline Circuits, Mumbai	2005-06	6.6
Ascent Circuits Pvt. Ltd.	2005-06	11.55
Genus Electrotech Pvt. Ltd.	2005-06	4
Hi Q Electronics	2005-06	5.3
Epitome Components Ltd.	2005-06	11.10

Source: IPCA, India

The import figures for glass fibre fabric for PCB* are as given below:

HS Code	Description	Imports (in Rs Crore)			Imports (Quantity)			
		2005-06	2006-07	2007-08(E)	Unit	2005-06	2006-07	2007-08(E)
70191100	CHOPPED STRANDS OF A LENGTH <=50 MM	29	41	38	MT	5347	8200	8546
70195100	WOVN FBRCS (EXCL ROVINGS) OF A WDTH <=30CM	0.62	0.81	.85	MT	13.52	30.6	14.2
70195200	WOVN FBRCS (EXCL ROVINGS) OF A WDTH >30CM PLN WVE, WEING <250 G/SQM OF A FILAMNT MEASURING PER SNGL YRN <=136 TEX	1.47	2.67	2.09	MT	53.45	68.8	45.7
	Total	**31.09**	**44.48**	**40.94**	**MT**	**5413.97**	**8299.4**	**8605.9**

Source: DGCIS, IMaCS Analysis

The chopped strands are used for electrical applications other than PCB as well.

The export figures for glass fibre fabric for PCB are as given below:-

HS Code	Description	Exports (in Rs crore)			Exports (Quantity)			
		2005-06	2006-07	2007-08(E)	Unit	2005-06	2006-07	2007-08(E)
70191100	CHOPPED STRANDS OF A LENGTH <=50 MM	0.37	1.7	0.07	MT	31	302	3.2
70195200	WOVN FBRCS (EXCL ROVINGS) OF A WDTH >30CM PLN WVE, WEING <250 G/SQM OF A FILAMNT MEASURING PER SNGL YRN <=136 TEX	0.12	11.02	11.7		57.5	355	545
	Total	**0.37**	**1.7**	**0.07**	**MT**	**31**	**302**	**3.2**

Source: DGCIS, IMaCS Analysis

Primarily the imports for chopped strand mats arrives from China, Korea and Malaysia with 43%, 21% and 21% import share respectively. The major export market is Belgium with 53% of share of exports.

The import figures for PCB are as given below:

HS Code	Description	Imports (in Rs Crore)			Imports (Quantity)			
		2005-06	2006-07	2007-08(E)	Unit	2005-06	2006-07	2007-08(E)
85340000	PRINTED CIRCUITS	233	347	227	MT	3502	5255	5161
	Total	**233**	**347**	**227**	**MT**	**3502**	**5255**	**5161**

Source: DGCIS, IMaCS Analysis

The export figures for PCB are as given below:

HS Code	Description	Exports (in Rs Crore)			Exports (Quantity)			
		2005-06	2006-07	2007-08(E)	Unit	2005-06	2006-07	2007-08(E)
85340000	PRINTED CIRCUITS	322	452	351	MT	2388	2589	1983
	Total	**322**	**452**	**351**	**MT**	**2388**	**2589**	**1983**

Source: DGCIS, IMaCS Analysis

35% of PCB imports arrive from China followed by Hong Kong with 22%. The major export destination for India is Germany and Europe with more than 34% of export share.

During the latest Indian Printed Circuit Association (IPCA) seminar the experts were of the view that the tight government regulations, including the zero-discharge norms, make a PCB manufacturer wait for about three months to one year to get clearance to start a unit in India. This is one reason why many foreign PCB manufacturers hesitate to start their operations in India. Despite huge demand, there are still few manufacturers with inadequate supply, thus forcing the electronic goods manufacturers to import PCBs.

Raw materials and machinery

The raw material used for glass fibre fabric is monofilament glass fibres. The filaments are further processed to produce yarn which is used for weaving the reinforcement fabric.

The key machinery used for weaving glass fibre fabric is air-jet weaving machine the major producers of these air jet machines are as given below:

1. Sulzer Textil, Switzerland
2. SMIT SpA, Italy
3. Lindauer Dornier GmbH, Germany
4. Picanol, Belgium

Quality Control and Standards

The standards for manufacturing glass reinforcement fabric are set forth by IPC. The standard followed for manufacturing glass fibre fabric is IPC-4412.

Paper Making Fabrics

Paper machine clothing consists of large continuous belts of custom designed and custom manufactured, engineered fabrics that are installed on paper machines and carry the paper stock through each stage of the paper production process – pulp created and pressed to a mesh, dewatered, heated, and dried by paper-making machines to make paper web. The types of fabrics are as follows:

- Forming fabric - single-layer and double layer fabrics, two-and-half layer designs.
- Press fabrics - comprising single-base and multi base fabrics.
- Dryer fabrics - which consist of woven mesh dryers fabrics, needled woven mesh dryers, spiral link dryer fabrics, and needled spiral link dryer fabrics.

The demand for these fabrics is primarily driven by paper mills. With the advent of technology synthetic material is being used to replace wire fabrics.

Product Characteristics

The paper making fabrics are made from polyester and polyamide wires which are woven to produce the fabric. Paper making fabric should have the following functionalities:

1. Dewatering ability or good drain ability
2. Transferability of wet paper web - transfer wet paper web safely to the next position by adhering the wet paper web to the felt.
3. Run-ability - avoid undesirable conditions as snaking, deviation, vibration and wrinkling.
4. Wear resistance and resistance to hair shedding
5. Compaction resistance
6. Paper surface smoothness - avoid any felt or roll markings.
7. Uniformity
8. Sustain high speeds of movement on paper making machine

These vary according to the grades of paper, types of paper-making machines and the positions where the felts are used. In short, each position of the paper-making machine requires different felts.

The different types of paper making felts are as given below:

1. *Flow punch* - These are single layer Batt-on-mesh (BOM) type felts with a relatively light weight base fabric which are woven by monofilament and/or twisted monofilament yarns. It is relatively easy to convert Batt-on-base (BOB) type felts to BOMs. BOM felts are the most widely used.
2. *Dual punch* - The base fabrics of dual-punch felts are woven by monofilament and/or twisted monofilament yarns into double layers to make large voids in felt and to resist against high pressure loadings. Moreover, dual-punch felts are highly efficient for preventing roll markings, so the felts are widely applicable for various kinds of paper-making machines including ones with high speed and high pressure loadings.
3. *Lamitech punch* - Base fabrics of Lamitech-punch felts consist of top and bottom base layers with different mesh structures woven by monofilament and/or twisted monofilament yarns. The combinations of the top and bottom base layers are quite plentiful to meet customers' various requirements. Lamitech-punch felts are generally used at those positions which require high surface smoothness of paper, high speed and high pressure loadings and those positions where a large void volume is required for the felts.
4. *Aqua punch* - Aqua-punch felts feature no knuckle points of warp and weft yarn on the base fabrics. Therefore, they can maintain quality smoothness under high loadings and are suitable for positions where a high paper surface finish is required.
5. *Open punch* - Open-punch felts are on-machine seamed felts which have been developed for easier felt installation onto paper machines. When the felts are installed onto the machines, loop holes at both ends of the felts are joined with pintle-wire to make them endless.
6. *Nip punch* - Nip-punch felts are of the BOB type developed as the first needled felts, the base fabrics of which are made of spun yarn and/or a combination of spun and filament yarns.
7. *Warp punch* - Warp-punch felts are of the BOB type which has been developed with the aim of minimum contamination in base fabrics, with the characteristic of having a very small amount of weft yarn if any.
8. *Flat punch* - Flat-punch felts are of the BOB type which have been developed for better smoothness to the paper surface and have the characteristic of light weight base fabric.

Market dynamics and key growth drivers

The Indian paper industry has a total production at eight million tonnes. Per capita paper consumption in India is seven kilogram. A modest increase of one kilogram per capita translates into 1.15 million tonnes of additional paper demand. Growth of domestic paper industry is higher than GDP growth. With growth in GDP and Purchasing Power, per capita paper consumption is bound to increase from the current low, thus leading to increased consumption of Fabrics. Some existing papermakers are in the process of

expanding their production capacities and some new players have also indicated intention to set up paper mills in India, which could be a good opportunity for paper making felt manufacturers.

Key manufacturers of paper making fabric

The major producers of paper making fabrics in India are as given below:

Manufacturer	Year	Quantity	Value (Rs. Crore)	Installed capacity
Voith Paper Fabrics Limited	2006-07	234	45.12	310 MT
Wires & Fabriks Limited	2006-07	102566*	37.93	65105 SqM

Source: Capitaline, IMaCS Analysis

*****Wires & Fabriks is operating at 145% capacity utilisation, also surplus stocks from previous yeas*

Market size of paper making fabrics in India

The demand for paper making fabric in India is partially catered by the two companies- Voith Paper Fabrics Ltd. and Wires & Fabriks S.A. Limited and rest is sourced through imports. The above mentioned companies are active in export market as well. The products are woven fabrics made from synthetic yarns (Nylon, Polyester and Polyamide) and can be classified as 100% technical textile. The synthetic yarns have completely replaced the traditional bronze wire fabrics.

Paper Making Fabric industry	2007-08	2012-13
Paper making fabric (Rs. Crore)	93	119

Source: Industry survey, IMaCS Analysis

The potential market for paper making fabric industry is estimated to increase from Rs 93 Crore in 2007-08 to Rs 119 Crore in 2012-13. The industry growth is anticipated to be stagnant over the next few years (assumed to grow at 5%).

The paper making fabrics are imported from Italy, Germany, Sweden, Switzerland and other European countries, and lately from China and Korea as well. Owing to technological advances and availability of cheaper raw materials locally, imports from China are approximately 30% cheaper than Indian products which would affect the market for domestic producers. Estimated import of Fabric is as shown:

HS Code	Description	Imports Quantity	Imports (Rs Crore)
		2007-08(E)	2007-08(E)
59112000, 59113210, 59113250, 59113290, 59119010, 59119090, 59113290	Paper Making fabrics (Felts)	1128 Pieces	15.25

Source: IBIS, IMaCS Analysis

The estimated export figures for paper making fabric are as shown:

HS Code	Description	Exports Quantity	Exports (Rs Crore)
		2007-08(E)	2007-08(E)
59112000, 59113210, 59113250, 59113290, 59119010, 59119090, 59113290	Paper Making fabrics (Felts)	540 pieces	7.6

Source: IBIS, IMaCS Analysis

Paper making fabrics are exported to Middle East, Africa, Thailand, Pakistan, Sri Lanka and US. These exports for the year 2012-13 are estimated to be Rs 10 crore.

Raw materials and machinery

Polyester or polyamide wires are used for making the fabrics. Weaving is carried out on heavy duty modern wide looms, which are capable of producing fabrics of desired specifications. Weaving is followed by fibre-locking process. Fibre-locking process is carried out on automatic machines which ensure correct locking of the fibre layers with the base fabrics to achieve desired characteristics.

The key machinery used for paper making fabrics is as given below:

- Warp penetration machines
- Weaving machine
- Finishing and head setting machine

The key manufacturer of these machines is Emil Jäger GmbH, Germany.

Quality Control and Standards

There are no Indian standards.

Composites

The burgeoning manufacturing and infrastructure sectors are expected to provide an impetus to the composites industry in India. Production of composites involves combining polymer and glass fibre or carbon fibre in order to produce a material that is lighter yet stronger than steel. The technical textile material in the composites is the fibre glass.

Fibre glass dominates the composites industry as a preferred reinforcement fibre, with a share of around 85%-90%. Other reinforcement fibre like carbon fibre is sparingly used in India owing to its patented technology and high costs.

Fibre glass is made of fine solid rods of glass each with thickness less than one twentieth the width of human hair. Glass fibres are loosely packed together into a mass which can serve as heat insulators. They are also used like wool or cotton fibres to make glass yarn, tape, cloth and mats. Fibreglass also has applications in electrical insulation, chemical filtration and fire fighters' suits. Combined with plastics, fibreglass is used for airplane wings and bodies, automobile bodies, wind mill blades and boat hulls.

Product Characteristics

The product characteristics vary based on the type of finished glass fibre product and end application:

1. ***Chopped strands characteristics*** – High strand integrity, good flow and dispersion, good impregnation. The strand length varies from 1 mm to 6 mm.
2. ***Chopped strand mat characteristics*** – Good surface bonding and integrity, compatibility with polyester resins etc. The basis weight varies from 225 GSM to 900 GSM, with strand length usually 50 mm.
3. ***Assembled roving characteristics*** – Good resistance to weave distortion, good impregnation, good abrasion resistance, etc. The linear weight of yarn varies based on specification, however, the linear weight varies from 150 Tex to 4800 Tex
4. ***Woven roving characteristics*** – High mechanical strength in directions of the weave, resistance to weave distortion, good impregnation and low resin consumption. Weight is based on specification and is typically 210 GSM to 800 GSM

Market dynamics and key market drivers

The market for fibre glass is driven by the application industries. The glass fibre is used primarily in the following industries:

1. Wind energy - Wind Mill blades

2. Chemicals industry
3. Piping
4. Cooling towers
5. Automobiles
6. Oil and Gas
7. Building and Construction
8. Marine

Wind Energy – Wind blades

India has made tremendous progress in the wind energy industry where composite consumption has exceeded that of other developing and developed economies. India is the fourth largest generator of wind power in the world. The Indian firm Suzlon Energy Ltd. has emerged as one of the leading suppliers of wind turbines in the global market. The glass fibre is used as reinforcement in wind mill blades.

Chemical Equipment / Piping / Cooling towers

The major use of composites in India began with the chemical industry because of excellent corrosion resistance properties of the composites. Applications in this sector include chemical equipment, piping and fire fighting breathing apparatus. Composite pipes have applications as ducts in sea-water intakes and effluent discharge in desalination plants, sewer pipelines, etc. Composites are also being used for fabricating cooling tower units where the composite materials resist the corrosive effects of moisture.

Railways

Composites were identified as a potential material for application in the Indian Railways in the early 1980s for many passenger coach components such as louvre and glass shutters, window sills and frames, trays for battery boxes, ceilings, and flooring. The railways was working towards the complete elimination of timber and plywood in the coaches.

Automotive

The automobile industry is another sector where significant amounts of composite materials have been used in passenger cars, scooters and helmets.

Oil and Gas

There are a vast number of potential applications for composites in the oil and gas sector in India in high-pressure pipes and pipe fittings. Current offshore structural applications of composites include low-

pressure pipes, gratings, handrails, equipment covers or enclosures and ladders, because of their low weight, corrosion resistance, improved life-cycle costs and enhanced safety.

Building and Construction

Construction is also a key area for composite usage. The infrastructure business is witnessing extraordinary growth and with improved / advanced construction techniques, the demand for composites is set to increase over the years.

Marine

The use of composites for boat building applications started in early 1970s for replacing wood because of the advantages of corrosion resistance, ease of fabrication, improved performance and low cost.

The overview of composite (glass fibres) consumption in India is given in the table below:

Area of application	Usage in 2007 (MT)	Usage in 2008 (MT)
Wind Energy	20270	25960
Chemical	12100	13310
Piping	11500	13225
Cooling Towers	5500	6050
Railways	9600	11520
Passenger Cars	7722	8420
Helmets – Two wheelers	8772	10000
Oil and Gas	1600	1700
Building and Construction	39500	44650
Marine	1400	1800
Others	6174	6483
Total (MT)	**124138**	**143118**

Source: TIFAC Report 'Technology-linked Business Opportunities in composites in India

Key manufacturers of composites

There are three major producers of glass fibre in India - Owens Corning India Limited, Goa Glass Fibre Limited and UP Twiga Fibres. Total annual capacity is estimated at 82,000 MT per annum, as shown:

Manufacturer	Year	Capacity (MT)	Production (MT)
Owens Corning India Limited	2007-08	51500	50000
Goa Glass Fibre Limited	2007-08	10300	11377
U P Twiga Fibres	2007-08	16800	10119
Others	2007-08	3400	1312
Total	**2007-08**	**82000**	**72808**

Source: Goa Glass Fibre, Capitaline, Industry Survey, IMaCS Analysis

Leading multinational companies operating in the segment of fibreglass and fibreglass fabric are Saertex, LM Glass Fibre (turnover of Rs. 500 crore in India), Vestas and Dupont.

Amongst the smaller players, Montex Glass Fibre Industries manufactured 21.8 Lakh metres of glass fabric with value of Rs 5.72 crore in 2005-06. Harsh Deep Industries manufactured 4 Lakh metres in 2005-06 valuing around Rs 3 crore. Vishnu Fabrics is another niche player manufacturing speciality coated Glass Fibre technical textile mesh fabrics for reinforcing roads, gypsum walls and plaster; glass mesh for external insulation finishing system, glass geo-textiles for preventing soil erosion; glass mesh jointing self-adhesive tapes for jointing gypsum and calcium silicate boards and Cenfill Glass Fibres for fibre reinforcement for cement and gypsum. Cenfill exports to UK, South Africa, Israel, West Asia and USA. The unit had production of 25 Lakh Sq. Metres in 2005-06 with a value of Rs 5.8 crore.

Market size of composites (technical textiles component) in India

India approximately has an installed production capacity of around 82,000 MT per annum of glass fibre. The major producers of glass fibre in India are Owens Corning India Limited and Goa Glass Fibre Limited which account for nearly 70%-75% of the total Glass Fibre capacity in India. Imports also constitute a major share of glass fibre consumption in India.

Glass Fibre usage is diverse ranging from reinforcement fabric in printed circuit boards to aircraft wings. The total production in India is approximately 73,000 MT; the imports in 2007-08 were around 60,000 MT (E) and exports in 2007-08 have been around 33,000 MT (E) (the average exports of the Glass Fibre category is around 25,000-30,000 MT per annum and the average imports for the last three years are around 50,000 MT per annum). The approximate domestic market for glass fibre is around 100,000 MT per annum.

The glass fibre and composites market is witnessing strong growth stimulus, primarily on account of strong focus on infrastructure investments in India. Wind energy and pipeline systems are two applications where glass fibre reinforcements are finding extensive usage in India. The industry is expected to grow at 15% y-o-y over the next five years.

The current and future forecast of composites (technical textiles component) industry is given below:

Composites (technical textiles component) (Domestic consumption)	2007-08	2012-13
Volume (in MT)	100,000 MT	175,000 MT
Value (in Rs. Crore)	Rs 650 crore	Rs 1,400 crore

Source: Industry survey, IMaCS Analysis

The potential market for composites (technical textiles component) in 2012-13 is estimated at Rs. 1,400 crore, up from around Rs. 650 crore in 2007-08 (E). No inflationary increase has been assumed for the price of the material. In volume terms, the domestic usage of composites (technical textiles component) is expected to grow from around 100,000 MT in 2007-08 to around 175,000 MT in 2012-13.

Imports and Exports of Glass fibre fabric and its elements

The import figures for Glass Fibre and made-ups are given below:-

HS Code	Description	Imports (in Rs Crore)			Imports (Quantity)			
		2005-06	2006-07	2007-08(E)	Unit	2005-06	2006-07	2007-08(E)
70191100	CHOPPED STRANDS OF A LENGTH <=50 MM	29	41	38	MT	5,347	8,200	8,546
70191200	ROVINGS	63	96	84	MT	11,623	21,705	18,910
70191900	OTHER (SILVERS, FIBRE GLASS YARN)		74	70	MT	9,980	8,964	11,095
70193100	GLASS MATS	31	33	37	MT	3,745	4,001	6,172
70193200	GLASS THIN SHEETS (VOILS)	3	5	2	MT	218	259	124
70193900	OTHER (WEBS MATTRESSES BOARDS ETC) OF FIBRE GLASS	24	41	37	MT	1,640	2,588	2,543
70194000	WOVEN FABRICS OF ROVINGS	12	22	13	MT	1,501	1,905	1,544

HS Code	Description	Imports (in Rs Crore)			Imports (Quantity)			
		2005-06	2006-07	2007-08(E)	Unit	2005-06	2006-07	2007-08(E)
70195100	WOVN FBRCS (EXCL ROVINGS) OF A WDTH <=30CM	1	1	1	MT	14	31	19
70195200	WOVN FBRCS (EXCL ROVINGS) OF A WDTH >30CM PLN WVE, WEING <=136 TEX	1	3	2	MT	53	69	61
70195900	OTHER WOVEN FABRICS	19	28	35	MT	1,028	1,814	2,256
70199010	GLASS WOOL/GLASS FIBRE	37	64	56	MT	3,169	5,723	4,857
70199090	OTHR MD-UP ARTCLS OF GLS FBRS (FBR GLS NES	47	53	68	MT	3,033	3,187	3,431
	Total	**267**	**461**	**443**	**MT**	**41,351**	**58,446**	**59,558**

Source: DGCIS, IMaCS Analysis

The export figures for Glass fibre are given below:-

HS Code	Description	Exports (in Rs Crore)			Exports (Quantity)			
		2005-06	2006-07	2007-08(E)	Unit	2005-06	2006-07	2007-08(E)
70191100	CHOPPED STRANDS OF A LENGTH <=50 MM	0.37	1.75	0.04	MT	32	302	3
70191200	ROVINGS	4.39	1.34	0.88	MT	764	296	66
70191900	OTHER (SILVERS, YARN)	3.22	6.4		MT	126	577	
70193100	GLASS MATS	10.85	27.36	22.19	MT	1,494	4,061	1,664
70193200	GLASS THIN SHEETS (VOILS)	0.03	0.01	0.95	MT	3	1	71
70193900	OTHER (WEBS MATTRESSES BOARDS ETC)	1.44	0.88	2.87	MT	61	106	215
70194000	WOVEN FABRICS OF ROVINGS	0.47	7.03	2.39	MT	27	731	179
70195100	WOVN FBRCS (EXCL ROVINGS) OF A WDTH <=30CM	0.04	0	0	MT	1	0	0
70195200	WOVN FBRCS (EXCL ROVINGS) OF A WDTH >30CM PLN WVE, WEING <=136	1.29	11.03	5.57	MT	58	355	418

HS Code	Description	Exports (in Rs Crore)			Exports (Quantity)			
		2005-06	2006-07	2007-08(E)	Unit	2005-06	2006-07	2007-08(E)
	TEX							
70195900	OTHER WOVEN FABRICS	2	1.03	1.56	MT	89	56	117
70199010	GLASS WOOL/GLASS FIBRE	35.54	48.22	28.02	MT	3,228	4,667	2,101
70199090	OTHR MD-UP ARTCLS OF GLS FBRS (FBR GLS NES	73.37	155.16	369.07	MT	10,788	20,936	27,680
	Total	**133**	**260**	**434**	**MT**	**16,671**	**32,088**	**~ 33,000**

Source: DGCIS, IMaCS Analysis

The import of Glass fibre products into India is dominated by China, Germany, USA, Korea and UK. These five nations contribute to 75% of India's imports. The glass fibre prices are expected to firm up going forward. India exports to Middle East countries and European countries (like Belgium) which account for about 78% of total exports from India. These exports for the year 2012-13 are estimated to be Rs 609 crore.

Key machinery used

The key machinery used in process of Glass Fibre strands is given below:

1) Stitching machines
   a) LIBA GmbH
   b) Malimo
2) Weaving machines
   a) Dornier

Quality Control and Standards

The standards generally used are BS3496, BS3691, and BS3749.

Ropes and Cordages

Synthetic ropes and cordages are substitutes to traditional ropes and cordages made from jute and cotton. The synthetic ropes and cordages are primarily made from polypropylene and polyethylene. The 3-Strand and 4-Strand ropes required for fisheries, electricity boards, defence, ports and shipbuilding yards, stevedoring companies, steel pipe industries, sugar factories, engineering and oil exploration. The company also makes 8-Strand ropes that are ideal for marine applications like mooring lines, towing lines, messenger lines and on-board oil rigs. These products are manufactured to desired specifications.

Product characteristics

The ropes are generally available in 3-strand, 4-strand and 8-strand with standard lengths of length 110, 220, 330 and 440 metres and other customer specifications. The diametre of the ropes varies from ½ inch to 7 inches. The functional specifications of ropes are

- Excellent strength
- Controlled elongation
- Abrasion resistance
- Heat resistance
- Non-corrosive
- Light weight
- High flexibility
- Inert to chemicals

The ropes are made from polypropylene and HDPE polymer fibers.

Key manufacturers

The manufacturers of synthetic ropes are given below:

- Garware Wall Ropes – Production – 11674 tonnes/annum;
- Tufropes – Production – 4800 tonnes/annum
- Sona Ropes
- Krishna Filaments – Capacity – 21000 tonnes/annum; Production – Nil
- Axel Polymer Ltd. – Capacity – 3000 tonnes/annum

In addition to the organised there are large numbers of producers in the un-organised sector located mainly in Gujarat, West Bengal, Uttar Pradesh and Delhi.

Market dynamics and key growth drivers

The market of ropes and cordages is primarily driven by growth in application areas. The main application areas of synthetic ropes is as given below:

1. Fisheries – The biggest consumers of synthetic ropes

   The Indian fisheries industry is the biggest consumer of synthetic ropes. There are a large number of fishing vessels which carry around 80 kilograms of rope per vessel. Total number of fishing vessels in 2008 is estimated to be 264134. The demand for synthetic ropes from fisheries is estimated to be around 21976 tonnes. The growth in this sector generally tracks the growth in fisheries which is approximately 3-4% per annum.

2. Shipping

   The synthetic ropes required in shipping are primarily for mooring purposes. 8-strand rope is generally used for this purpose. As of January 2008 the Indian fleet has a total of 850 vessels of which 573 are coastal ships and 277 overseas. The coastal ships typically require 12 coils of ropes and overseas ships require 22 coils. In tonnage coastal ships typically require 5-6 tonnes of rope and overseas ships require 9-10 tonnes of synthetic ropes. The total demand from shipping is approximately around 5512 tonnes per annum. The sector is growing approximately at around 7% per annum.

3. Marine ports

   The marine ports have under development over the recent past and both the traffic and efficiencies at ports in India has improved. India has around 12 major ports and 187 minor ports. The minor port approximately require five to six tonnes of ropes and major ports require around 80-100 tonnes of rope. The total demand from ports is approximately around 3200 tonnes.

4. Transport – Road trucks, Railways and Airports

   The demand for ropes in transport is as given below:

   (i) The transportation trucks require ropes which typically ranges around 10 kilograms per truck. There are around 373907 trucks on road considering 15 years data which would require around 1500 tonnes of synthetic ropes

   (ii) Railways requires around 600-700 tonnes of ropes annually for cargo transport

   (iii) Airport require about 50-60 tonnes of ropes annually. Indian has about 81 fully operational airports which would result in demand of around 4000-4800 tonnes

The other major consumers of synthetic ropes are given below:

5. Defence – Navy and Army
6. Oil Rigs
7. Electricity boards
8. Sugar Mills
9. Construction Industries

   The miscellaneous areas where synthetic ropes find application are slings in bags, household usage, clothline etc.

Market size of ropes and cordages

The demand for ropes and cordages in India is close to ~Rs.634 crore (net of imports and exports for synthetic ropes and cordages). The production of ropes and cordages is approximately ~Rs.669 crore. Garware Wall Ropes Limited is the biggest player in the organised sector with close to 90% market share. The unorganised sector commands a major share in production. The leading states in cordage industry are Tamil Nadu, Maharashtra, Punjab, Gujrat and Madhya Pradesh. The cordage industry tracks the growth in shipping, fishing and other industries mentioned above.

The ropes and cordages are made from Polypropylene, Polyethylene or High density polyethylene (HDPE). Due to high density of HDPE products polypropylene and other polyethylene products are considered for most industrial applications. Ropes and cordages are 100% technical textile product.

The current and future forecast of ropes and cordages industry is given below:-

Ropes and Cordage industry	2007-08	2012-13
Ropes and Cordages (in MT)	115371	170066
Ropes and Cordages (in Crore)	669	1037

Source: Industry survey, Garware Wall Ropes Ltd. IMaCS Analysis

The potential market for ropes and cordages industry in 2012-13 is estimated at Rs.1037 crore up from Rs. 669 crore in 2007-08 (E). In volume terms, the usage of ropes and cordages in the industry is expected to grow from 115371 MT in 2007-08 to 170066 in 2012-13. The growth the industry is assumed to be 14% over the next five years for organised sector and 7% for the unorganised sector.

Imports and Exports

The import figures for synthetic ropes and cordages are as given below:

HS Code	Description	Imports (in Rs Crore)			Imports (Quantity)			
		2005-06	2006-07	2007-08(E)	Unit	2005-06	2006-07	2007-08(E)
56074900	OTHR CORDGE ETC OF POLYETHLN/POLYPROPYLN	47	86	116	MT	28	35	38
56079090	OTHER TWINE,CORDAGE,ROPE & CABLES	11	11	47	MT	470	608	9909
56081900	OTHER KNOTTED NETTING OF TWINE,CORDAGE OR ROPE OF MAN-MADE TEXTILE MATERIALS	1.5	2	2	MT	82	105	94
56089090	OTHER TWINE,CORDAGE/ROPE	0.75	3.2	0.67	MT	64	100	43
	Total	**60.25**	**102.2**	**165.67**	**MT**	**644**	**848**	**10084**

Source: DGCIS, IMaCS Analysis

The export figures for synthetic ropes and cordages are as given below:

HS Code	Description	Exports (in Rs Crore)			Exports (Quantity)			
		2005-06	2006-07	2007-08(E)	Unit	2005-06	2006-07	2007-08(E)
56074900	OTHR CORDGE ETC OF POLYETHLN/POLYPROPYLN	56	90	153	MT	6523	11429	17679
56079090	OTHER TWINE,CORDAGE,ROPE & CABLES	11	19	7	MT	1178	1735	911
56081900	OTHER KNOTTED NETTING OF TWINE,CORDAGE OR ROPE OF MAN-MADE TEXTILE MATERIALS	21	6	33	MT	2403	281	1839
56089090	OTHER TWINE,CORDAGE/ROPE	34	15	7	MT	1345	613	627
	Total	**122**	**130**	**200**	**MT**	**11449**	**14058**	**21056**

Source: DGCIS, IMaCS Analysis

The imports of ropes and cordages industry are small compared to the exports. The exports are distributed amongst 80 countries lead by USA, Norway and Indonesia with 11-13% share each. China is a major importer with around 23% of Indian cordage import; however China also receives around 8% of Indian cordage exports. These exports for the year 2012-13 are estimated to be Rs 402.3 crore.

Key machinery suppliers

The key machinery employed in manufacture of synthetic ropes is given below:

- Extrusion
    - J P Industries
    - Lohia Starlinger
    - Kabra Machines
- Twisting and Winding
    - JMW, Coimbatore

Quality Control and Standards

There are no Indian standards.

Filtration products

Key application areas of filtration products

The broad classification based on applications is given below:-

- **Industrial filters**

  Industrial filters include vacuum filters, pressure filters, and dust collection equipment like bag filters etc used in industries like Cement, Pharma, Fertilizer, Food Processing and other process industries

- **Automotive filters**

  Automotive filters are primarily of three types - Oil filter, Air filter and Fuel filter. The filters clean the oil, air and fuel by blocking dirt and other unwanted particles from entering the vehicle system. The technical textile used in the filters is cellulose and polyester non-woven filter paper.

Product characteristics

The filtration products can be classified into two major categories.

- Liquid solid separation
- Air-solid separation.

The filter media used for Air-solid separation is primarily non woven fabric whereas Liquid solid separation involves woven filter media.

Woven Filter Media				
	WEIGHT / SQ. MTR.	TENSILE STRENGTH (KGS.)		AIR PERMEABILITY
Fabric type		WARP	WEFT	(CU.FT/SEC)
Polypropylene spun fabric	280 - 650	200 - 426	140 - 350	0.97 - 0.20
Polypropylene Multi filament fabric	275 - 450	295 - 500	145 - 400	0.5 - 0.13
Polyester spun fabric	360 - 670	325 - 600	250 - 308	0.20 - 0.109
Nylon filament fabric	330 - 450	310 - 548	275 - 414	0.60 - 0.23
Cotton fabric	400 - 830	135 - 320	110 - 225	0.30 - 0.08

Non Woven Filter Media	Weight (GSM)	Thickness (Mm)	Breaking* Strength (Kgf)	Bursting Strength (Kg/Cm²)	Max. Temp. (C°)	Air Perme-ability**
Polyester & Polyester	300 – 550	1.7 - 2.3	30 - 70	15 - 30	150	160 - 750
Polypropylene & Polypropylene	400 – 700	1.8 - 3.0	70 - 150	30 - 40	90	100 - 200
Polyester - Acrylic & Polyester	500	202	70	30	120	200
Polyester - Viscose	220	1.8	16	4	130	550

Product characteristics of automotive filters

The characteristics of the filter are based on the specification of the original equipment manufacturers: permeability, corrugation depth, bursting strength, pore size, volatile content, resin content and width and height. All the three filters are required for proper functioning of internal combustion engine. The technical textile used in the filters is polyester and cellulose non-woven fabric of around 120-150 GSM.

Market Dynamics and key growth drivers

The primary growth driver for automobile filters is the automotive industry (including the replacement market).

The key end users for industrial filters are Cement, Pharmaceuticals, Fertilizer, Food Processing, Power and Engineering sectors. The demand of filter equipments and filter media is driven by the performance of these sectors. The filter media has a higher proportion of replacement demand compared to the filtration equipments. The increasing emphasis on pollution control and occupational health augur well for the industry.

Key manufacturer of automotive filtration medium

There are only few organised big players in the filter fabrics industry. However, there are large number of small companies which manufacture filter fabric from viscose, polypropylene and polyester. The major players in the automotive filter market are Purolator India Limited, John Fowler Filters (India) Pvt. Limited and Roots India. Mahle-Purolator Filters is the biggest automobile filter manufacturer in India. The Filter Paper Impregnation facility, located close to the filter manufacturing plant at Khandsa, is the largest of its kind in India. The unit produces close to 3600 MT of filter paper. The unit was setup primarily to replace imports and promote the indigenous manufacture of filter paper.

Polymer Paper Limited is another filter paper manufacturing company with own base paper and impregnation plant. The capacity of filter paper is around 800 tonnes and production 676 tonnes (2006). The other filtration media line has capacity of 1200 tonnes and production of 818 tonnes.

There are not many other organised large players in the automotive filter fabrics industry, however, there are large number of small companies which manufacture filter fabric from viscose, polypropylene and polyester.

Key manufacturers of industrial filter Media

Most of the filter fabric manufacturers are SSI units and concentrated in the states of Gujarat, Madhya Pradesh and Maharashtra.

Khosla Profil is one of the key players in this industry manufacturing filter fabrics - Spun, Multi-Filament & Monofilament from Polypropylene, Polyester, Nylon, Cotton, Poly/Cotton, Stainless steel, Carbon etc. with manufacturing widths up to 3.6 mts wide and jointless rolls upto 2000 mtrs. Khosla Profil has developed special dust collection non-woven filter bags.

Company	Year	Units	Production	Capacity
Shri Dinesh Mills Limited	2005-06	MT	179	-
Biyani Industrial Textiles Pvt. Ltd.	2007-08	Lakh metres	2.4	-
Travancore Fibres Pvt. Ltd.	2007-08	Lakh metres	-	5.4
Jyoti Overseas Ltd	2007-08	Lakh metres	-	240
Bimtex Fabrics	2005-06	Lakh metres	1.9	-
Kabeer Cotton Mills (P) Ltd.	2005-06	Lakh metres	0.26	-
Hi-Tech Speciality Fabrics Pvt. Ltd.	2005-06	Lakh metres	2	-
Ruchi Cottex	2005-06	Lakh metres	1.49	-
Filtech Fabrics	2005-06	Lakh metres	0.97	-
Quality Fabrics	2005-06	Lakh metres	1.24	-
MechTech Industries*	2007-08	MT	42	-
Charminar Non-wovens**	2007-08	Lakh metres	1	-
Muth Texfilters Ltd.	2007-08	Pieces	20000	-
Puromatic Filters Pvt.Ltd	2007-08	Lakhs of Pieces	5.5	-
Masterlal Pvt Ltd	2007-08	Lakhs of Pieces	0.9	-
Natural Canvas & Co.	2007-08	Lakhs of Pieces	0.5	-
Jay Engineering	2007-08	MT	6	-
N.K Fliter Fabric Pvt.Ltd	2007-08	Lakh metres	18	-
Pure Filter System	2007-08	Lakhs of Pieces	15	-

Source: Industry Survey, IMaCS Analysis

**MechTech Industries are authorized dealers of Supreme non-woven Pvt Ltd.*

***Includes products other than filtration*

Market size and future forecast for filter media

The current and future forecast of filter media domestic usage is given below:-

Filter media Domestic usage	2007-08	2012-13
Filter media Value	Rs 88 crore	Rs 113 crore

Source: Industry survey, IMaCS Analysis

The domestic consumption of filter media is estimated as Rs 88 crore in 2007-08. The demand for these products is estimated to increase at a CAGR of around 5% and the market in 2012-13 is estimated to be Rs 113 crore.

Market size of automotive filter paper in India

The market for automotive filters is driven by growth in automobile production and increase in vehicles on- road. The replacement frequency for four wheelers is assumed as twice for air filters, thrice for oil filters and once for fuel filter (all per annum) and once in four years for two-wheelers.

The average usage of non-woven fabric in air filter is around ~42.5 grams, ~100 grams in oil filter and ~50 grams in fuel filter.

The current and future forecast of automotive filter media domestic usage is given below:-

Automotive Filters Domestic usage	2007-08	2012-13
Quantity	5,300 MT	12,500 MT
Value	Rs 54 crore	Rs 130 crore

Source: Industry survey, IMaCS Analysis

The potential market for automotive filter in 2012-13 is estimated at Rs. 132 crore up from Rs. 54 crore in 2007-08 (E). In volume terms, the usage of non-woven filter medium in the industry is expected to grow from 5,300 MT in 2007-08 to 12,500 in 2012-13.

Imports and Exports of filter media

The import details for filter media are given in the following table.

HS Code	Description	Value (In Rs crore)	Imports (Quantity)
		2007-08(E)	2007-08(E)
59119090, 59111000, 59112000, 59113190	Filter Media	Rs 60 crore	3.5-4 million sq m

Source: IBIS, IMaCS Analysis

Most of the imports of Filter media are from Switzerland, Germany, USA and China. Sefar Filtration (India) Pvt. Ltd is the one of the key importers of Sefar Brand of filter products. The company is located in Thane (Maharashtra).

The export details for filter media are given in the following table

HS Code	Description	Value (In Rs crore)	Exports (Quantity)
		2007-08(E)	2007-08(E)
59119090, 59111000, 59112000, 59113190	Filter Media	Rs 4 crore	Around 0.1 million sq m

Source: IBIS, IMaCS Analysis

The automotive filter media is primarily exported to UAE.

Key machinery used

The machinery used for processing paper into filter paper is given below:

1. Filter paper impregnation machine
2. Pleating machine – Blade/Rotary type
3. Perforation machine
4. Curing machine

The machinery suppliers in India are:

1. Polymer Papers Limited, New Delhi
2. Dashmaesh International, New Delhi
3. Kanwal Enterprises – GT Element Manufacturing, Gurgaon

Raw materials

The raw material characteristics are given in the following table.

Basic Raw Material	Poly-Propylene	Polyester	Acrylonitrile (Co-Polymeric & Homopolymeric)	Ryton(Poly-Phenylene-Sulphide)	Nomex (Poly-Aramid)
Recommended Operational Temp.(C°)	80 - 100	120 - 150	100 – 160	170 - 190	190 - 204
Tensile Properties	Good	Good	Moderate	Good	Good
Resistance					
Abrasion	Excellent	Good	Moderate	Good	Good
Acid	Excellent	Excellent	Good	Excellent	Fair
Alkali	Excellent	Poor	Good	Excellent	Fair
To Hydrolysis [Presence Of Strong Acid, Sox, Alkali & Oxidizing Agent]	With Moisture	Moderately With Moisture At High Temperature.	With Moisture & Temperature.	Unaffected Even With Moisture & Temperature	With Substantial Moisture & Typical Temperature
Applications	Liquid Filtrations	Cement, Coal Mills, Fertilizer, Asbestos, Etc Industries.	Cement, Coal Mills, Fertilizer, Asbestos, Etc Industries.	Kilns, Boilers Of Different Industries.	Critical & Fine Gas Filtration, Kilns, Boilers Of Different Industries

The filtration media manufactured in India is predominantly manufactured in the woven form. The non woven filtration media is manufactured by needle punching process.

Quality Control and standards in India

The relevant BIS standards are given below.

BIS Standard	Description
IS 1178 : 1986	Cotton filter cloth
IS 5036 : 1969	Specification for Filter Presses, Recessed Plate Type, and Plate and Frame Type
IS 5675 : 1987	Specification for Rotary-disc Vacuum Filters
IS 8577 : 1977	Purchaser's data sheet for rotary vacuum filters

BIS Standard	Description
IS 9540 : 1980	Purchaser's data sheet for plate and frame filters
IS 11492 : 1985	Specification for Rotary Vacuum Filter Screens for Sugar Industry
IS 11574 : 1986	Specification for Polyamide Filter Cloth
IS 11575 : 1986	Specification for Polyester Filter Cloth
IS 12020 : Part 1 : 1987	Specification for Polypropylene Filter Cloth - Part 1 : Filter Cloth from Spun Polypropylene Yarn

Annexures

Annexure 1:

Protective cultivation Action plans (including shade-nets, mulching and greenhouses) for different states approved for 2006-07 (as per NHM)

	Physical Target (in Hectare)		Physical Target (in Hectare)
AP	370	Goa	2
Punjab	150	West Bengal	230
Orissa	145	Chattisgarh	187
MP	102	Bihar	467
Haryana	80	Jharkhand	1457
Rajasthan	116	Karnataka	182
Gujarat	209	Maharashtra	2074
UP	1859	TN	24
Kerala	470	A&N Islands	108
Delhi	1	Lakshdweep	2
		Total	**8235**

Source: Report of the Working Group on Horticulture, Plantation Crops and Organic Farming for the XI Five year Plan (2007-12)

Annexure 2: Shade net targets (2007-08) under NHM for some of the key horticulture states

	Physical Target (in Hectare)		Physical Target (in Hectare)
AP	25.4	UP	6.855
Orissa	10	Kerala	50
MP	0.8	Delhi	0.7
Haryana	5	Karnataka	34
Rajasthan	5	West Bengal	25
Gujarat	7.5	Jharkhand	1
Bihar	200	Tamil Nadu	3.9
Maharashtra	229.21	Chattisgarh	750
NE & Himalayan states	61.7	Others	200
		Total	**1,616**

Source: State-wise NHM reports

Annexure 3: Mulching targets (2007-08) under NHM for some of the key horticulture states

	Physical Target (in Hectare)		Physical Target (in Hectare)
AP	135	UP	1745
Orissa	500	Kerala	250
MP	100	Goa	10
Haryana	14	Karnataka	35
Rajasthan	50	West Bengal	45
Gujarat	200	Jharkhand	900
Bihar	3000	Tamil Nadu	25
Maharashtra	483	NE & Himalayan states	2092
		Total	**9,584**

Source: State-wise NHM reports

Annexure 4: Details of dimension, weight and material used for various varieties of defence tents

Type	Description	Dimensions		Weight		Materials	
Tent Arctic Small Mk 2	This is conical, circular based tent and is used in snow white and green vegetation terrains in extreme cold climates. Tent can be heated (warmed up) with the help of one Stove Heating.	Plinth Area	2.135 x 1.905 Mtrs	Textile material	6.3 Kg	Outer fly	Cotton Closely Woven 170 gms Dual Shade
		Pitching Area	4.190 x 3.660 Mtrs	Complete set	8.4 kgs.	Inner fly	Cotton Fabric
		Overall Height	1.07 Mtrs			Ground sheet	Fabric rubberised
		Effective Height	0.990 Mtrs				
Tent Arctic Large MK-2	This is used in snow/green vegetation terrain in high altitudes and extreme cold climates for accommodation/office purpose	Plinth Area	670 cm x 980 cm			Outer fly	Duck Cotton 612 gms Dual Shade
		Pitching Area	1025 cm x 1310 cm			Inner fly	Dosooti
		Overall Height	360 cm			Ground sheet	Fabric rubberised
		Effective Height	335 cm				
Tent 80 Kg MK-3	Intended for use as temporary shelter or living accommodation for troops, housing, cooking wash house and as hospital ward for 8 patients in emergency	Plinth Area	5.23 M x 4.27 M			Outer fly	Duck Cotton
		Pitching Area	9.08 M x 8.23 M			Inner fly	Dosooti
		Overall Height	2.5 M				
		Effective Height	2.29 M				
Tent Pvt MK 3	The Tent made of Dosootie , consists of	Plinth Area	6.4M x 6.4M			Outer fly	Duck cotton

	one Outer Fly, one Inner Fly and 4 walls	Wall size	5.85M x 1.83 M			Inner fly	Two folds of quilted dosootie
						Walls	3 folds of quilted dosootie
Tent Extendable Frame	This is a multipurpose Tent generally used by the troops in the cloudy weather. Outer fly of the Tent is made of single fold of strong WP & RP Canvas	Length	Any length in multiple of two meters			Outer fly	Duck Cotton 475 gms
		Width	4.62 M			Inner fly	Dosootie Green For Inner Fly
		Heights	2.83 M				
		Wall Heights	1.88 M				
Store Tent	The Tent made of Dosootie, consists of one Outer Fly, one Inner Fly and 6 wall	Length	16 M			Outer fly	2 quilted folds of dosootie
		Width	9 M			Inner fly	2 quilted folds of dosootie
		Walls	8M X 2 M				
			12 - 16 Square M				

Source: Ordinance factory board

Typical characteristics of Relief tents

Type	Description	Dimensions		Weight		Materials	
Ridge tents (Relief tents)	These tents are used for housing families	Poles	2-3 vertical, 1 ridge pole	Weight	75-120 Kg		
			12 - 16 Square M				

Source: Industry survey

Annexure 5: Industry-wise factories carrying on operations declared Dangerous and workers employed in such operations in India for the year 2002

Industry NIC-98	No. of Working Factories	Average Daily no. of Workers Employed	Average Daily Number of Workers Employed in Dangerous Operations
1	15	462	94
14	1	49	15
15	1097	80936	7068
16	2	68	9
17	51	10105	554
19	30	1193	623
20	99	7419	-
21	23	14002	4020
22	25	4382	411
23	43	7698	6318
24	520	78336	25252
25	31	4935	471
26	283	26638	6296
31	19	4150	128
32	4	1261	62
33	6	1178	409
34	6	15231	223
35	21	36096	6571
36	10	795	56
40	45	16323	654
41	4	69	4
50	80	5555	255
51	40	785	264
52	14	156	6
60	4	86	16
63	24	5570	1158
64	1	24	-
Total	***2902***	***406789***	***73609***

Source: Statistics of Factories, Ministry of Labour, Government of India

3. Non-woven sector of technical textiles

Introduction

Nonwoven fabrics are broadly defined as sheet or web structures bonded together by entangling fibre or filaments (and by perforating films) mechanically, thermally or chemically. They are flat, porous sheets made directly from separate fibres or from molten plastic or plastic film. They are not made by weaving or knitting and do not require converting the fibres to yarn.

Official ISO and CEN definition of nonwovens

Nonwovens are defined by ISO standard 9092 and CEN EN 29092. These two documents, identical in their content, are the only internationally acknowledged definition of Nonwovens. As industry, trade and technology have evolved since their publication in 1988, these standards are being updated by ISO experts to better reflect what the present understanding of Nonwovens is. The following text has recently been proposed to the International Standardization Organization by EDANA and INDA.

"A nonwoven is a sheet of fibres, continuous filaments, or chopped yarns of any nature or origin, that have been formed into a web by any means, and bonded together by any means, with the exception of weaving or knitting."

Felts obtained by wet milling are not nonwovens.

Wetlaid webs are nonwovens provided they contain a minimum of 50% of man-made fibres or other fibres of non vegetable origin with a length to diameter ratio equals or superior to 300, or a minimum of 30% of man-made fibres with a length to diameter ratio equals or superior to 600, and a maximum apparent density of 0.40 g/cm^3.

Composite structures are considered nonwovens provided their mass is constituted of at least 50% of nonwoven as per to the above definitions, or if the nonwoven component plays a prevalent role."

Non woven properties

Nonwoven fabrics are engineered fabrics that may be a limited life, single-use fabric or a very durable fabric. Nonwoven fabrics have various functions such as stretchability, flame retardancy, washability, strength, absorbency, liquid repellency, resilience, softness, cushioning, filtering, bacterial barrier and sterility. These properties are often combined to create fabrics suited for specific jobs.

Specific properties can be achieved by selecting raw materials and methods or by applying finishing treatments to nonwovens, such as printing, embossing, moulding, laminating etc.

They can achieve the texture, appearance and strength of a woven fabric and can be as bulky as the thickest paddings. They can be combined with other materials to provide various products with diverse properties, or can be used alone or as components of apparel, home furnishings, health care, engineering, industrial and consumer goods. For detailed properties, please refer to Annexure I.

Production Process

The production of nonwovens takes place in three stages (Some stages may be overlapping or run simultaneously). The three stages are:

1. Web Formation
2. Web Bonding
3. Finishing Treatments

1. Web Formation

Nonwoven manufacture starts by the arrangement of fibres in a sheet or web. The fibres can be staple fibres packed in bales, or filaments extruded from molten polymer granules.

Four basic methods are used to form a web are:

a. Drylaid
b. Spunmelt
c. Wetlaid
d. Other techniques

a) Drylaid

There are two methods of drylaying:

– Carding
– Airlaying

A carding machine is a rotating drum or series of drums covered in fine wires or teeth. Carding is a mechanical process starting with the opening of fibre bales which are blended and conveyed to the next

stage by air transport. They are then combed into a web by a carding machine. The exact configuration of cards depends on the fabric weight and fibre properties needed. The web can be parallel-laid, or can be random-laid. Typical parallel-laid carded webs result in good tensile strength, low elongation and low tear strength in the machine direction and the reverse in the cross direction. Relative speeds and web composition can be varied to produce a wide range of fabrics with different properties.

In airlaying, usually short fibres are fed into an air stream. From there it goes on to a moving belt or perforated drum, where they form a randomly oriented web. Airlaid webs offer great versatility in terms of the fibres and fibre blends that can be used. Compared with carded webs, airlaid webs have lower density, greater softness and the laminar structure is absent.

b) Spunmelt

Spunmelt is a generic term describing the manufacturing of nonwoven webs directly from thermoplastic polymers.

It consists of two processes:

- Spunlaid
- Meltblown

In spunlaid process (also known as spunbonded) polymer granules are melted and then the molten polymer is extruded through spinnerets. Then the continuous filaments are cooled and deposited on to a conveyor to form a uniform web. In the spunlaid process, the raw material flexibility is more restricted but it gives the nonwovens greater strength. Co-extrusion of second components is used in several spunlaid processes, usually to provide extra properties or bonding capabilities.

In meltblown web formation, on leaving the spinneret, low viscosity polymers are extruded into a high velocity airstream. This scatters the melt, solidifies it and breaks it up into a fibrous web.

c) Wetlaid

The method of wetlaying is similar to paper manufacturing but with synthetic fibres. Dilute slurry of water and fibres is deposited on a moving wire screen and drained to form a web. Then with the help of pressing between rollers the web is dewatered, consolidated and then dried. Impregnation with binders is often included in a later stage of the process.

d) Other techniques

This includes a group of specialised technologies, in which the fibre production, web structure and bonding usually occur at the same time and in the same place.

Flash spun webs are made by dissolving a polymer in a suitable solvent and then spraying it into a vessel which is held at reduced pressure. The solvent evaporates (flashes off) creating a cloud of fibres, which are collected and bonded. Other variants of web forming techniques include different methods of fibrillation such as electrostatic spinning.

Processes are emerging where two or more web forming techniques are used simultaneously. For example the spunlaid/meltblown process, in which one or more meltblown webs and spunlaid webs are combined.

2. Web Bonding

Webs, other than spunlaid, have little strength in their unbonded form. The web must therefore be consolidated in some way. The choice of method is a vital decision determining the ultimate functional properties.

There are three basic types of bonding:

a. Chemical
b. Thermal
c. Mechanical

1. Chemical bonding

Chemical bonding or adhesion bonding mainly refers to the application of a liquid based bonding agent to the web. Three groups of materials are commonly used as binders:

- Acrylate polymers and copolymers
- Styrene-butadiene copolymers
- Vinyl acetate ethylene copolymers.

There are water based binder systems (most widely used), powdered adhesives, foam and in some cases organic solvent solutions, which are used.

The binder can be applied uniformly by impregnating, coating or spraying or intermittently, like print bonding. Print bonding is used when specific patterns are required and where it is necessary to have the majority of fibres free of binder for functional reasons.

2. Thermal bonding (cohesion bonding)

This method is based on the thermoplastic properties of certain synthetic fibres to form bonds under controlled heating. Here a low melt fibre or bicomponent fibre is introduced at the web formation stage to perform the binding function later in the process but the web fibre itself can be used.

There are several thermal bonding systems in use:

- Calendering welds the fibre webs together using heat and high pressure applied through rollers at speed.
- Through-air thermal bonding makes bulkier products by the overall bonding of a web containing low melting fibres. This takes place in a carefully controlled hot air stream.
- Drum and blanket systems apply pressure and heat to make products of average bulk.
- When the molecules of the fibres held under a patterned roller are excited by high frequency energy producing internal heating and softening of the fibres, sonic bonding takes place.

3. Mechanical bonding

In mechanical bonding the strengthening of the web is achieved by inter-fibre friction as a result of the physical entanglement of the fibres.

There are three major types of mechanical bonding:

- needlepunching
- hydro-entanglement
- stitchbonding

Needlepunching is most commonly used. Specially designed needles are pushed and pulled through the web to entangle the fibres. Webs of different characteristics can be needled together to produce a gradation of properties.

Hydroentanglement uses high pressure jets of water to cause the fibres to interlace. It is mainly applied to carded or wetlaid webs. The water jet pressure used has a direct bearing on the strength of the web, but system design also plays a part. Hydroentanglement is sometimes known as spunlacing.

Stitchbonding is a third type of mechanical bonding. It can be done with or without the addition of a thread. When no thread is added, the process is often referred to a loop formation.

3. Finishing Treatments

A variety of different chemical substances are employed before or after binding, or various mechanical processes are applied to the nonwoven after binding for modifying or adding to existing properties.

Nonwovens can be made flame retardant, water repellent, conductive, porous, antistatic, breathable, absorbent and various other properties discussed before. They can also be coated, printed, dyed, and can be combined with other materials to form complex laminates.

Based upon the industry where it is used different methods are selected from above which will be applied. But mainly the following trends have been observed:

- Traditional textile industry uses Dry Form process
- The synthetic fibre industry uses the Spun-bond and Melt-blown methods
- The paper industry uses the wet process

The process used for various product categories are discussed in detail in the next section.

Nonwoven Products' Application Categories

Nonwoven fabric manufacturers usually manufacture the fabric in a roll form. It is then sent to various other industries where it has end applications, where is it cut and given different form depending upon the use. Non-woven technical textiles have diverse applications across various segments of technical textiles like automotive, geotextiles and health/hygienic sectors in various product categories like:

- Personal Care & Hygiene
- Healthcare
- Home Furnishings
- Leisure & Travel
- Clothing
- Automotive
- Construction
- Geotextiles
- Industrial
- Agriculture

Personal Care Products

Nonwovens due to their properties like softness, hygiene, ease of use and strength are ideal for personal care. Modern disposable absorbent hygiene products (AHPs) have become very popular in today's world. Similarly disposable personal hygiene wet wipes products are also gaining importance. Here, mostly needle-punched/thermal bonded or hydro-entangled nonwovens are used.

Main technologies used

- Airlaid
- Carded nonwovens
- Spunmelt
    - SMS
    - Spunbond

Household

Nonwovens are used in a multitude of household applications ranging from cleaning and filtering to adding an aesthetic touch to the home.

The most commonly used nonwoven products in home are the needlepunched carpets. Similarly thermal bonded nonwovens of PP find their application in the form of blinds. They prove to be cost effective over the woven ones. Another popular application is also the wall coverings used in various homes instead of the traditional wall paper. But these applications are not found much in India.

Spunbonded nonwovens are used as backing fabrics in the furniture. Nonwoven also has various other furniture applications like up-holstered furniture. It is used in mattresses and quilts as well. Nonwoven waddings are also used in pillows.

Main technologies used

- Needlepunched
- Spunbond
- Wetlaid

Medical and Healthcare

Nonwovens are extensively used in the medical field and in protection against biological agents in other sectors. New nonwoven materials with improved finishes including liquid repellent, virus proof and

bacterial barrier properties have also been developed for applications such as surgical masks, gowns and drapes etc. For such applications, carded thermal bonds/ spun-bonds / hydro-entangled nonwoven fabrics are used.

Main technologies used

- Drylaid in particular
    - Hydroentangled
- Meltblown
- Spundbond

Clothing, footwear & baggage

Nonwovens are being used for many decades in hidden, support functions, such as interlinings and components of shoes and bags.

Nonwovens due to their versatility and the ability to engineer many different properties into them, such as shape-retention, adaptation to the characteristics of the out fabric and lightness in weight have become very popular for use in interlinings. India is a large exporter of garments hence there is huge application of nonwoven interlining found here. Another product is the polyester nonwoven wadding which is used in winter clothing materials.

It is also used in protective clothing where there is high exposure to certain type of chemicals.

In the footwear industry, the inner sole and inside linings of sports shoes are generally nonwoven. It has various other applications as well like shoe uppers, stiffeners etc.

Main technologies used

- Drylaid
    - Chemically bonded
    - Thermobonded
    - Needlepunched
    - Hydro-entangled
- Spunlaid
- Meltblown

Automotive

The use of nonwovens has increased substantially in recent years. Various automotive parts like carpets, insulations, headliners, door panels, parcel shelf, padding in seats, etc. are made from nonwoven fabrics. Nonwovens help reduce the weight of the car, enhance the comfort and aesthetics and provide advanced insulation, fire retardancy etc. In short they contribute to make cars safer, more comfortable, cost-effective and also attractive.

Due to their versatility and numerous benefits they are also widely used in the design and construction of other vehicles and transportation means like aeroplanes, trains, boats, spacecraft and satellites.

Main technologies used

- Drylaid
    - Needlepunched
    - Spunlace
    - Thermobonded
- Spunmelt
    - Spunbond

Civil engineering and geotextiles

Nonwovens are used for filtration, reinforcement and as separators in various civil engineering projects like roadways, railways, runways, drainage, bridges, canals, dams, reservoirs etc. Their main advantage is that they are very strong despite being very light in weight. Polyester felts are used to make bitumen composites for water-proofing in construction.

Rapid developments in infrastructure have led to huge demand for nonwovens in highway, railway, airport and landfill projects.

Technologies used

- Drylaid and in particular
    - Needlepunch
- Spunlaid

Industrial

Nonwoven products are used for various insulation and protective applications in the electronics industry. Polyester Nonwovens are used in cable wrapping.

Another big application area of nonwovens is in the filtration area. Hi-loft waddings are used for fresh air filter systems. New products are also being developed whereby nonwovens are finding increasing applications in the packaging segment as well.

Agriculture and horticulture

Nonwovens are used effectively for optimising the productivity of crops, gardens and greenhouses.

The use of light weight spunbond nonwoven crop covers on the land increases yields and improves the quality of the crops. It also helps to keep the growth of weeds under control.

Usage of nonwoven mulch mat leads to healthy growth of flowers and vegetables.

Technologies used

- Needled
- Spunbond

Market size of non-woven in India

The domestic consumption of non-woven in India is estimated as around 2 lakh MT in 2007-08. The market for non-woven technical textiles is expected to increase to over 2.9 lakh MT by 2012-13. The market for non-woven is dominated by the segments like Mobiltech, Medtech and Geotech. The domestic market for non-woven is dominated by automobile interior carpets & NVH products, surgical dressings, non-woven interlinings, tea-bags fabric and the absorbent fabrics - diapers & sanitary napkins. In addition, non-woven is also used in several other products like cigarette filters, headliners, airlines disposables, surgical disposables, non-woven wipes, non-woven abrasives, sports footwear components (linings), mulch-mats, crop covers, etc.

Several Indian manufacturers are manufacturing a host of products using non-woven fabrics. But, the production of non-woven fabric is far less than the total requirement. Most of the non-woven fabric is imported by the Indian manufacturers. Hence, it is imperative for the Indian industry to increase the non-woven fabric manufacturing capacity in India.

Major Non-woven manufacturers in India

The Indian nonwoven manufacturing is dominated by dry laid process and spun bond technology. Wet laid and Melt blown technologies are currently not being used in India. The companies manufacturing nonwoven fabric in India are listed below:

1. Supreme Nonwovens Pvt Ltd
2. Hitkari Fibres Ltd
3. Charminar Nonwovens Ltd
4. Uniproducts (India) Ltd
5. Unimin India Ltd
6. Fiberweb India Ltd
7. KK Nonwovens India
8. KT Exports India Pvt. Ltd.
9. Vimal Industries (Regd.)
10. Lavino-Kapur Cottons Pvt. Ltd.
11. Jeevan Products
12. Miracle Nonwoven
13. Grindwell Norton Ltd.
14. Bajaj Carpet Industries Ltd
15. Entremonde Polycoaters Ltd.
16. Ginni Filaments Ltd.
17. Ultra Nonwoven
18. Rhyno Non Woven Fabrics
19. Piyush Polytex Industries Pvt. Ltd.
20. Mak Textchem Products
21. Alpha Foam Ltd
22. Radiance Spun Bond Pvt. Ltd.
23. Associates Nonwovens
24. Ambika Polymer
25. Kusumgar Corporates
26. Chaitanya fibres
27. JMDI Linen Private Limited
28. Freudenberg Non Wovens India Private Limited
29. Euro Asia Global
30. Pacific-Harish Industries Ltd.
31. Anjani Udyog Pvt Ltd (Anjani Nonwovens)
32. Ahlstrom Asia Holding Pte Ltd.
33. Birla Jute Mills
34. Khosla Profil Pvt. Ltd.
35. Obeetee Textiles Pvt. Ltd
36. Parishudh Fibres (P) Ltd.
37. Surya Textech
38. Nidhi Surgicals Private Ltd.
39. Jai Prabha Textiles
40. Dynamic Wooltex
41. D. Chemet International
42. Friends (I) Exim
43. P.A.R.K. Non-Woven Pvt. Ltd.
44. Melrose Overseas
45. Tex Fab Lining
46. Satyam Nonwovens Pvt. Ltd
47. Pannalal And Sons
48. KK Nonwovens
49. Texbond in South (Ultra Non woven's sister concern)
50. Prime Industries

There are around 30 Chinese spun bond lines installed by players predominantly in North India (including a few mentioned earlier in the list of players). These units are located in industrial areas in Himachal Pradesh, Uttarakhand and other north Indian states.

Brief profile of select nonwoven manufacturers

Supreme Nonwovens Pvt. Ltd.

Supreme Nonwoven is a manufacturer of nonwoven technical textile. The turnover of the company is estimated to be Rs 250 crore. The company has the following technologies in Nonwovens:

1) **Mechanical processes:**
   a. Needle Punching
   b. Stitch bonding
      i. Malivat
      ii. Malivlies
   c. Spun lace / Hydro entanglement
2) **Thermal bonding**
      i. Calendering
      ii. Hot Air bonding
3) **Chemical Bonding**
   a. Wet process
   b. Dry Process

The chemical finishes – flame retardant, water repellent, water absorbent - are imparted as per customer requirement.

Sales

	2004-05		2005-06	
Particulars	Quantity	Value (Rs. Crore)	Quantity	Value
Nonwoven fabrics	1.765 million meters	Rs 14.48 crore	2.451 million meters	Rs 21.29 crore

Key products and end-user industries

85 % of Supreme's products are customized. Automotive application accounts for 50 % of the business. The other key end user applications are – Medical, Filtration, Geotextiles, Garments – interlinings.

Future plans

At present, Supreme Nonwoven is catering to domestic market with very little exports. They plan to enhance exports to Europe & Middle East in future.

Hitkari Fibres Ltd

Key products and end-user industries

The Company is engaged in the manufacture of wall-to-wall carpets, Insulation felts, automotive carpets, blankets, non-woven fabrics, geo textile and industrial filters etc. The automobile sector is the major consumer of the company's products. The Company's car carpets are used by automobile manufacturers and exports of motor cars indirectly exports the product of the company. The company is diversifying its products range so as to service the construction industry.

Sales

Hitkari Fibres Ltd had a turnover of Rs 9.47 crore in 2006-07.

Manufacturer	Year	Quantity	Sales Value	Installed capacity
Hitkari Fibres	2006-07	N.A.	Rs 9.47 crore	N.A.

Charminar Nonwovens Limited

Key products and end-user industries

Charminar Nonwovens Ltd., provides four categories of non woven fabrics:

- Carpets
- Filter fabrics
- Geotextiles
- Bonded fabrics

❖ **Carpets:** Nonwoven Carpets marketed by the Company under the brand name 'Charm' find their use in homes, corporate offices, super markets, computer rooms, restaurants, hotels, clubs and recreation centres, and hospitals. Charm Nonwoven carpets are manufactured from Polypropylene fibre with Jute backing and Latex coating at the bottom. The basic raw material Polypropylene fibre used in the manufacture of Charm Carpets has many advantages compared to the material used in conventional

Carpets. Polypropylene fibre is thermoplastic, hydrophobic, inert and soft with high strength. It has appreciable resilience and high abrasion resistance.

- **Filter fabrics:** Industries like cement, mini-cement, aluminium, asbestos, thermal power plants, fertilizers and ferrous & nonferrous industries regularly use "Charm" filter fabrics for dry and wet filtration processes. The fabrics are made out of synthetic fibres by employing needle punching technology are generally converted into collection bags.
- **Geotextiles:** Charm geotextiles are used for separation, reinforcement as well as filtration in various applications like railroads, paved/unpaved surfaces, drainage ponds etc.
- **Nonwovens bonded fabrics:** It makes nonwovens bonded fabrics from a variety of fibres, by different process, using bonding agents.

Production

Particulars	2007-08
	Quantity
Non woven	1,00,000 sq m
Geotextile	15,00,000 sq m

Sales

	2004-05	2005-06
Particulars	Value	Value
Filtration products	Rs 1.04 crore	Rs 1.24 crore

Uniproducts (India) Limited

Key products and end-user industries

The Company's business is distributed between OEM products which comprise moulded carpets, trims, roof liner fabric. NVH parts, and standard products consisting of needle punch and tufted wall to wall carpets, interlinings, laminate floorings and carpet tiles. In the year 2007-08, a significant part of the Company's business was contributed by OEM products. Total sales for the year was Rs. 132.15 crore, representing a growth of 12% over the previous year.

- **OEM Products:** These recorded a sale of Rs. 119.65 crore during the year 2007-08, an increase of 14% over the previous year. This growth reflects the 14% increase in sales recorded by the passenger car segment.

- **Standard Products:** Sale of these products was Rs.12.50 crore. The Company continues to focus its growth efforts on tufted carpets, carpet tiles and laminate floorings imported by it, and has achieved beneficial results in the area. Simultaneously, it uses its strong distribution network in promoting its indigenously produced needle punch carpets.

Machinery Possessed

- Needle Punching lines from Germany and Austria
- Finishing lines from Switzerland
- Heavy duty Presses of Italian make
- Complete Carpet Moulding line from Germany
- German make PU Foaming and Moulding machines

Production details

Product Category	Installed capacity		Production (in Kg)		Sales 2007-08	
	2007-08	2006-07	2007-08	2006-07	Qty (kgs)	Value (Rs)
Floor Coverings	4,000 MT	2,600 MT	3,825 MT	3,611 MT	3,834 MT	Rs 79.77 crore
Nonwoven Light Weights	650 MT	650 MT	214 MT	218 MT	212 MT	Rs 2.78 crore
N.V.H. Products	4,200 MT	2,800 MT	4,136 MT	3,510 MT	4,140 MT	Rs 42.57 crore

Source: Annual report 2007-08

Future Plans

The Company continues to invest in technology and assets to make available adequate manufacturing capacities for the growth that it expects in the forthcoming years. The Company has, during the year 2007-08, procured two new needling looms from Germany which will enable it to increase its production capacity and manufacture a diverse range of products that provide significant value addition. It has also imported robust Italian equipment that will enable it to diversify into new product lines. The Company has recently acquired industrial land at SIPCOT, Oragadam, Chennai for the purpose of expansion and diversification.

Unimin India Ltd

Unimin is a public limited company, in the Non Woven Technical Textiles Industry manufacturing Polypropylene Spun Bonded Nonwoven Fabrics with Equipment & Technology from Reifenhauser Germany.

Plant & Technology

Unimin has a 3.2 Metres Web Single Beam Reicofil III production Line capable of producing 8 to 150 gsm range of polypropylene spun bonded non woven fabrics. The facility has on line slitting and continuous brand printing facilities

Sales

During the year 2007-08, the turnover of the company was Rs.203.45 lakhs (Previous year Rs. 420.50 lakhs). The production of SBPF during the year was 165.55 MT (previous year 614.26 MT). Total turnover and capacity utilization has declined during the current year due to on-going Plant Operational problems, aggravated further by financial constraints and increasing cost of raw materials.

	Rs in Lakhs		Quantity in MT			
			SBPF		SBPF Products	
Particulars	**2007-08**	**2006-07**	**2007-08**	**2006-07**	**2007-08**	**2006-07**
Opening Stock	13.53	42.96	16.93	51.93	5.97	32.81
Sales - Domestic	3.77	48.19	-			
Exports (incl. EEFC)	100.05	348.84				
Total Sales	103.82	397.03	160.96	649.26		26.84
Closing Stock	18.97	13.53	21.52	16.93	5.97	5.97

Source: Annual report 2007-08

Fiberweb (India) Ltd

Plant & Technology

Fiberweb (India) Ltd., manufactures spun bond non-woven fabric having diverse applications. It has Reicofil II Double Beam plant supplied by plastic Extrusion machinery manufacturer Reifenhauser Gmbh of Troisdorf, Germany.

Production details

Particulars	Year	Sales Quantity	Sales Value (Rs crore)	Production quantity	Installed capacity
Non-woven fabrics (spunbond)	Jan-Dec, 2007	3,240 MT	Rs 29.63 crore	3,312 MT	4,000 MT

Source: Capitaline, Annual reports, Industry survey

KK Nonwovens India

Products & Technology

KK Nonwovens manufactures and exports PP spun bonded nonwoven, thermal bonded non-woven and chemical bonded nonwovens. They also import and sell needle punched nonwovens, spun lace nonwovens, air-laid pulp nonwovens, nonwoven interlining for garment, embroidery materials, wipes, non-woven bags, clothes, caps, agricultural cover, car cover, respirator, barber suit, shoe cover, slipper and pillow cover, adult incontinence diaper, nonwoven fabrics for bag and trunk, nonwoven fabrics for shoe material etc.

Sales

	2004-05		2005-06	
Particulars	Quantity	Value	Quantity	Value
Nonwoven fabrics	200 MT	Rs 2 crore	1,800 MT	Rs 15 crore

Production

	2007-08	Production Capacity	
Particulars	Quantity	2007-08	2005-06
Nonwoven fabric	600 MT	600 MT	300 MT

Future Plans

The plant is currently running at 90% capacity utilisation and the company plans to expand its capacity by another 20 MT.

KT Exports India Pvt. Ltd.

Products & Technology

KT Exports manufactures PP Spun bond Non woven fabric on German Machine "Reifenhauser" (Reicofil II) line (15gsm to 150gsm and width of 3200 mm) in various colors. Its major product is crop covers.

Vimal Industries

Vimal Industries corporate office is located at Naraina the Industrial hub of New Delhi, the Capital of India. The factory is located at Kala Amb in Himachal Pardesh. The company started manufacturing Non Woven Fabric in year 2007.

Plant, Technology and Capacity

Vimal is equipped to produce 3,600 MT of PP spunbonded non-woven fabric in any colour with weight ranging from 10gsm to 160gsm. Vimal can produce non woven fabric with width ranging from 7" to 126".

Key products and end-user industries

These materials are widely used in industry, agriculture, healthcare, packing, decoration, clothing, shoes and daily commodities. They also make products with characteristics such as:

- Well-ventilation,
- Fire-retardant,
- Anti-bacteria &
- Radiation-protection from UV etc.

Vimal has imported technology from China and is now gaining more popularity as a brand in the industrial sectors like Medical, Automotive, hygiene, white goods & Packaging not just across the country but also overseas.

Lavino-Kapur Cottons Pvt. Ltd.

Plant, Technology and Products

The Lavino-Kapur plant is located in Mumbai, on a 23,000 square meter complex. It is a 100% export-oriented unit and manufacturing absorbent cotton. Lavino-Kapur manufactures its products under Food and Drug licence issued by the Government of India.

Jeevan Products

Products and Technology

JP nonwoven manufactures, nonwoven needle punched, thermal bonded wadding, mattresses up to 5000 gsm and geo textile products. It also exports Non-woven fabrics, thermal bonded wadding, needle punched fabric, embossed non woven's, air filters & liquid filters, acoustic insulation, beddings, cable wrap etc.

Sales

	2004-05		2005-06	
Particulars	**Quantity**	**Value**	**Quantity**	**Value**
Nonwoven fabrics	150 MT	Rs 1.99 crore	200 MT	Rs 2.4 crore

Miracle Non-woven

Key Products

Miracle non-woven manufactures and exports non woven polyester wadding & interlining.

Sales

	2004-05		2005-06	
Particulars	**Quantity**	**Value**	**Quantity**	**Value**
Nonwoven fabrics	1,29,116 sq m	Rs 0.29 crore	3,45,717 sq m	Rs 1.01 crore

Grindwell Norton Ltd. (GNO)

Key Products

GNO is India's leading manufacturer of Abrasives (Bonded, Coated, Non-Woven, Superabrasives and Thin Wheels) and Silicon Carbide. GNO is the only manufacturer non-woven coated abrasives in India with production of one million square meters annually.

Bajaj Carpet Industries Ltd.

Bajaj Carpet Industries Ltd. is closely held public limited company formed in the year 1985-86 (Initially Incorporated as a private limited company in the name of Bajaj Spinning Mills (P) Ltd.) The company was converted into a public Limited company in the name of Bajaj Carpet Industries Ltd., on 21st march 1994.

Key Products

Since its incorporation it has been actively engaged in the production of Carpets and Insulation's for the Automobile Industry.

Sales

	2004-05		2005-06	
Particulars	**Quantity**	**Value**	**Quantity**	**Value**
Automotive Carpets	2.12 million sq m	Rs 30.86 crore	1.74 million sq m	Rs 24.23 crore

Machinery Details

Needle Punching: 07 Nos.	Hydraulic Press: 04 Nos.
Dilour: 01 No.	Heated Plate: 02 Nos.
Carding: 04 Nos.	Moulding Tools: 14 Nos.
Coating Plant : 03 Nos.	Hydraulic Carpet Punching Machine: 01 Nos.
Moulding Unit: 02 Nos.	Automatic Fabric Cutting Machine 02 Nos.
Press Machine: 04 Nos.	Automatic Pasting machine 01

	Nos.
Tufting Machine: 2 Nos.	Calendering M/C: 01 Nos.
Shearing Machine: 1 No.	Fyber Dying Unit: 01 Nos.
Chromojet Printing Machine: 01 Nos.	
Generator: 2 Nos.	
Tufted Graphic Machine	

Entremonde Polycoaters Ltd.

Key Products

Entremonde Polycoaters Ltd. Manufactures non woven products used for car interiors, furnishing and garments. The company is expanding its production in two products

- Breathable fabrics for use in Siachen
- Medical textile – drapes and surgical ware

Ginni Filaments Ltd.

Plant and Capacity

Ginni Filaments Limited has set-up a state-of-the art Spunlace Non-Woven Fabric manufacturing facility in State of Gujarat (India). The plant capacity is 12,000 metric tonnes per annum and can produce a wide variety of spunlace roll goods.

Technology

The technology and equipments have been provided by world's leading textile machinery supplier M/s. Rieter Perfoject, France. The plant is capable of producing spunlace fabric made of Viscose Polyester blends, 100% Polyester, 100% Viscose and cotton enriched blends etc.

Sales

Product Category	Installed capacity		Production		Sales 2007-08	
	2007-08	2006-07	2007-08	2006-07	Quantity	Value
Nonwoven fabric	12,000 MT	12,000 MT	1,307 MT	Nil	1,075 MT	Rs 14.5 crore
Wipes					38.79 million pieces	Rs 3.55 crore

Line configuration:

- Slit width: 3,200 mm
- GSM: 30 to 100
- Roll diameter: Up to 1,200 mm

Equipment Suppliers

- Spunlacing: M/s Rieter Perfojet, France

Ultra Nonwoven

Key Products and their applications

Ultra Nonwoven is a manufacturer of Nonwoven rolled goods. It also manufactures non-woven bags. The Non woven rolled goods are supplied to converters which then use it for various end applications. The applications of Non woven rolled goods are in the following areas:

- Bags
    - Shopping bags
    - Promotional bags
    - Packaging of food grains, etc.
    - Corporate Seminar bags
    - Gift bags: a replacement of paper bags
    - Suit covers
    - Saree covers
- Meditech
    - Caps
    - Masks
    - Drapes
- Mobiltech
    - Auto seat backing
    - Filters: Air filters, liquid filters
- Hometech
    - Seat backing below the office chairs
    - Backing in matrices

- Quilt backing

- Agrotech
  - Wheat protection cloth
  - Heat protection cloth for crops

Technology and capacity

The company has Chinese machinery based on Italian technology. The capacity of each nonwoven line is 3000 tons / annum. With 2 lines Ultra Nonwoven has a capacity of 6000 tons / annum. On an average, the company is operating at a capacity utilization of 20% – 25%

Rhyno Non woven fabrics

Technology

Rhyno is an internationally renowned private group that specializes in the production PP Spunbonded Non-Woven Fabrics in 1.6 mtr. and 3.2 mtr. width with double beam technology.

Products

Its products are in the Hygiene, Medical, Industrial, Wiping, Microfiber and Composite Materials sectors. Using polypropylene polymer and other engineering polymers, Rhyno is able to offer an extensive range of modern, techologically advanced non-woven, such as spunbonds and laminated with other products.

Piyush Polytex Industries Pvt. Ltd.

Products

Piyush Polytex are manufacturers of medical disposable products, non woven fabrics, non woven bags, printed fabrics etc.

Technology

It makes spunbond nonwovens. Machinery has been procured from China. The fabric ranges from 30 to 120 GSM.

Production

	2007-08		Production Capacity
Particulars	**Quantity**	**Value**	**2007-08**
PP Nonwoven fabric	500 MT	Rs 0.9 crore	500 MT

Future Plans

Plan to double their capacity in the near future.

Mak Textchem Products

Key Products

Mak Textchem Products is into manufacturing chemically and thermally bonded of nonwoven fabrics from Polyester, Natural Cotton & Bleached Cotton fibre.Their range of products would include:

- Cotton Filters: Manufactured from Bleached Cotton in various qualities to suit to different filtration requirements. This range of products finds wide application in filtration of high viscous liquids like lubes and low viscosity liquids like soft drinks. Moreover it finds some specialized applications in air filtration as well most popular example would be AHU filters used in pharma Industry. This range of filters is manufactured in GSM from 135 to 400 and available in width upto 68".
- Polyester Wadding: This product finds application from stuffing pillows, quilting to providing stuffing material to manufacture baby bunkers. They manufacture this product from 100% Hollow fibre They manufacture the mentioned product from 30 GSM to 600 GSM.
- Cotton Wadding: Application of this product is in products which need to be made from natural contents only. They manufacture the mentioned product from 150 GSM to 600 GSM it is available in upto 120" width.

Technology

This firm has 3 manufacturing lines of which one line is of William Tatham, UK.

Production

	2007-08		Production Capacity
Particulars	**Quantity**	**Value**	**2007-08**
Nonwoven fabric	1,00,000 meters	Rs 1 crore	1,00,000 meters

They import the complete requirement of raw materials.

Alpha Foam Ltd.

Key Products

It manufactures of Polyethylene Foams, Polypropylene Foams, Sheeting Products and PP Spunbond Non Woven Fabric. Its PP spunbound non woven fabric has a width of 160 cm and the GSM varies from 15 to 200.

Radiance Spun Bond Pvt. Ltd.

Key Products and their end applications

They manufacture PP Nonwoven fabrics from 12 to 140 GSM in various sizes, colours and finishes (soft/medium/stiff) for various applications in industries such as Automotive, Building, Civil Engineering, Construction, Air and Liquid Filtration, Hygiene, Industrial, Medical, Protective Clothing, Textiles, etc.

Associates Nonwovens

Key Products and their end applications

Associates Nonwovens founded by Shri. K. R. Mittal is a leading manufacturer and exporter of PP Spun bound Non Woven Fabrics in varied length and design. Non Woven Fabrics are available in 1.6 mm width from 10 GSM to 250 GSM in different colors and sizes. Non Woven Fabrics and other products manufactured by them have varied applications like medical & hygiene, packaging and interlining, agriculture covers etc.

Sales

	2005-06	
Particulars	**Quantity**	**Value**
Nonwoven fabrics	123 MT	Rs 1.19 crore

Production

	2007-08	
Particulars	**Quantity**	**Value**
Nonwoven fabric	96 MT	Rs 25 crore

Ambika Polymer

Key Products

Ambika Polymer located in Gujarat manufactures nonwoven needlepunched Geotextile.. The main raw material used is PP filament fibre

Kusumgar Corporates

Key Products

Kusumgar manufactures woven geotextile. It also supplies other geosynthetic materials like:

- Non-woven geotextiles for separation, drainage, filtration, erosion control, protection and asphalt overlay

Chaitanya Fibres

Key Products and Applications

Chaitanya Fibres is a supplier of non woven products to hotels, restaurants, spas, health centers, hospitals, airlines and other various institutions and retail shops. The product list includes laundry bags and delivery bag, newspaper bag, table runners, plate and glass covers, suit covers, chappals, disposable bed sheets, male female disposable briefs, thongs, shoe covers, caps, chef caps and other products.

Freudenberg Non Wovens India Private Limited

Key Product Applications

Freudenberg Nonwovens is the world's leading nonwoven manufacturer with 23 production sites in 13 countries. The company develops and produces interlinings for apparel, filters, nonwovens for

automotive, building and construction, shoes, textile and upholstery, hygiene and medical as well as other industrial applications.

Production

	2007-08	2006-07	2007-08
Particulars	**Quantity**	**Quantity**	**Capacity**
Nonwoven fabric	1,40,000 million meters	1,20,000 million meters	1,40,000 million meters

Euro Asia Global

This company manufactures PP Spun Bound Non Woven Fabrics.

Pacific-Harish Industries Ltd.

Key Products and end applications

Manufactures needle punched non woven fabrics and recycled polyester staple fibre. The non woven fabrics manufactured by it has various applications like:

- Filters (Air, Gas, Liquid, Dust collection)
- Automotive interiors
- Shoe linings
- Geo textiles
- Consumer fabrics
- Garment accessories
- Felt (Insulation)
- Channel fabrics
- Surgical fabrics for orthopaedic applications.

Sales

	2004-05		2005-06	
Particulars	**Quantity**	**Value**	**Quantity**	**Value**
Nonwoven fabrics	8 lakh meters	Rs 5.8 crore	11 lakh meters	Rs 7.95 crore

The current turnover is estimated to be around Rs 25 crore.

Anjani Udyog Pvt Ltd (Anjani Nonwovens)

Products and Capacity

The 7,000-tonne-a-year plant, which will produce cotton pads and wipes, will commence exports in the first quarter of 2009-10. The plant is expected to start commercial production in May with an initial capacity of 20 tonnes a day, which will be increased to 40 tonnes a day within a year.

Technology

Global management consulting firm Technopak Advisors Pvt Ltd is providing consultancy for the project. Machinery and equipment supplier Fleissner will supply an entire production line to Anjani Non-wovens.

Future Plans

Anjani Nonwovens, part of the Gurgaon-based Anjani Udyog Pvt Ltd, will invest Rs.1.2 billion to set up a spunlace plant at the Mundra special economic zone (SEZ) in Gujarat's Kutch district.

Ahlstrom Asia Holding Pte Ltd.

Future Plans

Singapore-based Ahlstrom Asia Holding Pte Ltd, manufacturer of fibre-based products, is setting up a fabric manufacturing unit in the Adani group's Mundra SEZ in Kutch district of Gujarat. The plant is expected to start production by October 2009 and churn out volumes to the tune of 12,000 tonnes of non-woven, spun-bond and melt-blown fabrics.

Birla Jute Mills

Key Products & Applications

It manufactures non woven jute felts. Jute Non-Woven supported and unsupported in high and low density using modern (Dilo) needling technology extensively used for carpet underlays, padding, moulded products for automotive sector as also usage in agricultural, horticultural and construction activities. The main applications are floorings and home interior products.

Production

	2007-08	
Particulars	**Quantity**	**Value**
Nonwoven fabric	516 MT	Rs 12 crore

Raw material consumption is on an average, 55 MT every month, 70 % of which is sourced locally and the rest is imported. Birla Jute exports to Australia, UK, Japan and Switzerland.

Khosla Profil Pvt. Ltd.

Key Products

Khosla Profil produces filter fabrics in Spun, Multi-Filament & Monofilament from Polypropylene, Polyester, Nylon, Cotton, Poly/Cotton, Stainless steel, Carbon etc. with manufacturing widths up to 3.6 mts wide and jointless rolls upto 2000 mtrs. Khosla Profil has developed special dust collection non-woven filter bags.

Obeetee Textiles Pvt. Ltd

Obeetee is manufacturer Non Woven Textile Products offering a product range spanning mechanical , chemical & thermal bonded products.

Key Products & Applications

Obeetee produces felts along with other products like Filters, Floor Coverings, Substrate & other shoe liners, Geo Textiles, Felts and Automotive Felts Their products have their application in the education, leisure, commercial, healthcare and public sectors.

Parishudh Fibres (P) Ltd.

Key Products

Their key products include:

- Non Woven Carpet
- Non Woven Filter Fabrics
- Geotextiles
- Shoe Lining

Melrose Overseas

Key Products

Melrose manufactures non woven fabric which has its end application in the Garment industry.

Production details

	2007-08	
Particulars	**Quantity**	**Value**
Nonwoven fabric	2.5 MT	Rs 4 crore

The company is currently running at 90% capacity utilization. It had the same amount of production in the year 2006-07 as well.

Future plans

The company plans to expand it production capacity to 3MT.

Pannalal and Sons

Key Products

Pannalal & Sons manufactures non woven fabric which is used mainly in making bags.

Production details

	2007-08		Production Capacity	
Particulars	**Quantity**	**Value**	**2007-08**	**2005-06**
Nonwoven fabric	8,000 meters	Rs 2 lakh	8,000 meters	5,000 meters

Future plans

Pannalal & Sons plans to expand its capacity to 10,000 Mts.

KK Nonwoven

The nonwoven fabric manufactures by KK is used for agriculture and packaging.

Production

	2007-08		Production Capacity
Particulars	**Quantity**	**Value**	**2007-08**
Nonwoven fabric	300 MT	Rs 30 crore	300 MT

The plant is currently working at 90% capacity utilization.

4. Competitive assessment of India vis-à-vis other countries

India has advantage of higher cost competitiveness over the major industrialised countries like US, Germany, UK, etc, primarily for labour intensive technical textile products. However, India lacks competitive advantage vis-à-vis other South Asian countries like China. The primary contributors to the cost disadvantage of India are higher cost of power, poor infrastructure resulting in higher cost of logistics, higher interest rates and taxes (including indirect taxes with anomalies on account of CST and VAT). These costs make the Indian companies uncompetitive by up to 10% vis-à-vis South Asian countries and by around 5% vis-à-vis US and Europe. India nevertheless enjoys a significant labour cost advantage over other south-east Asian countries, US and Europe.

In order to assess the cost competitiveness of the Indian technical textiles industry, IMaCS has assessed the cost competitiveness across the following dimensions:-

(iv) Operating costs including labour costs, power costs and transaction costs
(v) Capital cost (and interest costs)
(vi) Taxes and duties

Operating costs

For the manufacturers & exporters of technical textiles in India, raw materials, salary & wages, power and fuel cost and transaction costs (for exports and inland transportation) are the key operating costs impacting the cost competitiveness vis-à-vis other countries. Of these, raw-materials typically constitute around 40-70% of the operating costs, employee expenses (salaries and wages) account for around 8% to 20% of the operating costs and power and fuel cost typically accounts for 5% to 10% of operating costs. For the exporters, the transaction costs typically range from 3% to 7% depending upon the location of facilities in India and destination of exports.

The typical cost structure for these units is given below:-

Cost elements	% share
Raw-materials	50%
Labour	9%
Power and fuel cost	7%
Other manufacturing expenses	7%

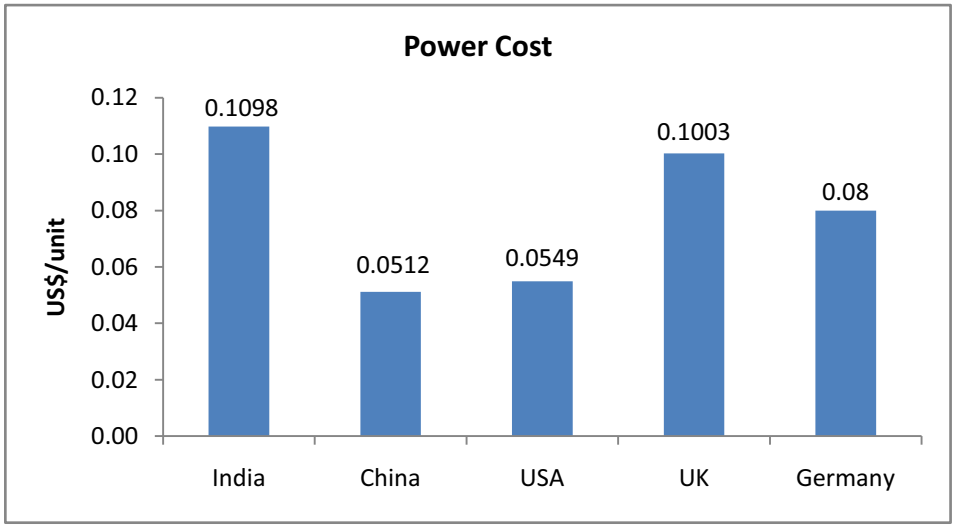
Cost elements	% share
Selling and admin cost (incl. Logistics cost)	12%
Miscellaneous expenses	3%
Interest cost	4%
Depreciation cost	5%
Corporate taxes	3%

Raw-materials

The raw-material requirement of the technical textiles industry in India is met by a mix of domestic production and imports. The raw-materials imported are nylon, aramid, glass fibre, carbon fibre, etc. Imports account for around 20-25% of consumption of the other raw-materials PP, HDPE, LDPE and LLDPE. Since most of the raw-materials being used by technical textiles industry are at zero-duty, there is little or no cost disadvantage on account of raw-material prices for the Indian manufacturers.

Power and fuel cost

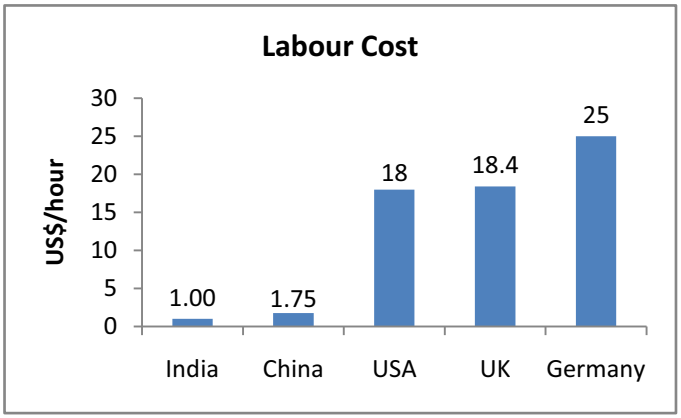
Power cost in India is around Rs 4 to Rs 5 per kWh which is double the power cost in China & US, around 20% higher than the power cost in Germany, at par with the power cost in UK and around 30-40% higher than the power cost in Thailand and Indonesia. Further, the Southern states in India face severe power shortages with power outages of 4 to 6 hours per day. Hence, the manufacturers are forced to source power from captive plants at Rs 7 – 8 per kWh or halt the production lines (which in turn increases the per unit fixed cost of production as the production decreases).

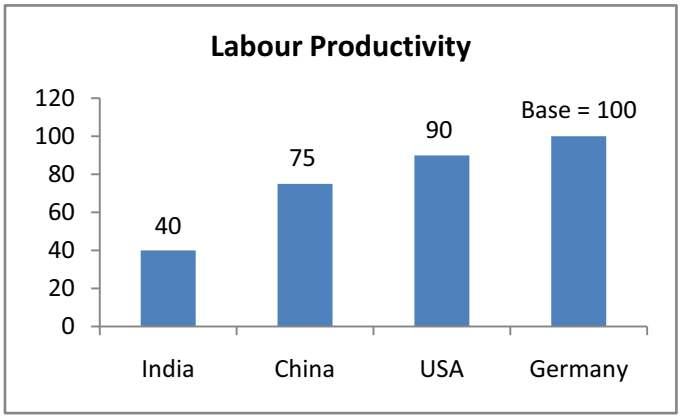


Source: IEA and OECD Energy Prices and Taxes, 4th Quarter 2007

Labour cost

Labour costs in India are typically in the range of 5% to 10% of the labour costs in US & Europe while around 60% of the labour costs in China. But, labour productivity in India is lower (around half of the labour productivity in China & US, around 40% of Germany and around 20-30% lower than Indonesia and Thailand). Hence, in terms of labour, India has effective cost advantage of around 80-90% as compared to US and Europe while it is at par with China.





Source: www.werner-newtwist.com

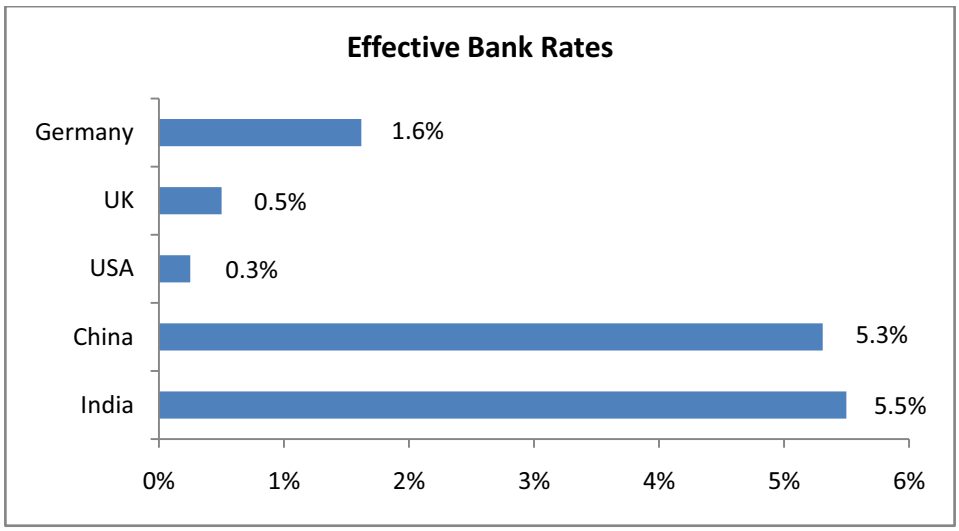
Transaction cost

The transaction costs of exports in India are higher in India as compared to other countries like China and other neighbouring countries. The cost disadvantage to Indian exporters is up to 5% as compared to these countries on account of these transaction costs. Further, the time taken for port clearance and shipments is around 10-15 days higher in India leading to longer lead times and higher working capital requirements. Chinese exporters on an average require a total time of 18 days to export to U.S., while this time for India is more than double which makes India less competitive.

Capital costs

Majority of the machinery for high-end technical textiles (primarily value-added and non-woven technical textiles), is imported. In addition, the technology for setting up of these units is often imported leading to high capital costs. Further, the strong export dependence and lower domestic demand leads to lower economies of scale and hence, higher per unit fixed cost of production.

Further, the interest rates in India are very high (bank rate of around 5.5%) as compared to US and Europe where bank rates are between 0 to 2% and China (with bank rate at part with India). The long-term interest rates are also in line with the bank rates giving Indian manufacturers cost disadvantage of around 4-5% of the bank funding for capital expenditure / working capital as compared to US and Europe. This leads to higher interest outflow on capital costs.



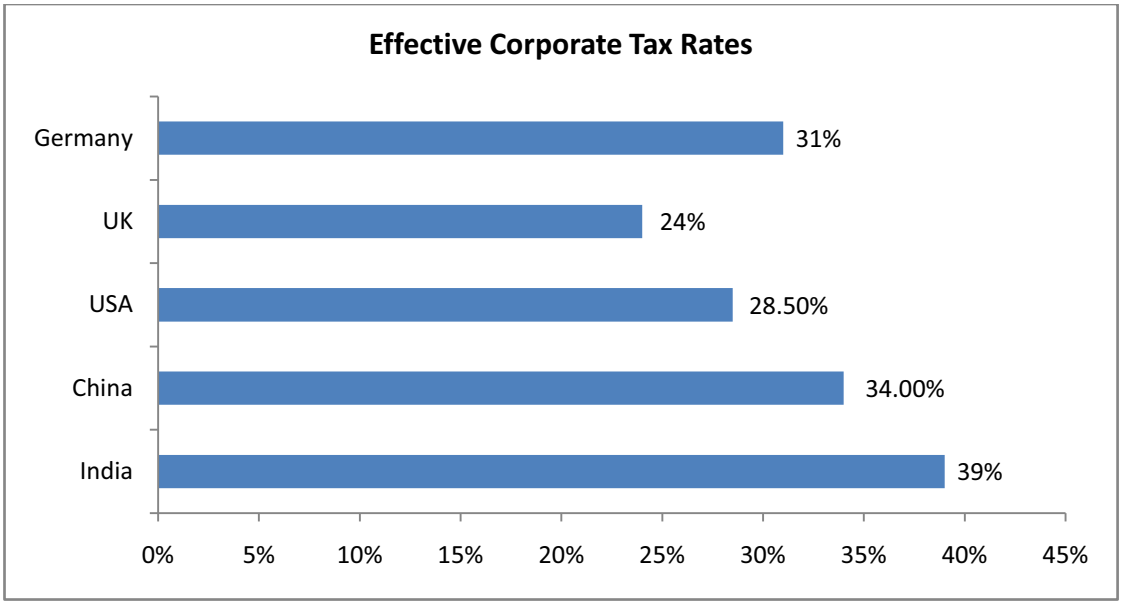
Source: www.fxstreet.com

In order to address the issue of high capital costs, the Government of India, under TUFS, has sanctioned technical textiles projects totalling over USD 200 million in project cost since April 1999. However, low domestic demand is one of the major reasons for entrepreneurs not willing to set up these facilities for high end technical textiles products.

Taxes and duties

The Indian manufacturers are subjected to both Central Sales Tax (CST) and Value Added Tax (VAT) which cannot be set-off against each other. Hence, there is an anomaly in terms of indirect taxes leading to additional costs. This anomaly is will get removed after the abolishing of CST which is scheduled to happen gradually over the next 2-3 years. In addition, the exporters are subjected to several service tax payments on the goods exported. For the exports of technical textiles, service tax is exempted only in case of insurance for overseas agent cargo. Other services like project consultant's fee (for setting up or upgradation of the plant), inland freight charges (to the port) for exports, C&F agent's commission at the port and insurance expenses, etc., are not under the ambit of service tax exemption. This results in added costs to the manufacturers and exporters of these products.

Further, the effective corporate taxes in India are higher than those in other countries, as per *World Bank & PWC Report, "Paying Taxes 2009"*. Hence, the profitability of the Indian manufacturers and exporters of technical textiles is negatively impacted.



Source: Paying Taxes 2009, World Bank & PWC Report

Overall Cost competitiveness of Indian manufacturers

The Overall Cost competitiveness of Indian manufacturers is given below:-

	Cost advantage for India vis-a-vis'		
Cost elements	**US**	**Europe**	**China**
Labour	8%	7%	0%
Power and fuel cost	-4%	-2.50%	-4%
Selling and admin cost (incl. Logistics cost)	-7%	-7%	-5%
Interest cost	-2%	-2%	-
Corporate taxes	-1%	-1%	-
Total cost advantage for India	**-6%**	**-5.5%**	**-9%**

The cost disadvantage of Indian technical textiles manufacturers and exporters vis-à-vis US and Europe is around 5.5% to 6% while as compared to China, India has a cost disadvantage of around 9%. The cost

disadvantage is higher for India for various high-end technical textiles products with lower scale of production in India as compared to the global giants of US and Europe which have the advantage of large economies of scale. The cost disadvantage is because of lower scale of production and hence higher fixed cost per unit of production as well as shortage / unavailability of specialised raw-materials in India. On the other hand, the total cost advantage from the labour cost in India outweighs the negative impact of the other cost factors primarily for the labour intensive technical textiles products with labour cost of 15% to 20% of the total cost (like surgical sutures, surgical dressings, seat covers, nylon tyre cord, insulation felts, footwear components, etc), as compared to US and Europe.

Overall, the following table benchmarks India vis-a-vis US, Europe and China in terms of competitiveness in manufacturing technical textiles:-

	India	**US**	**Europe**	**China**
Cost competitiveness	Least competitive	More competitive than India by around 5.5-6%	More competitive than India by around 5.5-6%	More competitive than India by around 9%
Labour cost (including the impact of productivity)	Strong labour cost advantage primarily in labour intensive technical textiles products	Labour cost disadvantage of around 8% as compared to India	Labour cost disadvantage of around 7% as compared to India	At par with India
Technology	Dependent on import of technology and machinery for most of the high-end technical textiles products (incl. Non-woven)	Strong	Extremely strong	Availability of low-cost machinery and technology (quality of products manufactured is not very good if cheaper technology is used)

5. Details of raw-materials for technical textiles

Technical Textiles are manufactured from a variety of fibres/filaments based on the desired properties of the end product. The fibres/filaments used can be broadly classified as *Natural* and *Man Made*.

Natural fibres

India being a rich source of natural fibres, these fibres are important raw materials for the technical textile industry. The natural fibres predominantly used in Technical Textiles include:

- Cotton
- Jute
- Silk
- Coir

The segment wise consumption of fibres is given in the table below:

Natural Fibre	Key segments
Cotton	Buildtech, Clothtech, Packtech, Mobiltech, Meditech, Sportech, Hometech, Indutech
Jute	Buildtech, Geotech, Packtech, Agrotech, Sportech,
Silk	Clothtech, Meditech, Hometech
Coir	Geotech, Hometech

Cotton

Cotton is the most important raw material for the Textile industry as a whole, accounting for around 56% of the domestic fibre consumption and exports. The fibre is also a key raw material for the Technical textile industry.

India is amongst the world's largest potential reservoirs of cotton with nearly 9.2 million hectares (mha) under cotton cultivation (accounting for 25-26% of total global acreage under cotton). The country ranks third (behind China and the US) in cotton production with a production of around 4.59 million tonnes (mt) in CY2007, accounting for around 18% of world production. The cotton balance sheet for the last few years is given below:

India's Cotton Balance Sheet

(Volume in million kg)

CY	2002	2003	2004	2005	2006	2007	3-year CAGR
Supply	3,608	3,292	3,574	4,692	5,440	5,644	16.5%
Opening Stock	493	680	408	357	1,224	952	32.6%
Crop	2,686	2,312	3,043	4,131	4,148	4,590	14.7%
Import	429	300	123	204	68	102	-5.9%
Demand	2,928	2,884	3,217	3,471	4,488	4,896	15.0%
Mill Consumption	2,499	2,421	2,557	2,788	3,094	3,485	10.9%
Non–Mill Consumption	199	198	221	282	340	340	15.4%
Small spinners Consumption	222	251	233	246	255	255	3.0%
Exports	9	14	206	155	799	816	58.3%
Closing Stock	680	408	357	1,221	952	748	28.0%

Jute

Jute is a key raw material for Geo textiles and packaging sacks. Jute fabrics also find application in Buildtech, Sportech and Agrotech. India is the largest producer of raw jute in the world. The jute producing states in India are West Bengal, Bihar, Assam, Orissa and Uttar Pradesh. India also imports certain quantity of Jute majorly from Bangladesh The supply demand situation of raw jute is given below:

Raw Jute Balance Sheet
Qty in lakh bales (180 kg per bale)

	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08 Projected
SUPPLY						
Opening stock	16	34	33	14	8	23
Jute and Mesta crop	110	90	75	85	100	95
Import	9	5	4	7	4	4
Total :	**135**	**129**	**112**	**106**	**112**	**122**
DISTRIBUTION						
Mill consumption	93	88	90	90	81	91
Domestic/industrial consumption	8	8	8	8	8	9
Export	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Total:	**101**	**96**	**98**	**98**	**89**	**100**
CLOSING STOCK	34	33	14	8	23	22

Source: Jute Advisory Board

Silk

Silk is used to manufacture some varieties of blinds (Hometech), sutures (Meditech) and sewing threads (Clothtech), though the consumption is limited to high end products.

India is the second largest producer of silk, contributing around 18% to the world production. The major silk producing centres of India are Karnataka, Tamil Nadu, Andhra Pradesh, West Bengal and Assam.

In 2006-07, the total production of raw silk stood at 18,475MT (mulberry and non mulberry), showing a growth of 6.76% compared with 2005-06. India also imports certain quantity of silk; the silk imports in 2006-07 were 5,567 MT worth Rs 673.36 crore. China is the major supplier of raw silk to India with a share of over 95% followed by Brazil. Raw silk import is decreasing year by year with increase in country's production levels.

Coir

Coir, the coconut fibre finds application in mattresses, ropes, cordages and floor coverings. India is among world's top two producers of coir and accounts for world's two third production of coir. The coir industry in India is concentrated in coconut growing States and Union Territories i.e., Kerala, Tamil Nadu, Andhra Pradesh, Karnataka, Maharashtra, Goa, Orissa, Assam, Andaman & Nicobar, Lakshadweed, Pondicherry, etc.

The production of coir fibre in India is estimated at 430,000 MT. In 2007 – 2008 11,102 MT of coir fibre valued at Rs 12 crore was exported.

Man Made Fibres and Polymers

Manmade fibres (MMF) and Man Made filament yarns (MMFY) account for around 40% share of the total fibre consumption in the textile industry as a whole. These fibres form a key raw material for the technical textile industry especially because of their tailor made properties. The key manmade fibres/filaments and polymers used as raw material in Technical Textiles are:

- Man made fibres/filaments
  - Viscose
  - Polyester
  - Nylon
  - Acrylic/Modacrylic
  - Polypropylene

- Polymers
  - HDPE
  - LLDPE
  - LDPE
  - PVC

The segment wise consumption of various man-made fibres/filaments and polymers is given below:

Natural Fibre	Key segments
Viscose	Clothtech, Hometech, Mobiltech*
Polyester	Buildtech, Geotech, Clothtech, Packtech, Meditech, Agrotech, Sportech, Hometech, Indutech
Nylon	Buildtech, Clothtech, Packtech, Mobiltech, Meditech, Agrotech, Sportech, Indutech
Acrylic/Modacrylic	Buildtech, Protech, Meditech, Hometech
Polypropylene	Buildtech, Geotech, Clothtech, Packtech, Mobiltech, Meditech, Agrotech, Sportech, Hometech, Indutech
HDPE	Buildtech, Oekotech, Packtech, Sportech, Indutech
LDPE/LLDPE	Packtech, Agrotech, Sportech,

**Viscose High Tenacity filament yarn finds application in Mobiltech*

India ranks among one of the world's largest producers of MMF/MMFY. As of September 2007, there were 103 units in operation, comprising 32 in MMF with total installed capacity of 1.66 MT/annum and 71 in MMFY with total installed capacity of 2.06 MT/annum. Over the last decade, there has been a steady increase in production and consumption of major synthetic fibres and polymers as a consequence, a fair degree of self-sufficiency has been attained.

Viscose Fibre/Filament

Viscose is an important raw material for Clothtech. Viscose also finds application in manufacturing of wipes (Hometech) because of high absorbent properties. A special variety of viscose i.e. Viscose High Tenacity Filament yarn called tyre yarn finds application in Mobiltech. The installed capacity, production, capacity utilisation, consumption, imports and exports of viscose staple fibre/filament yarn are given below:

	Volume (thousand tonnes)					Growth
	2003	2004	2005	2006	2007	3-year
Viscose Staple Fibre						
Installed capacity	305	305	337	338	346	4.2%
Production	225	221	248	229	247	3.8%
Consumption	225	221	225	228		2.4%
Import	3	3	1	1		-11.4%
Export	6	10	8	15		25.8%
Viscose Filament Yarn						
Installed capacity	75	75	78	80	80	2.0%
Production	51	53	54	53	54	2.6%
Consumption	44	50	51	48		-5.1%
Import	7	3	3	3		-42.5%
Export	11	4	8	10		-42.5%

India consumes majority of the indigenously manufactured viscose. Significant reduction in imports over the years indicates that India is self sufficient with regards both viscose staple fibre/filament.

Grasim Industries is the major manufacturer of regular viscose staple fibre whereas Century Rayon and Indian Rayon and Industries Ltd. are the major manufacturers of viscose filament yarn. The manufacturers of viscose staple fibre/filament with their annual capacity are given below:

Capacity of Viscose Staple fibre as on March 31, 2007

S No	Name of the Unit	Capacity (MT/Annum)
1	Grasim Industries Ltd.	270,100
2	SIV Industries Ltd. #	56,450

 # Currently not in production

Capacity of Viscose filament yarn as on March 31, 2007

S No	Name of the Unit	Capacity (MT/Annum)
1	Century Rayon	25,000
2	Indian Rayon And Industris Ltd.	16,400
3	NRC Ltd.	16,000
4	SIV Industries Ltd. #	7,500
5	Kesoram Rayon	6,500
6	Baroda Rayon Corporation Ltd.	4,500
7	Travancore Rayons Ltd. #	4,200

 # Currently, not in production

Century Rayon produces high tenacity viscose filament yarn in deniers 1650 (1840 DTex) and 2200 (2440 DTex). The manufacturers of high tenacity viscose filament yarn with their annual capacity are given below:

Capacity of Rayon Tyre Yarn / as on March 31, 2007

S No	Name of the Unit	Capacity (MT/Annum)
1	Century Rayon	5,500
2	Shriram Rayons	9,000

Polyester

Polyester (Polyethylene Terephthalate or PET) is the one of the most widely used synthetic fibre in technical textiles. The fibre has variety of applications however, around 40-50% of the polyester produced is used for textile application. Some of the unique features of polyester, making it more desirable in the textile industry, are shrinkage resistance, wrinkle resistance, mildew and abrasion resistance, etc.

During the second half of the 1990s, a downturn in the global polyester markets led to over-capacity in the domestic market. The situation reversed during 2002 however in FY2005, declining cotton prices, high fibre intermediate prices and worsening international demand supply situation resulted in decline in demand of polyester. The increasing over-capacity in global markets has further exacerbated the situation. The installed capacity, production, capacity utilisation, consumption, imports and exports of polyester staple fibre/filament yarn are given below:

	Volume (thousand tonnes)						Growth
	2002	**2003**	**2004**	**2005**	**2006**	**2007**	**3-year**
Polyester Staple Fibre							
Installed capacity	605	610	619	665	665	1,057	19.6%
Production	546	575	604	639	623	785	9.1%
Consumption	555	571	584	604	596		1.4%
Import	27	26	12	15	16		-15.1%
Export	18	29	32	50	43		13.3%
Polyester Filament Yarn							
Installed capacity	1,175	1,212	1,298	1,380	1,441	1,877	13.1%
Production	905	946	1,003	970	1,015	1,188	5.8%
Consumption	925	968	1,030	993	1,005		1.3%
Import	88	115	99	120	99		-4.8%
Export	68	94	72	98	110		5.4%

Majority of polyester consumed in India is indigenously produced. Polyester is also imported though the imports have reduced over the years with increasing domestic production and India is a net exporter of Polyester staple fibre/filament.

In addition Polyester Staple Fibrefil finds application in filling of pillows, cushions, etc though the market is at a nascent stage. The installed capacity, production, capacity utilisation, consumption, imports and exports of polyester staple Fiberfil is given below:

	Volume (thousand tonnes)						Growth	
	2002	**2003**	**2004**	**2005**	**2006**	**2007**	**2007**	**3-year**
Polyester Staple Fibrefil								
Installed capacity	46	46	46	47	47	47	0.0%	0.9%
Production	25	30	39	40	47	47	-0.7%	6.6%
Consumption	25	30	39	40	47			17.1%
Import								
Export								

Reliance is the country's largest manufacturer of polyester and related products. The other major manufacturers of polyester are Century Enka, Indo Rama Synthetics, JBF Industries, JCT Fabrics and Sanghi. The major manufacturers of polyester staple fibre/filament with their annual capacity are given below:

Capacity of Polyester staple fibre as on March 31, 2007

S No	Name of the Unit	Capacity (MT/Annum)
1	Reliance Industries Ltd.	575,000
2	Indo Rama Synthetics (I) Ltd.	276,000
3	Bombay Dyeing & Mfg. Co. Ltd.	160,000
4	Apollo Fibres Ltd. *	88,600
5	India Polyfibres Ltd. *	40,000
6	Orrisa Synthetics Ltd*	35,000
7	Indian Organic Chemicals Ltd. (Futura)	30,600
8	Arora Fibres Ltd. (Recycled PSF)	9,600
9	GPL	7,200
10	Harish Enterprises	7,200
11	Himalaya	7,200
12	Mahalaxmi	7,200

Capacity of Polyester filament yarn as on March 31, 2007

S No	Name of the Unit	Capacity MT/annum
1	Reliance Industries	645,000
2	Indo Rama Synthetics	252,000
3	JBF Industries	144,000
4	Garden Silk Mills	115,200
5	Century Enka	85,600
6	Recron Synthetics, Allahabad	70,000
7	Nova Petrochem	57,600
8	Modern Petrofills	55,000
9	Sanghi Polyester	55,000
10	Filatex India	54,000
11	Raj Rayon	54,000
12	Centrl India Polyester (IPCL group)	50,000
13	Alok Industries	48,600
14	Gupta Synthetics Ltd.	43,200
15	Gokulanand Polyfibres	42,000
16	Chiripal Industries Ltd. (Fibre division)	37,800
17	Nakoda Textile Industries	36,000
18	Prag Bosmi Synthetics Ltd.	25,000
19	Paras Petrofills	23,400
20	Bhilosha	21,600
21	Unify	21,600
22	Wellknown	21,600
23	Ramakrishna	20,000
24	Welspun Syntex	19,000
25	Sanathan Textiles Pvt. Ltd.	14,600
26	Apollo Fibres Ltd (IPCL Group)	14,400
27	Superfine Polyester	14,000
28	Sumeet Industries	12,240
29	Emtex India	12,000
30	Pamis	11,000
31	MicroSynth Fabrics	9,600
32	Orissa Synth Ltd. (Orissa Polyfibres Ltd.)	8,400

Nylon

Nylon (Polyamide) finds application in majority of the technical textile products. Regular Nylon filament yarn is produced in India though the consumption has outpaced the indigenous production in recent years resulting in increase in imports.

Nylon tyre yarn is a key input for the Mobiltech technical textiles. The capacity for Nylon tyre yarn is not sufficient to fulfil indigenous consumption, thus, the demand is partly fulfilled by imports. The installed capacity, production, capacity utilisation, consumption, imports and exports of nylon filament yarn and tyre yarn are given below:

	Volume (thousand tonnes)						Growth
	2002	**2003**	**2004**	**2005**	**2006**	**2007**	**3-year**
Nylon filament yarn							
Installed capacity	28	28	28	28	28	36	8.7%
Production	27	30	31	37	40	32	1.6%
Consumption	29	29	28	45	46		16.3%
Import	6	5	9	16	12		37.4%
Export	3	5	12	7	6		3.4%
Nylon Tyre Yarn							
Installed capacity	50	50	50	50	64	74	8.1%
Production	51	51	56	48	55	72	8.6%
Consumption	64	64	69	65	68		2.2%
Import	13	14	15	20	17		6.6%
Export	1	2	3	3	4		38.7%

Century Enka and SRF Ltd. and are the key manufacturers of Nylon yarn. The major manufacturers of nylon filament yarn and tyre yarn with their annual capacity are given below:

Capacity of Nylon filament yarn as on March 31, 2007

S No	Name of the Unit	Capacity MT/annum
1	JCT Ltd. (Filament unit)	14,000
2	Modipon Fibres Company	8,800
3	Century Enka Ltd.	6,570
4	GSFC (Fibre Division)	6,000
5	Shree synthetics Ltd.	5,070

Capacity of Nylon tyre yarn as on March 31, 2007

S No	Name of the Unit	Capacity MT/annum
1	SRF Ltd.	51,455
2	Century Enka Ltd.	22,000
3	N.R.C. Ltd.	7,500

Acrylic / Modacrylic

Acrylic fibres are defined as those which contain not less than 85% of acrylonitrile molecule. Fibres which contain 35-85% acrylonitrile molecule are "modacrylic" fibres. In addition there are many types of modified acrylic fibres such as animal-like fibres with oval cross-section, thermal resistant fibres, anti-pilling fibres, antibacterial and deodorant fibres, and anti-static fibres. Acrylic fibres are majorly used for manufacturing Blinds and Stuff toys (Hometech). Modacrylic fibres find application in manufacturing flame retardant apparel (Protech).

The installed capacity, production, capacity utilisation, consumption, imports and exports of nylon filament yarn and tyre yarn are given below:

	Volume (thousand tonnes)						Growth
	2002	**2003**	**2004**	**2005**	**2006**	**2007**	**3-year**
Acrylic fibre							
Installed capacity	138	138	138	145	142	142	1.1%
Production	95	105	117	128	114	107	-2.9%
Consumption	101	116	112	124	114		-0.6%
Import	13	22	14	15	12		-18.5%
Export	6	11	19	18	11		1.2%

The major manufacturers of acrylic staple fibre with their annual capacity are given below:

Capacity of Acrylic staple fibre as on March 31, 2007

S No	Name of the Unit	Capacity (MT/Annum)
1	Indian Acrylics Ltd.	42,000
2	Pasupati Acrylon Ltd.	30,000
3	Indian Petrochemicals Corporation Ltd. (Reliance Group)	24,000
5	Vardhaman Acrylics Ltd.	16,500
6	Arafat Petrochem (J.K. Plant)	14,400
7	Consolidated Fibres And Chemicals Ltd.	12,000

Polypropylene

Polypropylene is the most widely used raw material for the technical textile products because of its special properties. The production and consumption of polypropylene staple fibre has remained stable for the last 3 years. The domestic demand is met by indigenous production.

The demand for Polypropylene filament yarn is partly met by imports though the imports are decreasing over the years. The installed capacity, production, capacity utilisation, consumption, imports and exports of polypropylene staple fibre/filament are given below:

	Volume (thousand tonnes)						Growth
	2002	**2003**	**2004**	**2005**	**2006**	**2007**	**3-year**
Polypropylene Staple Fibre							
Installed capacity	7	7	8	8	8	8	3.0%
Production	2	3	3	3	3	4	8.6%
Consumption	2	2	3	3	3		8.6%
Import	0	0	0	1	0		-0.4%
Export	1	0	0	0	0		-2.5%
Polypropylene Filament Yarn							
Installed capacity	22	22	18	18	18	14	-8.4%
Production	16	15	15	11	9	10	-14.2%
Consumption	15	20	18	16	14		-12.2%
Import	1	8	5	6	6		-9.4%
Export	1	3	2	1	1		-30.0%

The manufacturers of polypropylene staple fibre/filament with their annual capacity are given below:

Capacity of Polypropylene staple fibre as on March 31, 2007

S No	Name of the Unit	Capacity (MT/Annum)
1	Neomer Alembic #	4,300
4	Zenith Fibres Ltd.	3,900
2	Arora Fibres Ltd. #	1,000
3	Gujarat Filaments #	500
	Total	**9,700**

 # Currently not in production

Capacity of Polypropylene filament yarn as on March 31, 2007

S No	Name of the Unit	Capacity MT/annum
1	Jindal Polyester Limited	28,000
2	Parasrampuria Industries	20,625
3	Shree Rajasthan Syntex Ltd.	16,000
4	Filatex India Ltd.	9,000
5	Rajasthan Petro Synthetics Ltd.	4,250
6	Sumeet Industries Ltd.	3,900
7	Shree Shyam Filaments	3,600
8	Garware Wall Ropes Ltd.	2,100
9	Parasrampuria Synthetics	2,050
10	Filaments India Ltd.	1,850
11	Chetak Spintex Ltd.	1,000
12	Sanghi Filaments Ltd.	900
13	Alembic Chemical Works Ltd.	500

Polymers

High Density Polyethylene (HDPE), Low Density Polyethylene (LDPE), Linear Low Density Polyethylene (LLDPE) and Poly Vinyl Chloride (PVC) are the key polymers that find application in technical textile. HDPE/LDPE tapes are used in manufacture of variety of technical textile products. In addition the polymers are used as coating material for interlinings, etc. HDPE has a significant consumption in the packaging industry and variety of other products in technical textiles. Until 1990s the packaging industry was dependent on import of synthetic raw materials viz. HDPE due to insufficient domestic supplies. However, new capacity build-up by RIL, IPCL, GAIL, and HPL has resulted in increased availability from domestic producers. Because of significant capacity addition, India has become a net exporter of HDPE.

The production of LDPE in India has increased over the last 5 years though the consumption has increased at a much faster pace resulting in increase in imports. With low level of exports India is a net importer of LDPE.

PVC is majorly used as coating material for flex fabric, blinds, etc. The consumption of PVC in last five years has increased outpacing the production. With significant increase in imports of PVC India is a net importer of PVC. The installed capacity, production, capacity utilisation, consumption, imports and exports of various polymers are given below:

	Volume (thousand tonnes)						Growth
	2002	2003	2004	2005	2006	2007	3-year
PP							
Installed capacity	1,351	1,365	1,420	1,560	1,560	1,860	9.4%
Production	1,370	1,430	1,567	1,690	1,541	2,001	8.5%
Consumption	1,084	1,129	1,179	1,315	1,445		8.6%
Import	87	104	98	96	128		7.1%
Export	373	406	486	472	224		-17.9%
HDPE/LLDPE							
Installed capacity	1,490	1,520	1,580	1,630	1,630	1630	1.0%
Production	1,339	1,478	1,564	1,685	1,723	1730	3.4%
Consumption	1,470	1,407	1,508	1,453	1,678		6.0%
Import	254	181	204	187	263		13.4%
Export	123	251	260	418	309		7.1%
LDPE							
Installed capacity	200	200	200	200	200	200	0.0%
Production	187	192	184	205	201	195	2.0%
Consumption	219	199	209	201	232		5.2%
Import	38	28	28	29	46		18.0%
Export	6	20	2	33	14		-11.1%
PVC							
Installed capacity	780	780	780	788	816	985	8.1%
Production	830	822	878	885	953	926	1.8%
Consumption	852	878	970	960	1,199		10.9%
Import	32	58	107	92	267		66.4%
Export	9	1	15	16	21		173.4%

The manufacturers of various polymers with their annual capacity are given below:

Capacity of HDPE as on March 31, 2008

S No	Name of the Unit	Capacity MT/annum
1	IPCL	NA
2	GAIL	410,000
3	Haldia Petro	300,000

Capacity of LDPE as on March 31, 2008

S No	Name of the Unit	Capacity MT/annum
1	IPCL (Reliance Industries)	1,055,000

Capacity of PVC as on March 31, 2008

S No	Name of the Unit	Capacity MT/annum
1	RIL	625,000
2	Finolex Industries	260,000
3	DCW	90,000

Besides the regular fibres/filaments and polymers certain specialty fibres find application in technical textiles which include:

- Aramid
- Glass fibre
- Carbon fibre

These fibres find application in products categorised under Mobiltech, Meditech, Indutech and Protech segments of Technical textiles.

Aramid

Aramid has the largest share amongst the specialty fibres. These are aromatic polyamides available in different grades with properties to suit various applications. The typical properties of Aramid fibre are low density, high strength, good impact resistance, good abrasion resistance, good chemical resistance, good resistance to thermal degradation and compressive strength similar to E-glass fibres. Aramid fibre has both textile and non textile applications; the key applications of Aramid fibre in technical textiles include:

- Ballistic protective applications such as bullet proof vests
- Protective apparel such as gloves, motorcycle protective clothing and hunting gaitors, chaps and pants.
- Sails for sailboats, yachts etc
- Belts and hosing for industrial and automotive applications

The demand for aramid fibre is met by imports. USA and Germany account for majority of imports of Aramid to India followed by China. The estimated import figure of aramid fibre is given below:

HS Code	Description	Imports (in MT)	Imports (in Rs crore)
		2007-08(E)	**2007-08(E)**
54021110, 55051090, 55091200, 56013000	ARAMID FIBRE/TWARON ARAMID YARN/KEVLAR YARN/"KEVLAR" ARAMID FIBER	~ 400 MT	**~ Rs 45 crore**

Du Pont is the leading manufactuerer of Aramid fibres. The company markets its product under the brand name Du Pont Kevlar. In September 2007 DuPont announced a 500 million $ expansion to increase Kevlar capacity by over 25%. Aramid fibres are also manufactured by Teijin Twaron under the brand name Twaron.

Carbon fibre

Carbon fibre is second largest segment among the specialty fibres after aramid. The fibre finds application in Protech segment of Technical textiles. The bulk of demand for the material in India is met through imports from Japan and France.

Globally, Toray Industries Inc. is the world's largest producer of carbon fibre. Other manufactuerers of Carbon fibre are Toho Tenax (Japan), Mitsubhishi Rayon (Japan), Zoltek (USA) and Hexcelcorp. (USA).

Carbon fibre is manufactured in India. The first manufacturing facility for carbon fibre in India was set up by The National Aerospace Laboratories (NAL) in Bangalore at an investment of about Rs 30 crore. The plant has a capacity of 20 MT/annum.

Kemrock Industries and Exports Ltd (Vadodara), a manufacturer of fibre-reinforced plastic composites, is building a 400-tonne carbon fibre plant to open in August 2009. Reliance Industries Ltd is also reported to start manufacturing of carbon fibre at a 4000-tonne plant in Vadodara, Gujarat, using technology developed at NAL. Local production by Kemrock and subsequently by Reliance are expected to reduce dependence on imports over the next few years.

Glass fibre

Glass Fibre as reinforcement dominates the sector of composites material with a share of 85-90%. The formulation chosen for continuous fibre glass production is generally known as E-glass. Glass fibre finds application in a variety of products in Technical Textiles.

The fibre is produced in India though the Indian manufactures are facing threat from cheap Chinese imports. The key producers of Glass Fibre in India are:

- Owens Corning (India) Ltd.
- Goa Glass Fibre Ltd., a wholly owned subsidiary of Binani Industries Ltd.
- UP TWIGA Fibre Glass Ltd.
- FGP Ltd
- Deccan Fibre Glass Ltd
- Glass Fibre Division, CEAT Tyres Ltd

Owens Corning (India) Ltd. (OCIL) is the largest fiberglass manufacturer in India. The company has a state-of-art glass-fiber manufacturing facility at Taloja, near Mumbai. OCIL manufactures three main lines of products - chopped strand mat, rovings (a slightly twisted strand of fibers) and T-30, used in the composites industry. OCIL has acquired the manufacturing facilities of Saint Gobain Vetrotex India Ltd. that manufactures E-glass reinforcements for thermoplastics and thermosets along with full range of E-glass textile yarns and Cem-Fil (Cement reinforcement) fabrics (both woven and knitted with or without coating). Saint Gobain Vetrotex India Ltd. had a capacity of 12,000 MT/annum (2005). The installed capacity and production of the key players are given below:

Manufacturer	Year	Capacity (MT/annum)	Production (MT/annum)
Owens Corning (India) Ltd.	2007-08	51500	50000
Saint Gobain Vetrotex India Ltd.*	2005	12000	N.A.
Goa Glass Fibre Limited	2007-08	10300	11377
UP Twiga Fibres	2007-08	16800	10119
Others	2007-08	3400	1312

Source: Goa Glass Fibre, UP Twiga Fibre, Capitaline, Industry Survey, IMaCS Analysis
**Now a part of Owens Corning (India) Ltd.*

6. Technical Textiles Machinery

In addition to the conventional technologies, the manufacture of technical textiles requires specific unconventional spinning, weaving, knitting, braiding and nonwoven technologies. This chapter provides an overview of these along with details of nonwoven machinery suppliers.

Technologies specific to manufacture of technical textiles

Spinning Technologies		
Technology	***Applications***	***Manufacturers***
DREF Spinning	Hometech, Protech, Indutech, Meditech, Packtech, Mobiltech	Fehrer, Austria
Warp Spinning	Hometech, Mobiltech, Clothtech	Leesona, US Mackie, U.K. Suessen, U.K.
Weaving Technologies		
Technology	***Applications***	***Manufacturers***
Projectile Weaving	Agrotech, Geotech, Indutech, Buildtech	Juegens, Germany Sultex, Switzerland Texilmach, Russia
Rapier Weaving	Mobiltech, Protech, Sportech	Cobble Blackburn, UK CTMTC, China Dornier, Gormany Giropan NV, Belgium Juegens, Germany Mackie, U.K. Metag, Italy Mullaer Frick, Switzerland Panter, Italy Picanol, Belgium Promatech, Italy Spa Textile, Spain Sultext, Switzerland Texo, Sweden Trinca, Italy

Air-Jet Weaving	Mobiltech, Sportech	CTMTC, China Dornier, Gormany Investa International, Czech Republic Mullaer Frick, Switzerland Panter, Italy Picanol, Belgium Promatech, Italy Sulzer Tessile/Smit Textile, Italy Sultext, Switzerland
Water-Jet Weaving	Buildtech, Clothtech	CTMTC, China Nissan, Japan
Circular Weaving	Packtech, Meditech, Indutech	Frederick Enterprises Co. Ltd., Taiwan Karl Mayer, Germany Lohia, India Sima, Italy Starlinger, Austria
Three Dimensional (3D) Weaving	Buildtech, Mobiltech, Protech, Indutech, Meditech, Sportech	Multi-axail warp kit(MWK) by Liba ParaGlass structural core laminate by Parabeam
Multiphase Weaving	Geotech, Buildtech	Sultext, Switzerland Techmashexport, Russia
Knitting Technologies		
Technology	***Applications***	***Manufacturers***
Circular Knitting	Hometech, Indutech, Protech, Meditech, Agrotech, Packtech, Sportech	Artex Group, USA Berney Knitting Machinery Co. Inc., USA ITM Ltd. South, USA Monarch Knitting Machinery Corp., USA Textram Inc., USA Pai Lung Machinery Mills Co. Ltd., Taiwan Keum Young Machinery Mill

		Co. Ltd., Korea Texmac Inc, USA Karl Mayer, Germany
Flat Knitting	Meditech, Protech, Buildtech, Mobiltech	Shima Seiki, Japan Stiger, Germany Kauo Heng, Taiwan Elex International, India SuoHwan Machinery Co., Taiwan Brother Industries Ltd., Japan Keum Young Machinery Mill Co. Ltd., Korea Stoll H GmbH & Co., Germany Protti SpA, Italy Universal Maschinenfabrik, Germany
Warp Knitting		
a) Tricot Machines	Agrotech, Hometech, Indutech, Packtech, Sportech, Geotech, Mobiltech, Buildtech	LIBA, Germany Cummins Machinery Corporation, USA ITM Ltd. South, USA Karl Mayer, Germany Jakob Muller AG Frick, USA
b) Raschel Machines	Packtech, Indutech, Agrotech, Clothtech, Sportech, Geotech, Meditech, Hometech, Buildtech	Cummins Machinery Corporation, USA ITM Ltd. South, USA Karl Mayer, Germany Cornez SpA, Italy Jakob Muller AG, USA Arlin Industries, USA LIBA, Germany
c) Stitch-bonding	Hometech, Indutech, Mobiltech, Packtech, Clothtech, Protech	Chima Inc, USA Karl Mayer, Germany Textima Import Export, USA Southern Mill Supply Corp., USA

		Jakob Muller AG, USA
d) Multiaxial Knitting	Mobiltech, Geotech, Protech, Indutech, Meditech, Sportech, Buildtech	American LIBA Inc., USA Cummins Machinery Corporation, USA Fillattice SpA, Italy Fletcher International Inc., UK Jakob Muller AG, USA Mayer Textile Corp., USA
e) Spacer Fabrics Knitting	Sportech, Mobiltech, Hometech, Meditech, Indutech	LIBA, Germany Cummins Machinery Corporation, USA Comez SpA, Italy Karl Mayer, Germany Jakob Muller AG, USA
Braiding Technologies		
Technology	***Applications***	***Manufacturers***
Braiding Machinery	Mobiltech, Sportech, Meditech, Indutech	Barney Knitting Machinery Co. Inc., USA Fletcher International Inc., Spain Lamb Knitting Machinery Corp., USA United Textile Machinery Corp., USA Karl Mayer, Germany

Details of machines for manufacturing non-woven

Details of some of the leading suppliers of machines for manufacturing nonwoven fabric are given below:

S.No	Machines Suppliers	Process	Capacities	Cost	Applications
1	**Erko-Trutzschler GmbH, Germany**	Opening, blending & mixing machines, Airlay cards	25T/day	Euro 2.817.296,00	Wipes, Cotton pads, Surgical gowns, Drapes, Geotextiles, Automotive Textiles, Filter fabrics, Agrotextiles, Home furnishing,
		Opening, blending & mixing machines, Needling Technology	100-1200gsm, 6.5mts wide.	Euro 4 .000.000,00	Geotextiles
		Opening, blending & mixing machines, Needling Technology	250 to 1500gsm, 3.0 mts wide	Euro 2 .267.614,00	Automotive Textiles,
		Opening, blending & mixing machines, Needling Technology	250 to 100gsm, 3.2mts.	Euro 5 .452.775,00	Filter fabrics
2	**Fleissner GmbH, Germany**	Fibre production plants, Spunlace lines, Driers	25T/day	Euro 5.950.000,00	Wipes, Cotton pads, Surgical gowns, Drapes,
3	**Fong's, Hong Kong**	Complete bleaching line	25T/day	USD 1,685,000.00	Cotton bleaching
4	**Gavazzi , Italy**	Cake opener to Bale press	25T/day	Euro 1 .574.440,00	Fibers into Bales
5	**Fleissner Belt Ovens, Germany**	Thermobonding & Fusion lines, Hot ovens, Low speed winders	3mts wide	Euro 809.930,00	Nonwovens, Coating applications, Industrial wipes, Textiles Finishing, Rubberized coir.
6	**Falu, Switzerland**	Conversion machines			
		Cotton pads	240 cotton pads per min	Swiss Franc 866,930.00	De-makeup cotton pads
		Cotton Swabs	2700 cotton swabs	Swiss Franc 221,820.00	Cotton swabs
7	**Bouda, Austria**	Conversion machines			
		Zig-zag cotton		Euro 127,103.00	Medical purpose
		Cotton rolls		Euro	Medical purpose

S.No	Machines Suppliers	Process	Capacities	Cost	Applications
				66.830,00	
		Cotton balls		Euro 289.795,00	Medical poupose.
8	**Andritz Kusters**	Laminating & finishing calendars rollers			Apparel, hometextiles, sporttextiles, technical textiles,nonwovens.
9	**Bastian, Germany**	High speed winders	3.2 Mts	Euro 600.000,00	Nonwovens, Boppfilms, etc.
		High strength PET fibers	300T/ annum	8 million Euro	Bullet-proof vests, helments, armors, anti-cut gloves, rope, marine use, cement reinforcing material
10	**Shaoyang Textile Machinery Co. Ltd., China**	Spunbond line,	3.2mts wide, 3.2 MS, 10-150gsm	USD 452,000.00	Geotextiles, Medical textiles, Automotive, Hygiene, Packaging.
11	**Hanwei Machinery Manufacturing Co. Ltd., China**	Diapers, Adult diapers, Sanitary Napkins, Pull up diapers.			
		Diapers	400 pcs/min	USD 390,000	Baby diapers, adult diapers
		Lady napkins	350 pcs/min	USD 290,000	Sanitary napkins

Karl Mayer, Germany

The list of machineries supplied by Karl Mayer, Germany is as follows:

1	**Tricot Machines**	Warp Knitting	Appx. 50 to 70 Linear mtrs/hour	HKS 4 P E=28 and width=180" is Euro 170000.	Automotive Car seat Covers, Headliners, Home furnishings, Shoe fabrics, sportswear fabrics, coating substrates, etc. HKS 4 P E=28 180" width - The most popular machine in production of warp knitted automotive car seat cover and headliner fabrics.
2	**Weft Insertion Machines**	Warp Knitting	Apprx. 80 to 230 linear mtrs/hour	RS 2(3) MSUS "V" E=6, Width = 213" for Geotextiles with appx cost of Euro 530000	Geotextiles, Geo-grids, Geo-composites and billboards for advertising media For special glass and polyester Geogrid

				RS 2(3) MSUS E=18, Width= 245" for Billboards with approx cost of Euro 420000	production RS 2(3) MSUS-G is widely used. For Geo-composites (with Nonwoven) production RS 2(3) MSUS V is widely used.
3	**Double Needle Bar Raschel Machines for Spacers**	Warp Knitting	Appx. 20 to 40 linear meters/hour	RD 6 N / 3-12, E=22, Width = 136" is apparx. Euro 230000	Automotive Textiles, Industrial Filters, Shoe Fabrics, Sportswear, Upholstery, Mattresses, etc
4	**Stitch Bonding Machine, Maliwatt**	Nonwoven/Warp Knitting		Maliwatt cost is apprx. Euro 375000	Automotive Textiles, Geotextiles
5	**Stitch Bonding Machine, Malivlies**	Nonwoven/Warp Knitting		Malivlies cost is apprx. Euro 210000	Automotive Textiles, Geotextiles

Rieter India

The list of machineries supplied by Rieter India is as follows:

Name of machinery	Product manufactured	Technology Employed	Machine Capacity	Indicative cost of main machinery (w/o accessories, building, utilities, etc.)
JETlace - Turnkey System supply	Spunlace fabric	Hydroentanglement	From 2 TPA onwards	app. Euro 1mn/TPA
PERFObond - Turnkey System Supply	Spunbond fabric	Spunlaid	From 2 TPA onwards	app. Euro 1.5mn/TPA
SPUNjet - Turnkey System Supply	Spunjet Fabric	Spunlaid and Hydroentanglement	From 2 TPA onwards	app. Euro 1.5mn/TPA
Needle Punch - NSC Turnkey System Supply	Needle punched fabric	Needle Punching	From 1 TPA onwards	app. Euro 0.5mn/TPA
Combination of various	Nonwoven	Thermobond,	From 1	app. Euro 0.3mn/TPA

Name of machinery	Product manufactured	Technology Employed	Machine Capacity	Indicative cost of main machinery (w/o accessories, building, utilities, etc.)
other nonwovens technologies	fabric	through-air bonding, chemical bonding and above	TPA onwards	

Oerlikon Neumag

Oerlikon Neumag is a textile machinery manufacturer of European origin. The firm specializes in machinery for Non-woven applications and has a dedicated sales office in India. The range of machineries supplied by the firm in India can be broadly classified in 3 categories as indicated below:

1) **Nonwovens related:**

- Carding lines-complete for products like Geotextiles / Roofing material, Automotive Headliner, Automotive Velour, Artificial leather, Coating Substrates, Structured Carpet, Carpets, Wall covers, Blankets, Technical felts, Wipes, Wadding / Home furnishing, Filtration fabrics, Automotive substrates, NVH felts, Coverstocks, Interlinings for clothes / shoes, Spunlace wipes, Spunlaced coating substrates etc.
- Air laid Lines for products like Feminine Hygiene, Table Top, Household/ Industrial Wipes, Wet wipes, Hospital products, Incontinence, Diapers/ Training pants etc.
- Spunbond lines for applications like Hygiene products, Agriculture, Bedding & Furniture, Packaging & Industrial etc.
- Melt blown lines for applications like Air filtration, Liquid filtration, Medical fabrics etc.
- Spunmelt lines (SMS or SMMS type) for Barrier fabrics (protective clothing etc.), Medical gowns, Sterile wraps, Hygeine products etc.
- Combination lines like the combination of different web forming technologies like carding, spunbond and/or airlaid for high tier nonwoven products, Turnkey systems as well as stand-alone machine / euipment(s) (for e.g. like Cards, Crosslappers, Cutters/knives, Feeders, Needle looms, Openers, blending/mixing systems etc.), related components/accessories etc.

2) **Complete Synthetic staple fibre lines**
3) **Complete BCF Carn yarn lines**

The machinery solutions, especially for Nonwoven lines, is predominantly designed according to the individual requirements of the customers and results in a broad range of investment required for setting up of a production line depending upon the technology required, the end product as well as the capacity envisaged. However, an indicative idea of the prices can be obtained from following:

A Carding line for Geotextile comprising of 2 component Fibre opening & blending unit, card feeding system, 2.5 m double doffer card unit, 2.5 m crosslapper, one 7.3 m pre-needling machine, two finisher needle looms, 6.1 m winding station, process control system etc. costs around 4.7 Million Euros (FOB Europe). The line cost may go up to 6.25 Million Euros depending upon inclusion of other equipments like web drafter, felt drafter, webmax, etc.

Installations of machinery by Indian non-woven players

- Fiberweb India is one of the installation sites with German non woven lines capable of manufacturing Non woven fabrics ranging from 12 gsm to 105 gsm from **Reifenhauser Gmbh**. Fiberweb manufactures nonwoven spun bonded polyproylene fabric for applications such as cover stock for baby diapers, sanitary products, crop covers, ground covers, medical made ups, bed linen, filtration medium, industrial work clothing, head covers, disposable table wipes and mats etc
- **Reifenhauser, Gmbh** has also supplied another plant for manufacture of mono layer and multi layer films for packaging industries, laminations and masking.
- **Fleissner** has supplied an entire production line for spunlace nonwovens to Anjani Non-wovens to be installed at the factory in Mundra SEZ. The production line consists of a fiber opening line, a fiber bleaching line, an opening line and card, together with a spunlace line and dryer/winder. The production capacity is estimated to rise from 20 tons per day initially to 40 tons per day.
- **Chinese spun bond lines in India:** There are approximately 30 spun bond nonwoven manufacturing units in India that have installed machinery manufactured in China. Most of these machines are manufactured based on the spun bonding technology developed by Lurgi. Some of these units are:
    a. Ultra Nonwoven in Mumbai
    b. Alpha Nonwoven in Pune
    c. Rayhno Nonwoven in Rajkot

d. Radiance Non woven in Surat
e. Texbond in South India.
f. Associate Non wovens
g. KK Non wovens

7. Testing facilities for technical textiles in India

Technical textiles manufacturing calls for conformance to standards (both international and national) based on the type of product and the nature of application. In India, the testing facilities for technical textiles are predominantly set up by the Textile Research Associations (TRAs). These facilities ensure that the necessary tests required ensuring that the products being manufactured meet the requirements of the prescribed standards are carried out at a nominal cost. In addition to these facilities, some of the major manufacturers also have their own in-house testing facilities required to monitor key production parameters.

The Ministry of Textiles, Government of India has also nominated these TRAs to set up Centre of Excellence for specific segments of technical textiles. The various testing facilities for technical textiles available at the TRAs in the country are:

- SASMIRA (Synthetic and Art Silk Mills Research Association)
- MANTRA (Man Made Textiles Research Association)
- BTRA (Bombay Textile Research Association)
- SITRA (South India Textile Research Association)
- NITRA (Northern India Textile Research Organization)

The details of the testing facilities for technical textiles at these organizations are covered in this chapter subsequently.

SASMIRA (Synthetic and Art Silk Mills Research Association)

SASMIRA is engaged in multiple activities providing scientific and technical assistance to textile and allied industries. Some of the activities being carried out are:

- Development of technical textiles
- Product development
- Effluent treatment, water recycling and waste re utilization
- Development of energy conservative processes

For technical textiles, SASMIRA provides facilities for testing, evaluation and investigation of products such as polymer, fibre, yarn, garmet and other textile related products. Specialised testing facilities have been added for technical textiles such as agrotextiles and geo textiles.

Mechanical Testing-

Following types of equipments are available at SASMIRA

1. Universal tensile machine
2. Photo microscope
3. Wrap reel
4. Melt flow Index tester
5. Crimp Contraction tester
6. Crimp rigidity tester
7. Yarn evenness tester
8. Twist tester
9. Yarn strength tester
10. Fabric tensile strength tester- 440 kgs
11. Quick UV tester
12. Water permeability tester
13. Tear tester
14. Cone drop tester
15. Air permeability tester
16. Bursting strength tester
17. Crease recovery tester

18. Densometer
19. Thickness tester
20. Thermal conductivity tester
21. Water vapour permeability tester
22. Fabric friction tester
23. Flexing tester
24. Abrasion tester

Chemical testing- Various equipment available at the Chemical testing laboratory at SASMIRA are:

1. Hydrostatic head tester
2. Spray tester
3. Dome tester
4. Bundesmann tester
5. Xeno test
6. Light fastness tester
7. Crockmeter
8. Static charge tester
9. Atomic absorption spectrophotometer
10. Perspirometer
11. Static resistivity tester
12. PH Meter
13. Viscometer
14. Flammability tester
15. Spectroquant for detection of metals and other elements.

Further, SASMIRA has been chosen as the Lead agency along with MANTRA, NAU and IIT Delhi to set up a Centre of Excellence in Agrotextiles.

Gaps in testing facilities for agro textiles

Keeping in mind the tests required to be carried out for agrotextiles and geotextiles and the facilities currently available, testing equipment need for the following properties are required:

1. Water permeability – cross plane
2. Tension creep
3. High pressure air permeability
4. Tester for coefficient of friction between soil and fabric
5. Pullout resistance in soil
6. Compressive creep with normal load
7. CBR Puncture test
8. Wind blocking percentage
9. Agrotextile light shading percentage
10. Electrostatic testing
11. Non destructive testing of Chemical protective garments
12. Thermal insulation
13. Damage due to flexing
14. Resistance to permeation by hazardous liquid chemicals
15. Microbial resistance
16. Aging behaviour for protective clothing
17. Apparent opening size of geotextile
18. Soil geotextile permeability and clogging behaviour
19. Fourier transformation infra red spectrophotometer
20. Bacterial filtration efficiency tester
21. High speed stirrer and centrifuge
22. Differential Scanning Calorimeter
23. Thermal gravimetric analyzer

MANTRA (Man Made Textiles Research Association)

MANTRA, established in Mach 1981 has been recognized as a Centre of Excellence for Agrotech textiles. The issues highlighted are quite similar to other associations, issues being lack of skilled manpower and insufficient market linkages.

MANTRA conducts following activities in the field of technical textiles – Product development, Research and development, Technical services, consultancies, Testing and allied activities. Further, the association is undertaking expansion project worth Rs 6.11 crore to develop a pilot plant and testing facilities.

Most of the testing facilities mentioned under SASMIRA are available at other research locations also. Testing facilities unique to a particular organization are mentioned below:

Mechanical testing

1. Projection microscope
2. Yarn friction meter with F-metre winder
3. Dynamic modulus tester
4. Yarn hairiness meter
5. Nip tester
6. Pilling tester

Chemical testing

1. Digital flammability tester
2. Soxhlet Apparatus for determining oil content of yarn and fabric
3. Universal Auto titrator for measuring moisture contect of polyester chips
4. Xenotest alpha for determining colour fastness to light and weather
5. Bundlesmann water repellency tester
6. Oxygen Index apparatus for flammability testing of textile material or fabric
7. Cintra Visible Spectrophotometer – For strength comparison of dye and optical brightening agent
8. Hot air oven – For determining moisture content, loss in weight of textile auxiliary and yarn

Other testing facilities available are:-

1. Davenport Density gradient column – for measurement of density of textile fibres, plastics and films
2. Polarisation microscope – for measurement of birefringence of textile fibres

For the Centre of Excellence in testing of agrotextiles, the **testing facilities required to be setup** are:

1. Vibrodyne
2. Moist Heat Hydrolysis tester
3. Film thickness tester
4. Water permeability(in plane)
5. Shear tester
6. Forced air laboratory oven
7. Water vapour transmission tester
8. Cold crack tester
9. Weatherometer
10. CBR puncture test
11. Wind blocking percentage
12. Agrotextile light shading percentage
13. Pullout resistance in soil
14. UPF tester
15. Co-efficient of friction test between soil and fabric

BTRA (Bombay Textile Research Association)

BTRA has been involved with technical textiles since 1980 and initiated work specifically on geotextiles in 1985. The centre is a prime location for carrying out tests on technical textiles, particularly geo textiles. The testing facilities are ISO 17025 certified though BTRA faces some constraints in the form of non-availability of skilled manpower and issues in sharing of facilities for different segments. The available facilities in product development as well as testing are:

Product Development

Non-Woven pilot plant- Needle punching machine, Cross lapper, Roller clearer cards, Thermal calendaring machine and Hot Air bonding machine (sourced indigenously)

Testing facilities

Air permeability	Electrostatic charge	Pilling
Absorbence	Electrical resistivity	Peel bond strength
Apparent Opening size	Flammability	Thickness
Abrasion resistance(Flat/Flex)	GSM	Water permeability
Bursting strength(Ball & Diaphragm)	Hexapod Tumbler Test	Trapezoidal tear strength
Bending length	Hydraulic transmissivity	Compressional recovery
Breaking strength:Tensile	Index puncture resistance	CBR puncture resistance
Wide width tensile	Impact resilience test	Cone puncture resistance
Grab strength	Lisson test	Dynamic Loading
Single rip double rip	Liquid strike through time	

The various geotextiles products tested at BTRA (as per international standards) are:

1. Geotextiles-woven and non woven
2. Geogrids
3. Geocells
4. Geocomposites
5. Gabions
6. Geonets

7. Geomembranes
8. Geosynthetics clay liners
9. Prefabricated vertical drains
10. Coated fabrics (woven and non woven) – Rubber coated, PU foam coated and Aluminium coated
11. Laminated fabrics (woven and non woven) – Foam laminated, PVC laminated, HDPE laminated and LDPE laminated

The various instruments available for carrying tests pertaining to geo textiles are Air permeability tester, BTRA Water permeability tester, BTRA Hydraulic transmissivity tester, Cone Drop Apparatus, Index Puncture Resistance Test apparatus, CBR puncture resistance test apparatus, Direct shear tester, Sieve shaker, Diaphragm bursting strength tester, Taber abrasion tester, SDL thickness tester and BTRA thickness tester. Additionally, Compressional recovery test machine is also available for testing insulation pads, rugs, carpets, waddings, backing/feeling material, foam/rubber etc

For Applied chemical and physical tests, the following instruments are available-

- FTIR Spectrophotometer, DSC & TGA Thermograph, X-Ray diffractometer and Honestometer for raw material testing of geo textiles and automotive textiles.
- Electrical resistivity tester for conductive textiles
- Scanning electron microscope for special purpose tests
- Estameter(static charge) for automotive textiles
- LOI tester for automotive textiles, protective clothing

To promote and cater to the increasing use of technical textiles, BTRA has proposed **setting up of Centre of Excellence on Geotextiles**. Apart from regular testing facilities, the laboratory shall be equipped with following:

1. Ball Bursting test
2. Filtration efficiency
3. Hydraulic transmissivity
4. Particle size analyzer
5. Rope abrasion test

6. Rope net strength test
7. ESCR test for geomembrane
8. Carbon black content test

SITRA (South India Textile Research Association)

SITRA has planned to open a Centre of Excellence in the field of Meditech segment of technical textiles. Some of the key observations made by the association in this regard are inconsistent quality of raw materials and shortage of qualified technical manpower.

The association intends to focus on Hygiene products (Sanitary napkins, baby diapers, incontinence diapers), Health care products (surgical gowns, face masks hand gloves, towels), Wound dressings, Surgical dressings, Sutures and Vascular grafts for testing and product development purposes.

Present facilities available for testing purposes at SITRA are:

1. Air permeability tester – of hospital linen, bandage cloth
2. Fabric drape tester – Coefficient of drape for surgical gown, surgical spreads
3. Random tumble pilling tester – Pilling tendence of hospital linen, pillow cover, surgical gown
4. Universal testing machine
5. Friction/Peel strength tester
6. Thickness meter
7. Abrasion tester
8. Launderometer

Equipments available for chemical testing purposes are:

Test parameter	Equipment
Acid insoluble ash	Muffle furnace, Balance
Ethanol soluble matters	Shaker with water bath
Ether soluble	Soxhlet Apparatus
Water soluble	Soxhlet Apparatus
Color of the aqueous extract	Shaker
Presence of surfactants	Steaming apparatus
Color fastness to water	Hot plate
Residual total dissolved solids	Leaching apparatus
Total leachables with water	Water repellency apparatus
Water repellency/Water proofing	Differential scanning calorimeters

Thermal characteristics	UV Cabinet
Presence of fluorescence	Hot air oven
Weight loss on drying	Furnace
Sulphated ash	Furnace
Ash content	Microscope
Identification of foreign fibres	

NITRA (Northern India Textile Research Organization)

NITRA and IIT Delhi propose to set up a Centre for Excellence for product development and testing facilities for Protective textiles. The testing facilities presently available at the centre are:

1. Xenon air cooled light fastness and weatherability tester
2. Launder-o-meter
3. Motorized crock meter
4. Perspirometer
5. Sublimation tester
6. Wet scrub abrasion tester
7. Spectrophotometer for colour matching
8. UV-Spectrophotometer
9. IR dyeing machine
10. Taber Abrasion tester
11. Flammability tester
12. L.O.I tester
13. Bundesmann/Shower tester
14. Hydrostatic pressure head tester
15. Water vapour permeability tester
16. Muffle furnace
17. Hot air oven
18. Humidity chamber
19. Universal Testing machine
20. Elmondrof Tear tester
21. Drape tester
22. Air permeability tester
23. Stiffness tester
24. Tuft withdrawal tester
25. ICI Pilling box tester
26. Thickness gauge
27. Bursting strength tester
28. Mathis lab coater
29. Lab mixing extruder
30. Flammability test apparatus

31. Melt flow index tester
32. Demattia Flex tester
33. UV transmission analyser

The key gaps in testing facilities identified at NITRA and IIT Delhi are:

Porosity chamber	Ozone analyser to observe dye resistance	Yarn torsion tester
Viscometer	Water cooled xenotester	Dynamic impact tester
Smoke Density chamber	Snagging tester	Projectile test cabinet
Horizontal flammability tester	Seam fatigue tester	EMC Analyser and system
Scratch tester	Fabric friction tester	RF Network analyser
Hydrostatic head tester	Abrasion resistance tester	Capillary porometer
Photomer (entry angle 5-60°)	Brush pilling tester	Liquid, gas and vapour permeameters
Rotary crock meter	Low stress mechanical property tester	Submicron particle counter

Accreditation agencies

It is necessary to obtain certain accreditations for the technical textile products manufactured in India to enable exports of the same to other countries as well as meet the necessary standards prescribed within India. The various accreditations and agencies are listed below:

- ISO 17025 – National Accreditation Board for Laboratories,
- ISO 9000 – International Standards Organization,
- National Association of Testing Authorities(NATA), Australia,
- Standards Council of Canada,
- Japan accreditation board for conformity assessment,
- International Accreditation Japan,
- United Kingdom accreditation system,
- International accreditation service,
- American association of laboratories accreditation,
- National voluntary laboratories accreditation program,
- German accreditation system for testing,
- Comite francais d' accreditation(COFRAC),
- Deutscher akkreditierungs rat(DAR),
- Raad Voor accreditatie(RVA)

8. Standards for Technical Textiles in other countries

Standards for Technical Textiles in Agrotech

S No	Test Parameter/Standard	Specification Standard	Scope
Fishing nets & Fishline and Fishing Ropes			
1	Fishing- nets - designation of netting yarns in the tex system	ISO 858	Specifies a method for the designation of netting yarns for fishing nets by the use of the nominal linear densities of the single yarn components or of their resultant linear density
2	Fishing nets — netting — basic terms and definitions	ISO 1107	Gives the principal terms relating to netting for fishing nets, together with their definitions or, in some cases, the method of expressing dimensions.
3	FISHING NETS — DESCRIPTION AND DESIGNATION OF KNOTTED NETTING	ISO 1530	Specifies the principal characteristics of knotted netting for fishing nets, and specifies the items of information to be furnished when ordering the netting.
4	Fishing nets – cutting knotted netting to shape (“tapering”)	ISO 1532	Defines the different kinds of cutting knotted netting to shape by straight cut, the types of cutting (n-, t- and bar-cut) and gives rules for the designation of the cutting rate.
5	Fishing nets - determination of breaking load and knot breaking load of netting yarns	ISO 1805	Specifies a method of testing the breaking load and knot breaking load of netting yarns for fishing nets.
6	Fishing nets — determination of mesh breaking force of netting	ISO 1806	Specifies a method of determining the mesh breaking force of netting for fishing.
7	Netting yarns - determination of change in length after immersion in water	ISO 3090	Specifies a method for determining the change in length of netting yarns after immersion in water.

S No	Test Parameter/Standard	Specification Standard	Scope
8	Fishing nets - Method of test for the determination of mesh size - Part 1: Opening of mesh	ISO 16663-1	ISO 16663-1:2003 specifies a method for the determination of size of opening of the mesh of fishing nets using a flat wedge gauge. It is applicable to active fishing gears.
9	Fishing nets - Method of test for the determination of mesh size - Part 2: Length of mesh	ISO 16663-2	ISO 16663-2:2003 specifies a method for the determination of mesh length of fishing nets using a ruler. It is applicable to passive fishing gears.
10	Fishing nets - Designation of netting yarns in the Tex System	ISO 858	As a general rule, netting yarns designated by their linear density or their resultant linear density are usually grey yarns without any preparation. Specifies general usage and complete designation and, for particular cases, brief designation.
	Fishing line - Determination of breaking load	AS 4470	Specifies a method for testing the breaking strength of monofilament nylon fishing line with the objective of providing fishing associations, testing bodies and competition fishermen with a uniform method of test and therefore comparison of results.
Shade fabrics			
11	Synthetic shadecloth	AS 4174	Specifies minimum strength requirements for shadecloth and a method for determining the cover factor of a shadecloth, giving colour coded designations for the various cover factor ranges. Provides methods of measuring and reporting the transmission of radiation of a shadecloth, including UV-visible radiation and solar radiation.
Agriculture Twines			

S No	Test Parameter/Standard	Specification Standard	Scope
12	Sisal agricultural twines	ISO 5080	Describes the principal characteristics of sisal agricultural twines, the methods of their verification and the mode of commercial presentation them.
13	Polyolefin agricultural twines	ISO 4167	ISO 4167:2005 specifies the principal properties of polyolefin agricultural twines, the test methods which permit their verification, and the form of delivery for the twines
14	Agricultural machinery - Pick-up balers - Safety	SS-EN 704	-
15	Twine for Automatic Balers	ANSI/ASAE S315.3	The purpose of this Standard is to provide uniform sisal and polyolefin agricultural twine specifications which will insure satisfactory performance in a properly adjusted baler knotter and have adequate durability in normal storage and handling of the baled material.
Baler			
16	Equipment for harvesting and conservation -- Round balers -- Terminology and commercial specifications	ISO 11450	This International Standard establishes terminology and the content of commercial literature specifications for round balers as defined in 3.2.
17	Baling Wire for Automatic Balers	ANSI/ASAE S229.6	This specification shall cover annealed baling wire for automatic balers. The wire shall be furnished in two sizes of coils: 960 m (3150 ft) minimum and 1981 m (6500 ft) minimum.
Horticulture twines			
18	Fiber ropes and cordage	ISO 1968	ISO 1968:2004 specifies vocabulary relating to fiber ropes and cordage
Flexible silos			
19	Buried flexible pipelines - Structural design - Commentary	AS/NZS 2566.1 Supp 1	Emphasizes the need for field compaction of the embedment material to be consistent with assumptions on which the equations are based.

S No	Test Parameter/Standard	Specification Standard	Scope
20	Farm silos - Determination of storage capacity	AS 3729	Sets out a method for determining volumetric capacity of farm silos used for storage of grain and other agricultural bulk materials. A method for converting volumetric storage capacity for various materials is given in an appendix.
21	Storage equipment for loose bulk materials - Safety code	ISO 8456	Gives special safety rules for storage equipment for loose bulk materials, such as hoppers, silos, storage bins and bunkers, and bin gates. These safety rules apply regardless of the use for which the equipment is intended.
Capillary non-wovens			
22	Textiles -- Test methods for nonwovens -- Part 6: Absorption	ISO 9073-6	This part of ISO 9073 describes methods for the evaluation of some aspects of the behaviour of nonwoven fabrics in the presence of liquids.

Standards for Technical Textiles in Sportech

S No	Test Parameter/Standard	Specification Standard	Scope
Parachute Fabrics			
1	Paragliding equipment - Paragliders - Part 1: Requirements and test methods for structural strength	DIN EN 926-1	This European Standard is applicable to paragliders as defined in 2.1. This part of EN 926 specifies requirements and test methods for the resistance of a paraglider to static and dynamic loads and sets the minimum strength threshold for its qualification
2	Aerospace series - Non-metallic materials - Textiles - Wide woven fabrics - Technical specification	ONORM EN 4416	This standard defines the requirements for manufacture, inspection and testing of wide woven fabrics for aerospace applications.

S No	Test Parameter/Standard	Specification Standard	Scope
3	Standard Test Method for Air Permeability of Textile Fabrics	ASTM D737-04	This test method covers the measurement of the air permeability of textile fabrics. This test method applies to most fabrics including woven fabrics, nonwoven fabrics, air bag fabrics, blankets, napped fabrics, knitted fabrics, layered fabrics, and pile fabrics. The fabrics may be untreated, heavily sized, coated, resin-treated, or otherwise treated.
4	Methods of test for textiles - Physical tests - Determination of permeability of fabrics	AS 2001.2.34	Sets out a method for determining the resistance of a fabric to the passage of air through it.
5	Paragliding equipment - Emergency parachutes - Safety requirements and test methods	ONORM EN 12491	-
Sports Footwear components			
6	Footwear - Test methods for insoles, lining and insocks - Perspiration resistance	ONORM EN 12801	-
7	Footwear - Test methods for insoles, lining and insocks - Perspiration resistance	ISO 22652	ISO 22652 specifies a method for the determination of the ageing of insoles, lining or insocks, caused by human sweat
8	Footwear - Test methods for insoles - Dimensional stability	ONORM EN 12800 ISO 22651	Specifies a method for the determination of the dimensional stability of insoles, irrespective of the material, after immersion in water.
9	Footwear - Test methods for insoles - Heel pin holding strength	ONORM EN 12745 ISO 20867	Specifies a method of determining the ability of an insole component to hold a heel pin and to prevent its head from being pulled through the insole component.

S No	Test Parameter/Standard	Specification Standard	Scope
10	Footwear - Performance requirements for components for footwear - Accessories	ISO/TR 20572	ISO/TR 20572:2007 establishes the performance requirements for accessories (laces and eyelets, metal components and touch and close fasteners) for footwear (not for finished footwear), irrespective of the material, in order to assess the suitability for the end use. It also establishes the test methods to be used to evaluate the compliance with the requirements.
11	Footwear - Test methods for insoles - Delamination resistance	ISO 20866	ISO 20866 specifies a test method for the determination of the delamination resistance of insoles, irrespective of the material.
12	Footwear - Test methods for accessories: shoe laces - Abrasion resistance	ISO 22774	ISO 22774:2004 specifies three test methods for determining the abrasion resistance of a shoelace, on repeated rubbing
13	Footwear - Standard atmospheres for conditioning and testing of footwear and components for footwear	ISO 18454	-
14	Footwear - Performance requirements for components for footwear - Shanks	ISO/TR 20883	ISO/TR 20883:2007 establishes the performance requirements for shanks components for footwear (not for finished footwear), irrespective of the material, in order to assess the suitability for the end use and/or fitness for purpose. It also establishes the test methods to be used to evaluate the compliance with the requirements.
15	Standard atmospheres for conditioning and testing of footwear and components for footwear	DIN EN 12222	The document sets out the general conditioning and testing atmospheres for the evaluation of footwear and footwear component properties. It defines two standard atmospheres for conditioning and testing of footwear and footwear components.
Artificial Turf			

S No	Test Parameter/Standard	Specification Standard	Scope
16	Standard Test Method for Relative Abrasiveness of Synthetic Turf Playing Surfaces	ASTM F1015-03	This test method is applicable to both laboratory and field measurement of synthetic turf surfaces used for sports.
17	Standard Test Methods for Comprehensive Characterization of Synthetic Turf Playing Surfaces and Materials	ASTM F1551-03	These test methods establish a recommended list of test methods to be used for the identification of physical property characteristics and comparison of the performance properties of synthetic turf systems or components for athletic and recreational uses, or both.
18	Surfaces for sports areas - Synthetic turf and needle-punched surfaces primarily designed for outdoor use - Part 1: Specification for synthetic turf	DIN EN 15330-1	Specifies performance and durability characteristics of synthetic turf sports surfaces used primarily outdoors. Under this 5 categories of surface are covered, as follows: - surfaces designed primarily for hockey, football, tennis, multi-sports use and for rugby union (training purposes) .
19	Surfaces for sports areas - Methods of test - Procedure for the preparation of synthetic turf and textile test pieces	AS 4693.8	Specifies the procedure for preperation of synthetic turf and textile test pieces
20	Surfaces for sports areas - Methods of test - Determination of water infiltration rate	AS 4693.5	Specifies the test method for determination of water infiltration rate of surfaces for sports.
Sleeping bags (Camping)			
21	Standard Test Method for Measurement of Sleeping Bags	ASTM F2568-06	This test method determines the internal girth, the internal length and width, and the external length and width of a sleeping bag under a standardized measurement method.
22	Standard Test Method for Flammability of Sleeping Bags	ASTM F1955-99	This test method covers a means to measure the end use flammability, for example, burn rate of sleeping bags which use various materials and constructions in their manufacture, and provides labeling requirements to facilitate the identification of products conforming to this test method.

S No	Test Parameter/Standard	Specification Standard	Scope
23	Standard Test Method for Measuring Thermal Insulation of Sleeping Bags Using a Heated Manikin	ASTM F1720-06	This test method covers determination of the insulation value of a sleeping bag or sleeping bag system. It measures the resistance to dry heat transfer from a constant skin temperature manikin to a relatively cold environment. This is a static test that generates reproducible results, but the manikin cannot simulate real life sleeping conditions relating to some human and environmental factors, examples of which are listed in the introduction.
24	Standard Test Method for Measuring Sleeping Bag Loft	ASTM F1932-98	This quantitative test method covers the determination of the loft of a sleeping bag under a standardized load.
25	Standard Test Method for Measuring Sleeping Bag Packing Volume	ASTM F1853-03	This test method covers the quantitative volume of a sleeping bag in a cylinder under a standardized load. This test method uses a physical volumetric measurement applicable in the laboratory or in the field.
26	Determination of dimensional characteristics of sleeping bags - Part 3: Volume under load and easiness of packaging	DIN EN 13538-3	This European Standard specifies a method of measurement of the volume under load of sleeping bags as specified in EN 13537 and a method of calculation of easiness of packing of sleeping bags filled with feather and/or down.
27	Determination of dimensional characteristics of sleeping bags - Part 2: Thickness and elastic recovery	DIN EN 13538-2	This European Standard specifies a method for the determination of the thickness and elastic recovery of sleeping bags filled with feathers and/or down.
28	Requirements for sleeping bags	DIN EN 13537	This standard specifies definitions and general requirements as well as provisions for marking and the Information supplied by the manufacturer for sleeping bags used in sports and leisure time activities.

S No	Test Parameter/Standard	Specification Standard	Scope
29	Standard Classification Index of and Descriptions of Textile Flammability Test Methods	ASTM D4723-07	This index provides lists of test methods used in the United States of America and Canada for measuring and describing the properties of textiles and textile products or assemblies in response to heat and flame under controlled laboratory conditions.
Tents			
30	Standard for Grandstands, Folding and Telescopic Seating, Tents, and Membrane Structures	NFPA 102	Covers the construction, location, protection and maintenance of tents and air-supported structures used for places of assembly; temporary, permanent and portable grandstands and bleachers; interior folding or telescopic seating normally used in gymnasiums, multi-use rooms and similar indoor mass seating.
31	Standard Test Method for Measuring the Headroom of a Backpacking or Mountaineering Tent	ASTM F1935-01	This test method covers tents for use in the sports of backpacking and mountaineering. It establishes requirements for the testing and marking of tents.
32	Standard Test Method for Weighing a Backpacking or Mountaineering Tent	ASTM F1934-98	This test method covers requirements for weighing and marking tents for use in the sports of backpacking and mountaineering.
33	Sports and recreational equipment - Fabrics for awnings and camping tents - Specification	ISO 10966	ISO 10966:2005 specifies the most important material characteristics for woven fabrics for awnings and camping tents. It can also be applied to other types of fabric.
Sports Nets			
34	Playing field equipment - Basketball equipment - Functional and safety requirements, test methods	DIN EN 1270	This European Standard specifies functional requirements and safety requirements for basketball equipment.
35	Playing field equipment - Volleyball equipment - Functional and safety requirements, test methods	DIN EN 1271	This European Standard specifies the functional requirements and the safety requirements for volleyball equipment.

S No	Test Parameter/Standard	Specification Standard	Scope
36	Playing field equipment - Badminton equipment - Functional and safety requirements, test methods	DIN EN 1509	This European Standard specifies the functional requirements and the safety requirements for badminton equipment.
37	Playing field equipment - Hockey goals - Functional and safety requirements, test methods	DIN EN 750	This European Standard specifies the functional requirements and the safety requirements for hockey equipment.
38	Playing field equipment - Football goals - Functional and safety requirements, test methods	DIN EN 748	This European Standard specifies the functional requirements and the safety requirements for football equipment.
39	Playing field equipment - Handball goals - Functional and safety requirements, test methods	DIN EN 749	This European Standard specifies the functional requirements and the safety requirements for handball and indoor hockey goals.
Sports Bags			
40	Standard Test Method for Measurement of Backpack Capacity	ASTM F2153-07	This test method determines and standardizes an unextended and extended capacity for backpacks and related bags. Related bags include lumbar packs, soft rucksacks, internal and external frame packs, duffel bags, and travel packs.
Sports composites			
41	Inflatable play equipment - Safety requirements and test methods	DIN EN 14960	This standard is applicable to inflatable play equipment intended for use by children fourteen years and under both individually and collectively.
42	Protective equipment for martial arts - Part 6: Additional requirements and test methods for breast protectors for females	DIN EN 13277-6	This European Standard specifies additional requirements and test methods for breast protectors for females used in unarmed martial arts such as Taekwondo, Karate, Kick-Boxing and similar disciplines.
43	Protective equipment for martial arts - Part 2: Additional requirements and test methods for instep protectors, shin protectors and forearm protectors	DIN EN 13277-2	The document specifies additional requirements and test methods for instep protectors, shin protectors and forearm protectors used in unarmed martial arts such as Taekwondo, Karate, Kick-Boxing and similar disciplines.

S No	Test Parameter/Standard	Specification Standard	Scope
44	Protective equipment for martial arts - Part 5: Additional requirements and test methods for genital protectors and abdominal protectors	DIN EN 13277-5	This European Standard specifies additional requirements and test methods for genital protectors and abdominal protectors used in unarmed martial arts such as Taekwondo, Karate, Kick-Boxing and similar disciplines.
45	Protective equipment for martial arts - Part 1: General requirements and test methods	DIN EN 13277-1	The document specifies the general requirements and test methods for innocuousness, ergonomics, cleaning, restraint, zone of protection, impact performance as well as provisions for marking and the information supplied by the manufacturer for protective equipment used in martial arts.

Standards for Technical Textiles inClothtech

S No	Test Parameter/Standard	Specification Standard	Scope
	Threads		
1	Yarns, short length method- Fiber fineness and mass	DIN 53830-3, ISO 7211-5,ASTM D 1059	Threads are removed from rectangular strips of fabric, the straightened length of a portion of them is determined and their mass is determined either in equilibrium with the standard atmosphere for testing textiles (method A) or oven-dry plus the commercial allowance given in ISO 6741/4 (method B). Linear density is calculated from the mass and the sum of the straightened length.
2	Yarns, skein method-Fiber fineness and mass	EN ISO 2060	Specifies a method for the determination of the linear density of all types of yarn in package form. Includes seven optional procedures based on different methods of conditioning and preparation.

S No	Test Parameter/Standard	Specification Standard	Scope
7	Yarn, direct count method- Fiber twist test	EN ISO 2061, ISO 7211-4	Specifies a method for the determination of the linear density of all types of yarn in package form. Includes seven optional procedures based on different methods of conditioning and preparation.
8	Yarns, untwist-retwist method- Fiber twist test	ISO/DIS 17202, ASTM D 1422	ISO 17202 specifies a method for the determination of the direction of twist in single yarns and the amount of twist, in terms of turns per unit length, by the indirect untwist/retwist method. It is applicable to single spun yarns.
9	Yarn, tensile strength	EN ISO 2062, ASTM 2256	Applies to all types of yarn except glass yarns, elastomeric yarns, aramid yarns, ceramic yarns, carbon yarns and polyolefin tape yarns. In this standard Four methods using constant rate of specimen extension tensile testers are specified.
10	Yarn strands, tensile tests for fiber strength	ISO 6939, ASTM D 1578	Applicable to spun single and folded yarns of any fiber or mixture of fibers manufactured by any spinning systems. Not recommended for testing filament yarns, glass yarns, more complex structures such as cabled yarns or cords.
11	Yarns and threads, knot tensile test- for fiber strength	DIN 53842-1	-
12	Testing the strength of yarns and threads from packages. Methods for determination of knot strength and loop strength	BS 1932-2	Specifies methods of testing the strength of yarns from packages. Determination of knot strength and loop strength
13	Methods of test for elastomeric threads. Polyurethane thread (elastane yarn)	BS 5421-2	Preparation of test specimens; mass per unit length; breaking load, tenacity and elongation at break; load at predetermined elongation; stress decay; set; resistance to copper staining; resistance to fume staining.
Ropes, Cordage and Clothesline			

S No	Test Parameter/Standard	Specification Standard	Scope
14	Fiber Ropes - Manila And Sisal - 3-, 4- And 8-strand Ropes	I.S. EN ISO 1181	Provides requirements for 3-strand hawser-laid and 4-strand shroud-laid ropes and 8-strand braided ropes for general service made of manila and sisal and gives rules for their designation.
15	Fiber ropes - Polyamide - 3-, 4- and 8-strand ropes	ISO 1140	ISO 1140:2004 specifies requirements for 3-strand hawser-laid and 4-strand shroud laid ropes and 8-strand braided ropes for general service made of polyamide and gives rules for their designation.
16	Fiber ropes - Polypropylene split film, monofilament and multifilament (PP2) and polypropylene high tenacity multifilament (PP3) - 3-, 4- and 8-strand ropes	ISO 1346	ISO 1346:2004 specifies requirements for 3-strand hawser-laid and 4-strand shroud laid ropes and 8-strand braided ropes for general service made of polypropylene and gives rules for their designation.
17	Fiber ropes - Polyethylene - 3- and 4-strand ropes	ISO 1969	ISO 1969:2004 specifies requirements for 3-strand hawser-laid and 4-strand shroud laid ropes for general service (excluding fittings) made of polyethylene and gives rules for their designation.
18	Fiber ropes - Determination of certain physical and mechanical properties	ISO 2307	ISO 2307:2004 specifies, for ropes of different kinds, a method of determining each of the following characteristics: linear density, lay length, braided pitch, elongation, and breaking force. The linear density, lay length and braided pitch are measured with the rope under a specified tension called the reference tension.
19	Fiber ropes - Three-strand hawser-laid and eight-strand plaited	AS 4142.2	This Standard specifies manufacturing and performance requirements for three-strand hawser-laid and eight-strand plaited rope made from natural or man-made textile staple fiber, monofilament or multifilament yarn.

S No	Test Parameter/Standard	Specification Standard	Scope
20	Methods of test for fiber ropes - Dimensions, linear density, breaking force and elongation	AS 4143.1	This Standard sets out methods for measuring the diameter, length of lay, linear density, breaking force and elongation of fiber rope.
21	Methods of test for fiber ropes - Knotability and knot breaking force	AS 4143.2	This Standard sets out methods for measuring the knotability and knot breaking force of fiber rope
22	Methods of test for fiber ropes - Resistance to flexion and surface abrasion	AS 4143.5	This Standard sets out methods for measuring the resistance to flexion and surface abrasion of fiber rope.
Shoe Laces and other shoe components			
23	Footwear - Test methods for insoles, lining and insocks - Perspiration resistance	ONORM EN 12801	-
24	Footwear - Test methods for insoles, lining and insocks - Perspiration resistance	ISO 22652	ISO 22652 specifies a method for the determination of the ageing of insoles, lining or insocks, caused by human sweat
25	Footwear - Test methods for insoles - Dimensional stability	ONORM EN 12800 ISO 22651	Specifies a method for the determination of the dimensional stability of insoles, irrespective of the material, after immersion in water.
26	Footwear - Test methods for insoles - Heel pin holding strength	ONORM EN 12745 ISO 20867	Specifies a method of determining the ability of an insole component to hold a heel pin and to prevent its head from being pulled through the insole component.
27	Footwear - Performance requirements for components for footwear - Accessories	ISO/TR 20572	ISO/TR 20572:2007 establishes the performance requirements for accessories (laces and eyelets, metal components and touch and close fasteners) for footwear (not for finished footwear), irrespective of the material, in order to assess the suitability for the end use. It also establishes the test methods to be used to evaluate the compliance with the requirements.

S No	Test Parameter/Standard	Specification Standard	Scope
28	Footwear - Test methods for insoles - Delamination resistance	ISO 20866	ISO 20866 specifies a test method for the determination of the delamination resistance of insoles, irrespective of the material.
29	Footwear - Test methods for accessories: shoe laces - Abrasion resistance	ISO 22774	ISO 22774:2004 specifies three test methods for determining the abrasion resistance of a shoelace, on repeated rubbing
Hook and Loop Fasteners			
30	Standard Test Method for Shear Strength (Dynamic Method) of Hook and Loop Touch Fasteners	ASTM D5169-98	This test method measures the shear strength of hook and loop touch (CRE) fasteners using a recording constant rate of extension tensile testing machine.
31	Standard Test Method for Peel Strength ("T" Method) of Hook and Loop Touch Fasteners	ASTM D5170-98	This test method covers the measurement of the peel strength of hook and loop touch fasteners using a recording constant-rate-of-extension tensile testing machine (CRE).
Narrow Fabrics			
32	Determination of the elasticity of fabrics - Part 3: Narrow fabrics	DIN EN 14704-3	This standard describes the methods of test, which can be used to measure the elasticity and related properties of narrow fabrics. Two methods are itemised one for the purposes of product quality assurance and the other for product performance in use.
33	Standard Test Method for Elongation of Narrow Elastic Fabrics (Static-Load Testing)	ASTM D5278-98	This test method determines the elongation characteristics of narrow elastic fabrics made from natural or man-made elastomers, either alone or in combination with other textile fibers, when tested with a static load testing procedure before or after laundering.

S No	Test Parameter/Standard	Specification Standard	Scope
34	Standard Test Method for Tension and Elongation of Elastic Fabrics (Constant-Rate-of-Extension Type Tensile Testing Machine)	ASTM D4964-96	This test method covers the measurement of tension and elongation of wide or narrow elastic fabrics made from natural or man-made elastomers, either alone or in combination with other textile yarns, when tested with a constant-rate-of-extension (CRE) type tensile testing machine.
35	Flexible Couplings - Mass Elastic Properties and Other Characteristics	ANSI/AGMA 9004-A99	This standard provides information and calculation methods related to Mass Elastic Properties of flexible couplings. Properties discussed are coupling weight, WR2, center of gravity, axial stiffness, axial natural frequency, lateral stiffness, lateral natural frequency and torsional stiffness.
Wadding			
36	General technical requirement for products with wadding fiber	GB 18383	-
Umbrella			
37	Standard Performance Specification for Woven Umbrella Fabrics	ASTM D4112-02	This performance specification covers woven fabrics comprised of any textile fiber or mixture of fibers to be used in umbrellas.
38	Textiles - Test methods for nonwovens - Part 17: Determination of water penetration (spray impact)	ISO 9073-17	ISO 9073-17:2008 specifies a method for measuring the resistance of fabrics to the penetration of water by impact. The water penetration (spray impact) test is applicable to fabrics that are expected to exhibit a degree of water resistance or water repellency.
Interlining			

S No	Test Parameter/Standard	Specification Standard	Scope
39	Test methods and minimum requirements for woven fusible interlinings for use in public sectors.	BS4973: Part 2 (1973) and Part 3 (1976)	In this standard, mass, bursting strength, flexibility and durability, and dimensional change on cold water immersion are specified for dimensional change on cold water immersion and minimum tensile strength in warp direction are specified for woven fusible interlinings.

Standards for Technical Textiles in Hometech

S No	Test Parameter/Standard	Specification Standard	Scope
		Stuffed toys	
1	Standard Consumer Safety Specification for Toy Safety	ASTM F963-07e1	This specification relates to possible hazards that may not be recognized readily by the public and that may be encountered in the normal use for which a toy is intended or after reasonably foreseeable abuse.
2	Children's toys (Safety requirements) - Constructional requirements	AS 1647.2	Specifies in two broad groups various hazards associated with constructional aspects of toys intended for use by children up to the age of 14 years. The first group of hazards is applicable to all toys. The second group of hazards relates to specific toys which, because of their design or their traditional play modes, present a particular hazard
3	Safety of toys - Part 1: Safety aspects related to mechanical and physical properties	ISO 8124-1/Amd2	This standard relates to safety aspects related to mechanical and physical properties

S No	Test Parameter/Standard	Specification Standard	Scope
4	Standard Consumer Safety Performance Specification for Public Use Play Equipment for Children 6 Months through 23 Months	ASTM F2373-08	This consumer safety performance specification provides safety and performance requirements for various types of public use play equipment such as, but not limited to, composite play structures, climbing structures, to-fro swings, spring rocking equipment, and slides.
Blinds			
5	Windows, doors, shutters and blinds - Bullet resistance - Requirements and classification	SS-EN 1522	Gives bullet resistance requirements and classification for windows, doors, shutters and blinds
6	Shutters and blinds - Additional thermal resistance - Allocation of a class of air permeability to a product	ONORM EN 13125	Gives the requirements for additional thermal resistance for shutters, blinds and related products.
7	Windows and curtain walling, doors, blinds and shutters - Determination of the resistance to soft and heavy body impact for doors	ONORM EN 949	Gives the methods of determination of the resistance to soft and heavy body impact for doors and related products.
Furniture and furniture components			
8	Standard Method of Test for Determining Resistance of Mock-Up Upholstered Furniture Material Assemblies to Ignition by Smoldering Cigarettes	NFPA 261	This method is designed to evaluate the ignition resistance of upholstered furniture when exposed to smoldering cigarettes under specified conditions.
9	Standard Methods of Tests and Classification System for Cigarette Ignition Resistance of Components of Upholstered Furniture	NFPA 260	Provides the performance results of upholstered furniture under conditions of exposure to a smoldering cigarette.
10	Standard Method of Test for Fire Characteristics of Upholstered Furniture Exposed to Flaming Ignition Source	NFPA 266	This test method, using an open calorimeter environment is used to determine heat release, smoke density, weight loss, and generation of carbon monoxide of upholstered furniture or full-scale mock-up furniture.
11	Furniture - Cribs and cradles for domestic use - Part 1: Safety requirements	SS-EN 1130-1	Specifies the safety requirements for Cribs and cradles used for domestic purposes.

S No	Test Parameter/Standard	Specification Standard	Scope
12	Furniture - Assessment of the ignitability of upholstered furniture - Ignition sources - Nominal 160 mL/min gas flame and nominal 350 mL/min gas flame	AS/NZS 3744.3	Sets out the method to be employed in assessing the ignitability of actual combinations of upholstered seating materials when subjected to gas flaming ignition sources.
13	Furniture -- Tests for surfaces -- Part 4: Assessment of resistance to impact	ISO 4211-4	The specified method is suitable for use either as a means of comparing different finishing systems or as a quality control test to ensure that a specified performance level is achieved or maintained.
14	Standard Specification for Flexible Cellular Materials-Urethane for Furniture and Automotive Cushioning, Bedding, and Similar Applications	ASTM D3453-07	This specification covers flexible cellular urethane materials intended for such uses as inserts for furniture cushions, mattresses, and similar applications.
15	Furniture - Assessment of the ignitability of upholstered furniture - Ignition source - Smouldering cigarette	AS/NZS 3744.1	Gives the test method for assessment of ignitibility of upholstered furniture
Mattress Components			
16	Standard Test Method for Determining the Heat Release Rate of Upholstered Furniture and Mattress Components or Composites Using a Bench Scale Oxygen Consumption Calorimeter	ASTM E1474-07	This fire-test-response test method can be used to determine the ignitability and heat release from the composites of contract, institutional, or high-risk occupancy upholstered furniture or mattresses using a bench scale oxygen consumption calorimeter.
17	Standard Method of Test for Fire Characteristics of Mattresses and Bedding Assemblies Exposed to Flaming Ignition Source	NFPA 267	This test method, using an open calorimeter environment is used to determine heat release, smoke density, weight loss, and generation of carbon monoxide of mattresses and bedding assemblies.
18	Standard Test Method to Evaluate Edge Binding Components Used in Mattresses After Exposure to An Open Flame	ASTM D7016-07	This standard measures the flammability characteristics of mattress edge bindings and sewing threads during and after exposure to an open flame ignition source.

S No	Test Parameter/Standard	Specification Standard	Scope
19	Standard Test Method for Fire Testing of Mattresses	ASTM E1590-07	This test method provides a means of determining the burning behavior of mattresses used in public occupancies by measuring specific fire test responses when the test specimen, a mattress or mattress with foundation, is subjected to a specified flaming ignition source under well ventilated conditions.
20	Textiles - Mattress ticking - Specifications and test methods	DIN EN 14976	This European Standard specifies properties, test methods (other than flammability) and minimum requirements for ticking (woven, nonwoven or knitted), suitable for covering mattresses, divans and bed bases which are intended for residential (domestic) use, and for use in the public sector and contract markets.
21	Textiles - Burning behaviour of bedding items - Part 1: General test methods for the ignitability by a smouldering cirgarette	ISO 12952-1	This European Standard specifies a general test method common to all bedding items, for assessment of their ignitability when subjected to a smouldering cigarette.
22	Feather and down - Specification for feather and down filled bedding articles	ONORM EN 13186	-
23	Standard Test Methods for Cigarette Ignition Resistance of Components of Upholstered Furniture	ASTM E1353-08A	These test methods are designed for the assessment of the resistance of upholstered furniture component assemblies to combustion after exposure to smoldering cigarettes under specified conditions.
24	Textiles - Mattress ticking - Specifications and test methods	ONORM EN 14976	Gives the specifications and test methods for mattress tockings
Carpet Backing			
25	Textile floor coverings -- Jute carpet backing fabric -- Specification	ISO 11860	This International Standard specifies requirements for primary and secondary jute carpet backing fabrics.

S No	Test Parameter/Standard	Specification Standard	Scope
26	Standard Specification for Rubber Cellular Cushion Used for Carpet or Rug Underlay	ASTM D3676-07	This specification covers high-density cellular rubber adhered to carpet, rugs, or various substrates for use as separate underlay. This standard may also be used as a specification for separately blown sponge used as carpet underlay.
Wipes			
27	Standard Test Method for Determining the Dynamic Wiping Efficiency of Nonwoven Fabrics Not Used in Cleanrooms	ASTM D6702-01	This test method covers the quantifying of the dynamic wiping efficiency of nonwoven fabrics.
28	Standard Test Method for Surface Water Absorption of Terry Fabrics (Water Flow)	ASTM D4772-97	This test method determines the ability of a terry fabric to rapidly absorb and retain liquid water from surfaces such as human skin, dishes, and furniture.
Vaccum Filters			
29	Household and similar electrical appliances - Safety - Particular requirements for wet and dry vacuum cleaners, including power brush, for industrial and commercial use	AS/NZS 60335.2.69	Gives the safety requirements for household and similar electrical appliances including vaccum cleaners
30	Household and similar electrical appliances - Safety - Part 2-2: Particular requirements for vacuum cleaners and water-suction cleaning appliances	IEC 60335-2-2 Ed. 5.2 B	Deals with the safety of electric vacuum cleaners and water-suction cleaning appliances for household and similar purposes, including vacuum cleaners for animal grooming, their rated voltage being not more than 250 V
HVAC Filters			
31	The HVAC Commissioning Process	ASHRAE GDL 1	Describes the commissioning process that will ensure heating, ventilating, and air-conditioning (HVAC) systems perform in conformity with design intent. Covers each phase of the commissioning process for all types and sizes of HVAC systems, from pre-design through final acceptance and post-occupancy, including changes in building and occupancy requirements after initial

S No	Test Parameter/Standard	Specification Standard	Scope
			occupancy.
32	Ventilation for buildings - Performance testing of components/products for residential ventilation - Part 8: Performance testing of un-ducted mechanical supply and exhaust ventilation units	DIN EN 13141-8	This European Standard specifies methods for the performance testing of components used in residential ventilation systems
33	German construction contract procedures - Part C: General technical specifications for building works - Room ventilation systems	DIN 18379	The document specifies the contract conditions regarding materials, workmanship, ancillary labours and invoicing to be obeyed in the execution of room ventilating systems
Webbing			
34	Standard Test Method for Abrasion Resistance of Textile Webbing (Hex Bar Method)	ASTM D6770-07	This test method covers the determination of abrasion resistance of textile webbing using a hex bar abrasion tester. The resistance is expressed as a percentage of retained break strength.
35	Standard Test Method for Breaking Strength and Elongation of Textile Webbing, Tape and Braided Material	ASTM D6775-02	This test method covers the determination of the breaking strength and elongation of textile webbing, tape and braided materials using a split-drum type specimen clamp.
Sewing Thread			

S No	Test Parameter/Standard	Specification Standard	Scope
36	Standard Specification for Glass Fiber Cord and Sewing Thread	ASTM D4030-04	This specification covers the requirements for continuous glass filament sewing thread; and continuous filament cord, untreated and neoprene treated.
37	Standard Specification for Labeled Length per Holder of Sewing Thread	ASTM D3693-02	This specification covers requirements for the labeled lengths of sewing threads of all materials.
38	Methods of test for textiles - Dimensional change - Determination of dimensional change of yarns and sewing threads	AS 2001.5.6	Sets out a method for determining the dimensional change of yarns and sewing threads after immersion in a standard test solution. Two alternative test solution temperatures are given.

Standards for Technical Textiles in Indutech

S No	Test Parameter/Standard	Specification Standard	Scope
Conveyor Belts			
1	Methods of testing conveyor and elevator belting - Determination of combustion propagation characteristics of conveyor belting	AS 1334.12	Specifies a method for determining the propagation characteristics of a horizontally orientated specimen of conveyor belting.
2	Conveyor belting - Textile reinforced	AS 1332	Specifies requirements for conveyor belting made of elastomeric materials with textile reinforcement, intended for use on conveyors using flat or troughed idlers, and on slide bed or bucket elevators.
3	Conveyor belting of elastomeric and steel cord construction	AS 1333	Specifies requirements for conveyor belting of elastomeric materials and steel cord construction in which the carcass is composed of a plane of steel cords with or without supplementary reinforcements.

S No	Test Parameter/Standard	Specification Standard	Scope
4	Conveyor belts with textile carcass - Widths and lengths	ISO 251	ISO 251:2003 specifies the widths and lengths of conveyor belts with a textile carcass. It also specifies the corresponding tolerances.
5	Light conveyor belts - Part 1: Principal characteristics and applications	ISO 21183-1	ISO 21183-1:2005 describes the principal characteristics and applications of light conveyor belts. This description is necessary either for limiting the validity of certain standards to light conveyor belts or for excluding light conveyor belts from the validity of certain standards.
6	Light conveyor belts -- Tolerances on widths and lengths of cut light conveyor belts	ISO 15147	This standard specifies methods for the measurement of widths and lengths of cut light conveyor belts as described in EN 873 and specifies the tolerances on the dimensions.
7	Conveyor belts - Test atmospheres and conditioning periods	ISO 18573	ISO 18573:2003 specifies the temperature, humidity and time conditions used for the conditioning and testing of all types of conveyor belt, irrespective of whether they have plastics or rubber covers.
8	Light conveyor belts - Principal characteristics and applications	SS-EN 873	-
Hoses			
9	Methods of test for hose made from elastomeric materials - Determination of reeling properties of non-collapsible hose	AS 1180.14	Specifies the method for determining the reeling properties of non-collapsible hose with internal diameters up to 75 mm and intended for winding onto a reel. Reagents, apparatus, test pieces, procedures for petroleum-resistant hose and hose other than petroleum-resistant hose are laid down.
10	Plastics hoses - General purpose collapsible water hose, textile reinforced - Specification	ONORM EN 28029	Gives the specification for general purpose collapsible water hose

S No	Test Parameter/Standard	Specification Standard	Scope
11	Rubber hoses and hose assemblies for underground mining - Textile-reinforced air and water type	ISO/TR 8354	Specifies the requirements for one type of textile reinforced hose for use with air and water having a design working pressure from 0.7 to 1.4 MPa, dependent upon the bore size.
12	Standard on Fire Hose	NFPA 1961	Covers design, and design verification testing of new fire hose, specified as attack hose, rack and reel hose, forestry hose, and supply hose.
Ropes and Cordages			
13	Polyester fiber ropes - Double braid construction	DIN EN 14684	This European Standard specifies requirements for double braided ropes and for high performance double braid ropes made of polyester and given rules for their designation
14	Mixed polyolefin fiber ropes	DIN EN 14687	This European Standard specifies requirements for 3-strand hawser-laid, 4-strand shroud laid, 8-strand braided and 12-strand braided ropes made of mixed polyolefin fibers and given rules for their designation.
15	Fiber ropes - General specifications	ISO 9554	ISO 9554 specifies the general characteristics of fiber ropes and their constituent materials. ISO 9554:2004 is intended to be used in conjunction with the standards for the individual types of fiber rope, which cover the physical properties and specific requirements for that particular product type.
16	Packaging - Cordage	AS 2400.11	Provides guidance on the choice and use of twines and cords in securing packages or the top layer of unit loads.
17	Methods of testing materials for resistance to fungal growth - Resistance of cordage and yarns to fungal growth	AS 1157.3	-

S No	Test Parameter/Standard	Specification Standard	Scope
18	Ropes and cordage -- Equivalence between natural fiber ropes and man-made fiber ropes for use in the mooring of vessels	ISO 3505	Ropes made from man-made fibers are now very widely used for mooring and towing and it is important that sizes of the various man-made ropes which are equivalent to natural fiber ropes should specified in an international agreement. Equivalence between natural fiber and man-made fiber ropes (recommended minimal values) is laid down in a table.
19	Fiber ropes - Polyethylene - 3- and 4-strand ropes	ISO 1969	ISO 1969:2004 specifies requirements for 3-strand hawser-laid and 4-strand shroud laid ropes for general service (excluding fittings) made of polyethylene and gives rules for their designation.
20	Fiber ropes - Polyamide - 3-, 4- and 8-strand ropes	ISO 1140	ISO 1140:2004 specifies requirements for 3-strand hawser-laid and 4-strand shroud laid ropes and 8-strand braided ropes for general service made of polyamide and gives rules for their designation.
		Drive belts	
21	Belt Driven Live Roller Conveyors	ANSI/CEMA 403	The standard establishes recommended design and application engineering practice for this popular type of conveyor.
22	Belt drive - V-ribbed belts for the automotive industry - Fatigue test	ISO 11749	Refers to a dynamic test method for the quality control of V-ribbed belts which are used predominantly in the automotive industry
23	V-belt and V-ribbed Belt Drives For Agricultural Machines	ASAE S211.5	The purpose of this Standard is to provide sufficient technical data for the uniform physical application of belt drives to farm machines and mobile industrial equipment. Use of this Standard will contribute to the design of simple and economical drives.

S No	Test Parameter/Standard	Specification Standard	Scope
24	Endless wedge belt and V-belt drives	AS 2784-2002	Specifies dimensions and certain other properties of endless wedge belts, V-belts and their corresponding grooved pulleys for power transmission.
25	Belt drives - V-belts for the automotive industry and corresponding pulleys - Dimensions	ISO 2790	ISO 2790:2004 specifies the requirements for belts and pulleys for V-belt drive used for driving auxiliaries of the internal combustion engines for the automotive industry.
Computer Ribbon			
26	Standard Test Method for Determining the Yield of Wide Inked Computer Ribbons	ASTM F153-95	This test method covers the determination of the yield of a wide (7 to 17 in. in width) inked computer ribbon.
27	Standard Test Method for Comparing Multistrike Film Ribbons	ASTM F1051-00	This test method covers information and techniques for evaluating several performance qualities of multistrike film typewriter/printer ribbons on a comparative basis for general office use. It is not intended for specialized applications such as optical character recognition.
Battery Separator			
28	Standard Test Method for Determination of Ion Exchange Capacity (IEC) in Grafted Battery Separator	ASTM D7131-05	This test method evaluates an important characteristic of polyolefin or other fibrous nonwoven sheet material intended for use in alkaline battery separator applications.
29	Standard Test Method for Determining the Ionic Resistivity (ER) of Alkaline Battery Separator Using a Carbon Electrode in an Electrolyte Bath Measuring System	ASTM D7148-07	This test method covers the pretreatment, test conditions, apparatus, and procedure to determine the ionic resistivity, commonly referred to in the battery industry as electrical resistance (ER) of an alkaline battery separator immersed in an electrolyte of 40 % potassium hydroxide (KOH).

S No	Test Parameter/Standard	Specification Standard	Scope
30	Standard Test Method for Determination of Ammonia Trapping in a Grafted Battery Separator	ASTM D7129-05	This test method covers the measurement of the ability of a material to capture ammonia. This test method is intended primarily for testing grafted polyolefin materials used as a battery separator, although other materials could be tested.
Bolting Cloth			
31	Textiles - Cloth, duck - Cotton and polyester/cotton	AS 3567	Specifies requirements for duck and cloths of special weave made from cotton, blended polyester/cotton and corespun polyester/cotton yarns. Requirements are given for loomstate cloths and also cloths which have been treated for rot and water resistance.
32	Standard Specification for Industrial Woven Wire Cloth	ASTM E2016-06	This specification covers industrial woven wire fabric, referred to as wire cloth, for general use including the separation of particles.
Wipes			
33	Standard Test Method for Determining the Dynamic Wiping Efficiency of Nonwoven Fabrics Not Used in Cleanrooms	ASTM D6702-01	This test method covers the quantifying of the dynamic wiping efficiency of nonwoven fabrics.
34	Standard Test Method for Surface Water Absorption of Terry Fabrics (Water Flow)	ASTM D4772-97	This test method determines the ability of a terry fabric to rapidly absorb and retain liquid water from surfaces such as human skin, dishes, and furniture.
Brushes			
35	Standard Guide for Preparing Specifications for Miniature Brushes of Composite Materials for Sliding Electric Contacts	ASTM B613-76	This guide defines the criteria for composition, properties, and other requirements for brushes containing a matrix of one or more conducting metallic elements or alloys and one or more lubricating lamellar solids.
36	Power-driven brushes - Part 2: Safety requirements	ONORM EN 1083-2	-

S No	Test Parameter/Standard	Specification Standard	Scope
37	Standard Test Method for Evaluation of Cleanability of Paint Brushes	ASTM D5913-96	This test method covers a laboratory procedure for the evaluation or comparison of the cleanability of paint brushes, or both, when used with latex paints.
38	Standard Guide for Application and Evaluation of Brush and Roller Applied Paint Films	ASTM D7073-05	This guide describes procedures for the application of brush or roller, or both, applied paint films to sealed wallboard for evaluating application properties.
Abrasives			
39	Coated abrasives - Abrasive rolls	AS 4638	Specifies the dimensions and limit deviations for coated abrasive rolls and their designation.
Cigarette filters			
40	Cigarettes - Determination of the smoke condensate retention index of a filter - Direct spectrometric method	ISO 4388	Specifies an empirical, quick and practical method which relates only to smoke condensate. The results should not be interpreted with respect to any particular constituent of the smoke condensate.
41	Cigarettes - Determination of alkaloid retention by the filters - Spectrometric method	ISO 3401	Specifies a direct and a indirect method. Describes the principle, the reagents, the apparatus, the sampling, the test procedures, the expression of results, and the contents of the test report.
42	Tobacco and tobacco products - Draw resistance of cigarettes and pressure drop of filter rods - Standard conditions and measurement	ISO 6565	This International Standard describes a method for the measurement of the draw resistance of cigarettes and pressure drop of filter rods, and specifies the standard conditions applicable to such measurements. It is applicable to cigarettes, filter rods and, by extension, to cylindrical tobacco products similar to cigarettes.

Standards for Technical Textiles in Protech

S No	Test Parameter/Standard	Specification Standard	Scope
Fire Retardant Textiles			
1	Standard on Protective Clothing for Proximity Fire Fighting	NFPA 1976	Specifies minimum design and performance criteria and test methods for protective clothing designed to provide limb/torso protection for fire fighters against adverse environmental effects encountered during proximity fire fighting operations.
2	Standard on Protective Clothing and Equipment for Wildland Fire Fighting	NFPA 1977	This standard specified the minimum design and performance criteria and test methods for protective clothing, helmets, gloves, footwear, and fire shelters to protect fire fighters against the adverse effects to the fire fighter's body during wildland fire fighting.
3	Standard on Protective Ensemble for Proximity Fire Fighting	NFPA 1976	Specifies minimum design and performance criteria and test methods for protective clothing designed to provide limb/torso protection for fire fighters against adverse environmental effects encountered during proximity fire fighting operations.
4	Standard on Protective Ensemble for Structural Fire Fighting	NFPA 1971	Covers minimum design and performance criteria and test methods for protective clothing designed to protect fire fighters against adverse environmental effects during structural fire fighting.
5	Protective clothing for firefighters - Test methods and requirements for reflective clothing for specialized fire fighting	SS-EN 1486	-

S No	Test Parameter/Standard	Specification Standard	Scope
6	Standard Test Method for Evaluation of Flame Resistant Clothing for Protection Against Flash Fire Simulations Using an Instrumented Manikin	ASTM F1930-00	This test method covers quantitative measurements and subjective observations that characterize the performance of single layer garments or protective clothing ensembles in a simulated flash fire environment having controlled heat flux, flame distribution, and duration. This test method is extremely complex and requires a high degree of technical expertise in both the test setup and operation.
7	Protective clothing for firefighters - Laboratory test methods and performance requirements for wildland firefighting clothing	ISO 15384	ISO 15384:2003 specifies methods of test and minimum performance requirements for protective clothing to be worn in wildland firefighting and associated activities.
8	Methods for evaluating clothing for protection against heat and fire - Evaluation of heat transmission of materials and material assemblies when exposed to flame	AS/NZS 4502.2	Sets out a method for determining the behaviour of protective clothing or its constituents when exposed to flame.
9	Guide to the evaluation of the effectiveness of fire retardants	AS 3758	Provides general guidelines on relevant considerations for evaluating the effectiveness of fire retardants.
Protective textiles against heat and cold			
11	Standard on Liquid Splash-Protective Clothing for Hazardous Materials Emergencies	NFPA 1992	Covers design criteria, performance criteria, and test methods for Liquid Splash-Protective Suits designed to protect emergency response personnel against exposure to specified chemicals in liquid-splash environments during hazardous chemical emergencies.
12	Methods for evaluating clothing for protection against heat and fire - Evaluation of the contact heat transmission through material and material assemblies	AS/NZS 4502.5	Sets out a method for determining the contact heat transmission of protective clothing or its constituents in the range of 100°C to 500°C.

S No	Test Parameter/Standard	Specification Standard	Scope
13	Standard Performance Specification for Protective Clothing for Use by Workers Exposed to Specific Molten Substances and Related Thermal Hazards	ASTM F1002-06	This performance specification covers textile materials to be used for protective clothing. Materials used for both primary protection and for secondary protection are covered.
14	Clothing for protection against heat and flame - Test methods and performance requirements for heat-protective clothing	ISO 11612	This International Standard is applicable to protective clothing for workers exposed to heat. The clothing consists of outer garments made from flexible material to protect specific parts of the body. Hoods and gaiters are included but all other types of protection for the head, hands and feet are excluded.
15	Clothing for protection against heat and flame - Determination of contact heat transmission through protective clothing or constituent materials - Part 1: Test method using contact heat produced by heating cylinder	ISO 12127-1	ISO 12127-1:2007 specifies a test method for the determination of contact heat transmission. It is applicable to protective clothing (including hand protectors) and its constituent materials intended to protect against high contact temperatures.
16	Methods for evaluating clothing for protection against heat and fire - Evaluation of the behaviour of materials and material assemblies when exposed to small splashes of molten metal	AS/NZS 4502.3	Sets out a method for determining the resistance of materials used in the manufacture of protective clothing to small splashes of molten metal.
Cut, Slash Protection Apparel			
17	Protective clothing for users of hand-held chainsaws - Protective legwear	AS/NZS 4453.3	Specifies the requirements for the design and performance of protective trousers and leggings (chaps) for users of hand-held chainsaws.

S No	Test Parameter/Standard	Specification Standard	Scope
18	Standard Test Method for Evaluating Heat Transfer through Materials for Protective Clothing Upon Contact with Molten Substances	ASTM F955-07	This test method covers the evaluation of materials' thermal resistance to molten substance pour by describing means of measuring heat transfer. Note 1As used in this test method, the term molten substance refers to the three compositions (aluminum, brass, and iron) for which the procedure was validated. The test design may be adapted for use with other substances not validated as part of the test method.
19	Occupational protective clothing - Guidelines on the selection, use, care and maintenance of protective clothing	AS/NZS 4501.1	Set out guidance for the selection, use, care and maintenance of clothing designed to provide protection to the wearer.
20	Standard Test Method for Measurement of Cut Resistance to Chain Saw of Foot Protective Devices	ASTM F1458-04	This test method measures cut resistance of foot protective devices that are designed to protect the foot when operating a chain saw.
21	Standard Test Method for Measurement of Cut Resistance to Chain Saw in Lower Body (Legs) Protective Clothing	ASTM F1414-04	This test method measures cut resistance of garments and devices worn to protect the lower (legs) body when operating a chain saw.
Protective gloves for welders			
22	Protective gloves for welders	DIN EN 12477	The project gives additional requirements for electrical vertical resistance and an additional requirement to the design with respect to electrical conductivity.
23	Protective gloves - General requirements and test methods	ONORM EN 420	-
Face Mask			
24	Mesh type eye and face protectors for industrial and non-industrial use against mechanical hazards and/or heat	SS-EN 1731	-

S No	Test Parameter/Standard	Specification Standard	Scope
25	Eye and Face Protectors	CSA Z94.3-07	This Standard applies to eye and face protectors used in all occupational and educational operations or processes involving hazards to the eyes or face. Typical hazards include flying objects and particles, splashing liquids, molten metal, and ultraviolet, visible, and infrared radiation, but do not include X-rays, gamma rays, high-energy particulate radiation, radioactive materials, lasers, or masers.
Dust Protection Textile			
26	Protective clothing for use against solid particulates - Part 2: Test method of determination of inward leakage of aerosols of fine particles into suits	ISO 13982-2	ISO 13982-2:2004 specifies a test method to determine the barrier efficiency of chemical protective clothing against aerosols of dry, fine dusts
Radiation protection textiles			
27	Protective devices against diagnostic medical X-radiation - Protective clothing and protective devices for gonads	AS/NZS 4543.3	Provides requirements for the design and manufacture of clothing and devices for protection against X-radiation.
28	Protective clothing against radioactive contamination - Part 1: Requirements and test methods for ventilated protective clothing against particulate radioactive contamination	SS-EN 1073-1	-
29	Textiles - Solar UV protective properties - Part 2: Classification and marking of apparel	DIN EN 13758-2	This European Standard specifies the requirements for marking of clothing which are designed to offer the wearer protection against solar ultraviolet radiation exposure.
30	Protective devices against diagnostic medical X-radiation - Determination of attenuation properties of materials	AS/NZS 4543.1	Specifies the methods of determining and indicating the attenuation properties of protective devices against X-radiation.
Chemical Protection Textiles			

S No	Test Parameter/Standard	Specification Standard	Scope
31	Protective clothing - Protection against liquid chemicals - Test method: Determination of resistance to penetration by a jet of liquid (Jet test)	AS/NZS 4503.2	Sets out a method for determining the resistance of materials or their constituents used in the manufacture of protective clothing to penetration by a jet of water.
32	Protective clothing - Protection against liquid chemicals - Test method: Determination of resistance to penetration by spray (Spray Test)	AS/NZS 4503.3	Sets out a method for determining the resistance of materials used in the manufacture of protective clothing to penetration by a spray of water.
33	Standard Practice for Chemical Protective Clothing Program	ASTM F1461-07	This practice is intended to promote the proper selection, use, maintenance, and understanding of the limitations of chemical protective clothing (CPC) by users, employers, employees, and other persons involved in programs requiring CPC, thereby limiting potentially harmful and unnecessary skin exposures.
Ballistic Protective Clothing -- Bullet Proof Jackets			
34	Anti-Ballistic	NIJ Standard-0101.4	Details the ballistics resistance requirements of police body armor.
Reflective materials - Foul Weather Clothing			
35	Rubber- or plastics-coated fabrics for water-resistant clothing - Specification	Rubber- or plastics-coated fabrics for water-resistant clothing - Specification	ISO 8096:2005 specifies the requirements for water vapour permeable and non water vapour permeable coated fabrics suitable for use in the construction of water penetration resistant clothing. The standard does not address the method of fabrication of the garment.

Standards for Technical Textiles in Mobiltech

S No	Test Parameter/Standard	Specification Standard	Scope
Seat Belts			

S No	Test Parameter/Standard	Specification Standard	Scope
1	Seat belt assemblies for motor vehicles	AS/NZS 2596	Specifies requirements for seat belt assemblies for use in motor vehicles, excluding larger buses, trucks and specially constructed vehicles. It adopts the technical requirements of ECE Regulation No 16 with some Australian/New Zealand variations
2	Earth-moving machinery - Seat belts and seat belt anchorages - Performance requirements and tests	ISO 6683	Sets out requirements for seat belt assemblies for operators of earthmoving machines. The seat belts are intended to be fitted to machines fitted with roll-over protective structures (ROPS).
3	Restraint systems for motor vehicles - Performance tests - Determination of webbing durability in withdrawing and retracting duty through a sash guide	AS/NZS 4475.2	ISO 6683:2005 establishes the minimum performance requirements for restraint systems -- seat belts and their fastening elements (anchorages) -- on earth-moving machinery and specially designed forestry machines, necessary to restrain an operator or rider within a roll-over protective structure (ROPS) in the event of a machine roll-over , or within a tip-over protection structure (TOPS) in the event of a machine tip-over
4	Webbing for restraining devices for occupants of motor vehicles	AS 1753	Specifies requirements for webbing for restraining devices, and gives methods of test. Webbing complying with this Standard is intended for adult seat belts and child restraints, but may be suitable for other applications. Produced as a Joint Australian/New Zealand Standard.
Helmets			
5	Methods of testing protective helmets - Determination of stability of protective helmets - Dynamic stability	AS/NZS 2512.7.2	-
6	Methods of testing protective helmets - Measurement of peak	AS/NZS 2512.8	-

S No	Test Parameter/Standard	Specification Standard	Scope
	deflection		
7	Methods of testing protective helmets - Determination of penetration resistance	AS/NZS 2512.4	-
8	Methods of testing protective helmets - Determination of strength of retention system - Static strength	AS/NZS 2512.5.1	-
9	Methods of testing protective helmets - Determination of strength of retention system - Dynamic strength	AS/NZS 2512.5.2	-
10	Methods of testing protective helmets - Determination of impact energy attenuation - Helmet drop test	AS/NZS 2512.3.1	-
11	Methods of testing protective helmets - Determination of impact energy attenuation - Striker drop test	AS/NZS 2512.3.2	Sets out a method for determining the impact energy of a helmet, temple protector or faceguard, intended for use in a sport where there is danger of being injured by a ball or puck.
12	Protective helmets for vehicle users	AS/NZS 1698	-
13	Protective helmets - Test methods - Part 8: Electrical properties	DIN EN 13087-8	This European Standard describes methods of test for protective helmets. The purpose of these tests is to enable assessment of the performance of the helmet as specified in the appropriate helmet standard. This standard specifies the methods of test for electrical properties.
14	Protective helmets - Test methods - Part 6: Field of vision	DIN EN 13087-6	The document describes methods of test for protective helmets. The purpose of these tests is to enable assessment of the performance of the helmet as specified in the appropriate helmet standard. The document specifies the method of test for field of vision.

S No	Test Parameter/Standard	Specification Standard	Scope
15	Protective helmets - Test methods - Part 4: Retention system effectiveness	DIN EN 13087-4	The document describes methods of test for protective helmets. The purpose of these tests is to enable assessment of the performance of the helmet as specified in the appropriate helmet standard. It specifies the method of test for retention system effectiveness.
16	Protective helmets - Test methods - Part 7: Flame resistance	DIN EN 13087-7	The document describes methods of test for protective helmets. The purpose of these tests is to enable assessment of the performance of the helmet as specified in the appropriate helmet standard. The document specifies the methods of test for flame resistance.
17	Protective helmets - Test methods - Part 3: Resistance to penetration	DIN EN 13087-3	The document describes methods of test for protective helmets. It specifies the methods of test for resistance to penetration.
18	Protective helmets - Test methods - Part 2: Shock absorption	DIN EN 13087-2	The document describes methods of test for protective helmets. It specifies the methods for determination of shock absorption.
19	Protective helmets - Test methods - Part 5: Retention system strength	DIN EN 13087-5	The document describes methods of test for protective helmets. The purpose of these tests is to enable assessment of the performance of the helmet as specified in the appropriate helmet standard. The document specifies the method of test for retention system strength.
20	Protective helmets - Test methods - Part 1: Conditions and conditioning	DIN EN 13087-1	The document describes methods of test for protective helmets. It specifies conditions and conditioning to be used when testing protective helmets.
Air and Oil Filters			

S No	Test Parameter/Standard	Specification Standard	Scope
21	Air filters for use in general ventilation and air-conditioning - Application, performance and construction	AS 1324.1	Specifies requirements for the performance and construction of air filters for use in general ventilation and air-conditioning systems. It classifies air filters on the basis of design, construction performance and application and establishes minimum criteria for acceptance of an air filter into a particular category. It does not apply to HEPA filters.
22	Standard Test Method for Air Cleaning Performance of a High-Efficiency Particulate Air- Filter System	ASTM F1471-93	This test method covers the procedure and equipment for measuring the penetration of test particles through high-efficiency particulate air (HEPA) filter systems using a laser aerosol spectrometer (LAS).
23	Air filters for use in general ventilation and air-conditioning - Methods of test	AS 1324.2	Provides a method for laboratory or bench testing of air filters used in general ventilation and air-conditioning systems.
24	Standard Specification for Filters Used in Air or Nitrogen Systems	ASTM F1791-00	This specification covers the design, construction, test, and performance requirements for air or nitrogen system filters, referred to hereinafter as filters. These filters are intended to be installed in-line to protect equipment from particular contamination.
25	Road vehicles - Filter elements for full flow oil filters	ISO 7747	Specifies the essential dimensional characteristics necessary for the interchangeability of filter elements. Most filter elements are specified with two alternative internal diameters; however, the values listed in the "preferred" column of the table are recommended for future equipment.

S No	Test Parameter/Standard	Specification Standard	Scope
26	Methods of test for full-flow lubricating oil filters for internal combustion engines - Part 9: Inlet and outlet anti-drain valve tests	ISO 4548-9	ISO 4548-9:2007 specifies methods of measuring the effectiveness of either inlet or outlet anti-drain valves if fitted to a full-flow lubricating oil filter of the "spin-on" or "easy change" type, for internal combustion engines.
27	Methods of test for full-flow lubricating oil filters for internal combustion engines -- Part 1: Differential pressure/flow characteristics	ISO 4548-1	This part of ISO 4548 specifies tests for determining the differential pressure/flow characteristics of full-flow lubricating oil filters for internal combustion engines.
28	Methods of test for full-flow lubricating oil filters for internal combustion engines -- Part 2: Element by-pass valve characteristics	ISO 4548-2	This part of ISO 4548 specifies tests for determining the element by-pass valve characteristics of full-flow lubricating oil filters for internal combustion engines.
29	Methods of test for full-flow lubricating oil filters for internal combustion engines -- Part 3: Resistance to high differential pressure and to elevated temperature	ISO 4548-3	This part of ISO 4548 specifies tests for measuring the resistance to high differential pressure and the resistance to elevated temperatures of filter elements of full-flow lubricating oil filters for internal combustion engines.
30	Methods of test for full-flow lubricating oil filters for internal combustion engines -- Part 6: Static burst pressure test	ISO 4548-6	Establishes standard test procedures for measuring the performance of filters. It does not apply to filters for use in aeronautical applications. Includes the report of test results. Describes test rig and test liquid.
31	Methods of test for full-flow lubricating oil filters for internal combustion engines -- Part 4: Initial particle retention efficiency, life and cumulative efficiency	ISO 4548-4	This part of ISO 4548 specifies tests for determining the performance of full-flow lubricating oil filters for internal combustion engines
32	Methods of test for full-flow lubricating oil filters for internal combustion engines -- Part 5: Cold start simulation and hydraulic pulse durability test	ISO 4548-5	Specifies a method of testing the ability of oil filters to withstand an internal pressure surge such as occurs when an engine is started from cold, and cyclic internal pressure variations experienced during operation.
Auto Hose			

S No	Test Parameter/Standard	Specification Standard	Scope
33	Rubber hoses and hose assemblies for automobile power-steering systems - Specification	ISO 11425	Specifies requirements for five types of hose and hose assembly used in automobile power-steering systems, the five types differing in their pressure ratings and volumetric expansion. They are for use with fluids in the temperature range -40 °C to +135 °C.
34	Rubber and plastics hoses and hose assemblies for automotive air conditioning - Specification - Part 2: Refrigerant 134A	ISO 8066-2	This part of ISO 8066 specifies the requirements for rubber or thermoplastic hoses and hose assemblies used for circulating liquid and gaseous R134a (tetrafluoroethane) in the air-conditioning systems of automobiles
Protective covers			
35	Standard Specification for Cargo Bed Cover, Type IV (M923, 5 Ton Cargo Truck/M1083, 5 Ton Medium Tactical Vehicle (MTV)/M1082, 5 Ton MTV Trailer)	ASTM E2518-06	This specification covers the general requirements for the Type IV Cargo Bed Cover (CBC). The CBC provides environmental protection and security for mission equipment and items of general transport.
36	Standard Performance Specification for Cargo Bed Cover (CBC) M105A2 Trailer, Type II	ASTM E2463-05	This specification covers the general performance requirements for the Type II Cargo Bed Cover (CBC). The Type II Cargo Bed Cover is a removable general purpose rigid enclosure for the cargo bed of the M105A2 Trailer.
37	Standard Performance Specification for Cargo Bed Cover (CBC) HMMWV, Type I	ASTM E2462-05	Scope This specification covers the performance requirements for the Type I Cargo Bed Cover (CBC).
Drive Belt			
38	Belt drives - V-belts for the automotive industry and corresponding pulleys - Dimensions	ISO 2790	ISO 2790:2004 specifies the requirements for belts and pulleys for V-belt drive used for driving auxiliaries of the internal combustion engines for the automotive industry.
Tyres			

S No	Test Parameter/Standard	Specification Standard	Scope
39	Standard Test Methods for Tire Cords, Tire Cord Fabrics, and Industrial Filament Yarns Made from Manufactured Organic-Base Fibers	ASTM D885-07	These test methods cover the testing of industrial filament yarns made wholly of manufactured organic-base fibers, cords twisted from such yarns, fabrics woven from such cords, and products that are made specifically for use in the manufacture of pneumatic tires.
40	Rubber, vulcanized - Determination of static adhesion to textile cord - H-pull test	ISO 4647	Specifies principle, materials, apparatus, test piece, time-interval between vulcanization and testing, conditioning of the test piece, test temperature and procedure of the subject mentioned. An annex refers to the preparation of silicone-rubber-faced bars and contains several figures.
41	Truck and bus tyres - Verifying tyre capabilities - Laboratory test methods	ISO 10454	Of the test methods presented (strength test for the structure, endurance test), only some may be required depending on the type of tyre to be tested. The tests are carried out in a laboratory under controlled conditions. Applies to all truck and bus tyres.
42	Passenger car tyres - Verifying tyre capabilities - Laboratory test methods	ISO 10191	Contains test methods for verifying the capabilities of tyres for passenger cars. The tests are carried out in a laboratory under controlled conditions and are related to the strength test of the tread area with respect to braking energy, the endurance test with respect to full load and over long distances and the high speed test according to the speed category
43	Motorcycle tyres -- Test methods for verifying tyre capabilities	ISO 10231	ISO 10231:2003 specifies test methods for verifying the capabilities of tyres for motorcycles, carried out in the laboratory under controlled conditions.

Standards for Technical Textiles in Packtech

S No	Test Parameter/Standard	Specification Standard	Scope
		Sacks	
1	Packaging -- Method of specification for sacks -- Part 2: Sacks made from thermoplastic flexible film	ISO 8351-2	Provides a checklist for the characteristics to be specified when ordering sacks made from thermoplastic flexible films. These ordering specifications cover the description of the sack and do not deal with quantitative performance requirements.
2	Packaging -- Sacks -- Description and method of measurement -- Part 2: Empty sacks made from thermoplastic flexible film	ISO 6591-2	Description and dimensional designation of plastic sacks are given by eight figures. Equipment, sampling, procedure, calculation and expression of results, test report for the method of measurement are specified.
3	Packaging -- Sacks -- Determination of the friction of filled sacks	ISO 15119	This International Standard specifies three methods for the determination of the friction of filled sacks.
4	Packaging -- Dimensional tolerances for general purpose sacks -- Part 2: Sacks made from thermoplastic flexible film	ISO 8367-2	The tolerances of the following dimensions of sacks made from thermoplastic flexible film as defined in ISO 6590-2 are specified: thickness of plies, length of sack, width of sack, width of gusset, circumference of sack with gussets, width of bottom, width of valve, position of the leading edge of the valve sleeve, length of the valve sleeve, print position on sack.
5	Tea sacks -- Specification -- Part 1: Reference sack for palletized and containerized transport of tea	ISO 9884-1	Specifies the materials, construction and dimensions of a reference sack suitable for the palletized and containerized transport of tea.

S No	Test Parameter/Standard	Specification Standard	Scope
6	Tea sacks -- Specification -- Part 2: Performance specification for sacks for palletized and containerized transport of tea	ISO 9884-2	This part of ISO 9884 specifies requirements and tests to determine the suitability of sacks for the palletized and containerized transport of tea on standard pallets of standard unit load size in standard containers
7	Packaging -- Sacks made from thermoplastic flexible film -- Tear propagation on edge folds	ISO 11897	This International Standard specifies a method for the determination, under given conditions, of the resistance to tear propagation on an edge fold of sacks made from thermoplastic flexible film. Measurements on folded and unfolded film permit the determination of the residual resistance in the fold
8	Sacks -- Drop test -- Part 2: Sacks made from thermoplastic flexible film	ISO 7965-2	Specifies a method of vertical impact testing, the testing procedure and how the results of tests should be presented.
9	Sacks for the transport of food aid - Sacks made of woven jute/polyolefin fabric	DIN EN 767	The document specifies the general characteristics, requirements and methods of test for sacks made of jute/polyolefine fabric.
10	Sacks for the transport of food aid - Sacks made of woven polyolefin fabric other than polypropylene only	DIN EN 765	This document specifies the general characteristics, requirements and methods of test for sacks made of woven polyolefin fabric other than polypropylene only.
11	Packaging; sacks; description and method of measurement; part 2: empty sacks made from thermoplastic flexible film	DIN EN 26591-2	The document specifies a method for measuring and expressing the dimensions of empty sacks of thermoplastic flexible film. It is primarily intended for application to plastic sacks.
12	Sacks for the transport of food aid - Sacks made of jute fabric	DIN EN 766	The document specifies the general characteristics, requirements and methods of test for sacks made of jute fabric.
Wrappings			

S No	Test Parameter/Standard	Specification Standard	Scope
13	Packaging - Textile bags, sacks and wrappings	AS 2400.8	Provides information to assist packers in the selection, filling, handling and storage of textile bags, sacks and wrappings.
FIBC			
14	Flexible intermediate bulk containers - Non-dangerous goods	AS 3668 ISO 21898	Specifies material, construction and design requirements, together with type test performance requirements, for single-trip and multi-trip intermediate bulk containers, designed to be lifted from above by integral or detachable devices, and manufactured from flexible materials, to contain non-dangerous solid materials in powder or granular form.
15	Electrostatics - Part 4-4: Standard test methods for specific applications - Electrostatic classification of flexible intermediate bulk containers (FIBC)	IEC 61340-4-4	Describes procedures for evaluating the ignition risk presented by electrostatic discharges from FIBC to flammable or explosive environments.
Luggage, Handbags & Other Soft Goods			
16	Standard Test Method for Measurement of Backpack Capacity	ASTM F2153-07	This test method determines and standardizes an unextended and extended capacity for backpacks and related bags. Related bags include lumbar packs, soft rucksacks, internal and external frame packs, duffel bags, and travel packs.
17	Handbag, Women's, Synthetic:Black	A-A-55113	-
Cargo Pallet nets			
18	Air cargo equipment - Air/land pallet nets	ISO 4115	This international standard specifies dimensional, structural and environmental requirements for pallet nets up to 3 m (10 ft) in height to be used in freighter versions of high capacity fixed-wing aircraft

S No	Test Parameter/Standard	Specification Standard	Scope
19	Air cargo equipment - Interline pallet nets	ISO 4170	Specifies dimensional, structural and environmental requirements for nets used to secure cargo on aircraft pallets meeting the requirements of ISO 4117 or ISO 4171. Establishes six basic sizes of pallet nets.
20	Air cargo equipment - Interline pallets	ISO 4171	The document establishes dimensional, structural and environmental requirements for pallets used to transport cargo in aircraft using nets meeting the requirements of ISO 4170
21	Aircraft - Minimum airworthiness requirements and test conditions for certified air cargo unit load devices	ISO 8097	This International Standard specifies the minimum requirements and test conditions for certified cargo unit load devices to be installed in certified aircraft. It covers pallets, nets and containers intended for use with the following classes of aircraft loading and restraint systems
22	Air cargo equipment - Restraint straps - Part 2: Utilization guidelines and lashing calculations	ISO 16049-2	ISO 16049-2:2005 is applicable to cargo tie-down/lashing arrangements using exclusively air cargo restraint straps conforming to ISO 16049-1. Its general recommendations may be used for tie-down arrangements using other means (e.g. steel cables, rope, chains, other types of straps), but under the user's responsibility as to their adequacy and the strength calculations required.
23	Air and air/land cargo pallets - Specification and testing	ISO 4117	Gives dimensional, structural and environmental requirements for 2,44 m wide pallets to be used in freighter versions of high-capacity fixed wing aircraft and is intended to be compatible with the 2,44 × 2,44 m cross-section containers described in International Standards for air-land cargo containers.
Twines			

S No	Test Parameter/Standard	Specification Standard	Scope
24	Polypropylene twines	DIN EN 12423	The document specifies the main characteristics of twines for general service made of polypropylene. It specifies the manner in which they are described commercially, and gives methods for testing.
25	Sisal twines	DIN EN 12422	The document defines the exential characteristics of certain Sisal twines. It specifies the manner in which they are described commercially, and gives methods for testing. This standard does not specify the agricultural twines which made from Sisal.
Bags			
26	Flax canvas, including water-bag canvas	AS 1818	Covers flax line canvas in four masses and tow canvas in two masses, in addition to water-bag canvas consisting of flax warp and jute weft yarns. Fabric widths include 60, 90, 120 and 180 cm. Physical and chemical properties are stated.
27	Standard Test Method for Distortion of Yarn in Woven Fabrics	ASTM D1336	This test method covers the measurement of yarn distortion of one set of yarns over the other in woven cloth following the application of surface friction. This test method especially is applicable to open-weave fabrics, such as nettings, marquisettes, gauzes, chiffons, and heavier fabrics made from slippery surface yarns.
28	Methods of test for coated fabrics - Determination of coating adhesion	AS 4878.8	Specifies the methods for the determination of the coating adhesion of coated fabrics.
29	Synthetic weed blocking fabric	AS 4843	Specifies performance requirements for permeable synthetic woven and non-woven fabrics used to retard weed growth for agricultural, horticultural, nursery and landscape use for both domestic and commercial applications.

Standards for Technical Textiles in Meditech

S No	Test Parameter/Standard	Specification Standard	Scope
Sanitary napkins and Incontinence products			
1	Standard Test Method for Rate of Absorption of Water by Bibulous Papers	ASTM D824-94 TAPPI T 432 om-82	This test method covers the determination of the rate at which an unsized and absorbent paper will absorb water by measuring the time required for the paper to absorb completely a specified quantity of water
2	Urine absorbing aids -- Vocabulary -- Part 2: Products	ISO 9949-2	Defines 9 terms used in the field of urine absorbing aids and comprises the vocabulary for products. The terms used for products do not, individually or collectively, define or recommend specific designs, styles or constructions.
3	Urine-absorbing aids -- Basic principles for evaluation of single-use adult-incontinence-absorbing aids from the perspective of users and caregivers	ISO 16021	This International Standard provides guidelines for designing and conducting a user evaluation of single-use adult-incontinence-absorbing aids.
4	Assistive products for persons with disability - Classification and terminology	ISO 9999	ISO 9999:2007 establishes a classification of assistive products especially produced, or generally available, for persons with disability. Assistive products used by a person with disability, but which require the assistance of another person for their operation, are included in the classification.
Healthcare textiles			

S No	Test Parameter/Standard	Specification Standard	Scope
5	Surgical drapes, gowns and clean air suits, used as medical devices for patients, clinical staff and equipment - Part 2: Test methods	ONORM EN 13795-2 DIN EN 13795-2	This EN 13795-2 specifies test methods for evaluating characteristics of surgical drapes, gowns and clean air suits. Test methods are specified by referring to a standard test method and, if necessary, specifying amendments to adapt the test method for the purpose of this document.
6	Surgical drapes, gowns and clean air suits, used as medical devices, for patients, clinical staff and equipment - Part 1: General requirements for manufacturers, processors and products	ONORM EN 13795-1 DIN EN 13795-1 NBR15317-1	EN 13795-1 specifies information to be supplied in addition to the usual labeling of medical devices (see EN 980 and EN 1041) and manufacturing and processing requirements.
7	Surgical drapes, gowns and clean air suits, used as medical devices, for patients, clinical staff and equipment - Test method to determine the resistance to wet bacterial penetration	ISO 22610	ISO 22610:2006 specifies a test method, with associated test apparatus, which is used to determine the resistance of a material to the penetration of bacteria, carried by a liquid, when subjected to mechanical rubbing.
8	Clothing for protection against infectious agents - Test method for resistance to dry microbial penetration	ISO 22612	This test method provides a means for assessing the resistance to penetration through barrier materials of bacteria-carrying particles.
9	Textiles for health care facilities and institutions - Theatre linen and pre-packs	AS 3789.2	Specifies requirements for the following items of theatre linen for health care facilities and institutional uses: drapes, fenestrated drapes, theatre gowns, hand towels, leggings (mayo table covers), and wrappers.
10	Standard Specification for Surgical Gowns Intended for Use in Healthcare Facilities	ASTM F2407-06	This specification establishes requirements for the performance, documentation, and labeling of surgical gowns used in the healthcare facilities.
11	Textiles for health care facilities and institutions - Recyclable barrier fabrics	AS 3789.8	Specifies minimum performance requirements for unused recyclable barrier fabrics.

S No	Test Parameter/Standard	Specification Standard	Scope
12	Processing of reusable surgical textiles for use in health care facilities	ANSI/AAMI ST65	-
13	Liquid barrier performance and classification of protective apparel and drapes intended for use in health care facilities	ANSI/AAMI PB70	This standard establishes a system of classification for protective apparel and drapes used in health care facilities based on their liquid barrier performance and specify related labeling requirements and standardized test methods for determining compliance.
14	Selection and use of protective apparel and surgical drapes in health care facilities	AAMI TIR11	This technical information report (TIR) covers the selection and use of protective apparel and surgical drapes. It includes information on types of protective materials, safety and performance characteristics of protective materials, product evaluation and selection, levels of barrier performance, and care of protective apparel and drapes.
15	Textiles for health care facilities and institutions - Fabric specifications	AS 3789.6	Specifies requirements for cotton, cotton/synthetic and synthetic fabrics which are to be used in health care facilities and institutions.
16	Decontamination of Reusable Medical Devices	CSA Z314.8-08	-
Surgical dressings			
17	Surgical dressings - Absorbent wadding	AS 4369.4	Specifies requirements for manufacturing absorbent wadding, including cotton wool balls and cotton wool rolls for use in surgical procedures.
18	Absorbent woven gauze - Cotton	AS 2835.1	Specifies requirements for absorbent woven cotton gauze suitable for use in the manufacture of surgical dressings.
19	Absorbent woven gauze - Cotton-viscose blends	AS 2835.2	Specifies requirements for the cotton-viscose blends used in the manufacture of absorbent woven cotton gauze.

S No	Test Parameter/Standard	Specification Standard	Scope
20	Sterilization of health care products - Chemical indicators - Part 1: General requirements	ANSI/AAMI/ISO 11140-1	AAMI/ISO 11140-1 specifies performance requirements for indicators that show exposure to sterilization processes by means of physical and/or chemical change of substances.
Sutures			
21	Implants for surgery -- Malleable wires for use as sutures and other surgical applications	ISO 10334	Specifies the dimensions and mechanical properties and gives test methods. The mechanical properties specified are tensile strength, elongation, and resistance to damage in bending and in torsion. Surface finish is not covered.
22	Sutures	NBR13904	Brazilian standard giving specifications of sutures.
23	Standard Test Method for Burst Strength of Surgical Sealants	ASTM F2392-04	This test method provides a means for comparison of the burst or rupture strength of sealants on soft tissue.
24	Surgical needles suture	JIS T 3102	Gives the specifications for surgical needles sutures
25	Dentistry - Medical devices for dentistry - Dental implants	SS-EN 1642	-
Medical Implants			
26	Non active surgical implants - Particular requirements for cardiac and vascular implants - Part 2: Vascular prostheses including cardiac valve conduits	ONORM EN 12006-2	-
27	Standard Practice for Assessment of Compatibility of Absorbable/Resorbable Biomaterials for Implant Applications	ASTM F1983-99	This practice provides experimental protocols for biological assays of tissue reactions to absorbable/resorbable biomaterials for implant applications.
28	Standard Test Method for Stereological Evaluation of Porous Coatings on Medical Implants	ASTM F1854-01	This test method covers stereological test methods for characterizing the coating thickness, void content, and mean intercept length of various porous coatings adhering to nonporous substrates.

S No	Test Parameter/Standard	Specification Standard	Scope
29	Standard Specification for Polyetheretherketone (PEEK) Polymers for Surgical Implant Applications	ASTM F2026-07A	This specification covers polyetheretherketone (PEEK) polymer in virgin forms as supplied by a vendor (pellets, powder, and so forth). It provides requirements and associated test methods for these thermoplastics when they are to be used in the manufacture of intracorporeal devices such as surgical implants or components of surgical or dental devices.
30	Implants for surgery -- Non-destructive testing -- Radiographic examination of cast metallic surgical implants	ISO 9584	The method for detecting and evaluating internal imperfections shall be performed in accordance with the requirements in ISO 1027 and ISO 5579.
31	Implants for surgery -- Non-destructive testing -- Liquid penetrant inspection of metallic surgical implants	ISO 9583	The method for detecting and evaluating internal imperfections shall be performed in accordance with the requirements in ISO 3452.
32	Biological evaluation of medical devices - Part 19: Physicochemical, morphological, and topographical characterization of materials	ANSI/AAMI/ISO TIR10993-19	This Technical Specification provides a compilation of parameters and test methods that can be useful for the identification and evaluation of the physico-chemical, morphological and topographical (PMT) properties of materials in finished medical devices.
33	Standard Practice for Short-Term Screening of Implant Materials	ASTM F763-04	This practice provides guidelines for short-term testing or screening of candidate materials, both porous and dense, as to the effects of the material on animal tissue in which it is implanted. This is a rapid screening procedure for determining acceptability of candidate materials.
34	Non-active surgical implants - Joint replacement implants - Particular requirements	ISO 21534	ISO 21534:2007 specifies particular requirements for total and partial joint replacement implants, artificial ligaments and bone cement.

S No	Test Parameter/Standard	Specification Standard	Scope
35	Biological Evaluation of Medical Devices - Part 1: Evaluation and Testing	ANSI/AAMI/ISO 10993-1	Specifies the general principles governing the biological evaluation of medical devices; the categorization of medical devices based on the nature and duration of their contact with the body; and the selection of appropriate tests.
Contact Lens			
36	Ophthalmic optics - Contact lenses and contact lens care products - Determination of physical compatibility of contact lens care products with contact lenses	ISO 11981	-
37	Ophthalmic optics -- Contact lenses -- Ageing by exposure to UV and visible radiation (in vitro method)	ISO 11985	This International Standard describes an in vitro method which simulates the ageing of rigid (hard) and soft lenses in daylight.
38	Ophthalmic optics -- Contact lenses and contact lens care products -- Determination of biocompatibility by ocular study using rabbit eyes	ISO 9394	This International Standard specifies an in vivo method of test to assess the ocular safety of contact lenses and contact lens care products.
Others			
39	Self adhesive tapes - Measurement of quick stick	SS-EN 1945	-
40	Standard Specification for Polychloroprene Examination Gloves for Medical Application	ASTM D6977-04	This specification provides certain requirements for polychloroprene rubber gloves used in conducting medical examinations and diagnostic and therapeutic procedures.
41	Standard Specification for Nitrile Examination Gloves for Medical Application	ASTM D6319-00A	This specification provides certain requirements for nitrile rubber gloves use in conducting medical examinations and diagnostic and therapeutic procedures.
42	Standard Test Method for Determining Integrity of Seals for Medical Packaging by Visual Inspection	ASTM F1886-98	This test method covers the determination of channels in the package seal down to a width of 75 µm (0.003 in.) with a 60-100 % probability

S No	Test Parameter/Standard	Specification Standard	Scope
43	Standard Specification for Rubber Examination Gloves	ASTM D3578-05	This specification describes certain requirements for natural rubber gloves used in conducting medical examinations and diagnostic and therapeutic procedures. It also covers natural rubber gloves used in handling contaminated medical material.
44	Packaging of items (sterile) for patient care - Selection of packaging materials for goods undergoing sterilization	AS 1079.1	Specifies sterilization-related performance requirements to be considered in the selection of packaging materials and packages intended for sterilization.
45	Packaging of items (sterile) for patient care - Non-reusable papers - For the wrapping of goods undergoing sterilization in health care facilities	AS 1079.2	Specifies requirements for plain unimpregnated, impregnated and crepe paper intended for the wrapping of materials and equipment for sterilization in health care facilities by steam under pressure or by ethylene oxide.
46	Packaging of items (sterile) for patient care - Paper bags - For single use in health care facilities	AS 1079.3	Specifies requirements for single-use paper bags for packaging items to be sterilized by saturated steam and intended for use in health care facilities.
47	Standard Test Method for Microbial Ranking of Porous Packaging Materials	ASTM F1608-00	This test method is used to determine the passage of airborne bacteria through porous materials intended for use in packaging sterile medical devices. This test method is designed to test materials under conditions that result in the detectable passage of bacterial spores through the test material.
48	Packaging of items (sterile) for patient care - Single-use, non-woven wrapping materials - For goods undergoing sterilization in health care facilities	AS 1079.5	Specifies requirements for single-use non-woven materials made of natural or man-made (synthetic) fibers or their blends intended for use as non-reusable wraps for goods undergoing sterilization in health care facilities.

S No	Test Parameter/Standard	Specification Standard	Scope
49	Single-use medical examination gloves - Part 2: Specification for gloves made from poly(vinyl chloride)	ISO 11193-2	ISO 11193-2:2006 specifies requirements for packaged sterile, or bulked non-sterile, poly(vinyl chloride) gloves intended for use in medical examinations, and diagnostic or therapeutic procedures, to protect the patient and the user from cross-contamination. It also covers poly(vinyl chloride) gloves intended for use in handling contaminated medical materials.

Standards for Technical Textiles in Geotech

S No	Test Parameter/Standard	Specification Standard	Scope
		Geotextiles	
1	Standard Test Method for Determining Apparent Opening Size of a Geotextile	ASTM D4751-04	This test method is used to determine the apparent opening size (AOS) of a geotextile by sieving glass beads through a geotextile.
2	Standard Specification for Circular-Knit Geotextile for Use in Subsurface Drainage Applications	ASTM D6707-06	This specification covers circular-knit geotextiles for use on the outside of perforated pipes and Class B geocomposites per Specification D 7001 in drainage applications.
3	Geo-textiles, sampling	EN 963, ISO 9862, ASTM D 4354	This practice covers three procedures for the sampling of geosynthetics for testing. This practice requires that instructions on taking laboratory samples and test specimens be part of every test method for geosynthetics.
4	Geo-textiles, area mass	EN 965, ISO 9864, ASTM D 5261	This test method can be used as an index to the determination of mass per unit area of all geotextiles.

S No	Test Parameter/Standard	Specification Standard	Scope
5	Geo-textiles, thickness, single layers	EN 964-1, ISO 9863	-
6	Geo-textiles, tensile tests on wide strips	EN ISO 10319, ASTM D 4595	This test method covers the measurement of tensile properties of geotextiles using a wide-width strip specimen tensile method. This test method is applicable to most geotextiles that include woven fabrics, nonwoven fabrics, layered fabrics, knit fabrics, and felts that are used for geotextile application.
7	Geo-textiles, tensile tests	ASTM D 4632	This test method is an index test which provides a procedure for determining the breaking load (grab strength) and elongation (grab elongation) of geotextiles using the grab method.
8	Geo-textiles, tensile tests on joinings/seams	EN ISO 10321, ASTM D 4884	This test method covers the seam strength of geotextiles. The primary distinction of this test method for evaluating seam strength is the width of the specimen.
9	Geo-textiles, geo-cells, connection point strength	EN ISO 13426-1	This standard describes four index test methods for the determination of the strength of internal structural junctions of geocells under different loading conditions.
10	Geo-textiles, die penetration test	EN ISO 12236	ISO 12236 specifies a method for the determination of the puncture resistance by measuring the force required to push a flat-ended plunger through geosynthetics.
11	Geo-textiles, tensile creep	EN ISO 13431, ASTM D 5262	This Standard specifies a method for determining the tensile creep and creep rupture behaviour of geotextiles and geotextile-related products in an unconfined situation.
12	Geo-textiles, compression creep	ENV 1897, prEN 1897	Specifies index test methods for determining the compressive behaviour of geotextiles and geotextile-related products.

S No	Test Parameter/Standard	Specification Standard	Scope
13	Geo-textiles, tear growth test, trapeze method	ASTM D 4533	This test method is an index test used to measure the force required to continue or propagate a tear in woven or non-woven geotextiles by the trapezoid method
14	Geo-textiles, pyramid drop test	DIN V 60500-1	-
15	Geo-textiles, cone drop test	EN 918, ISO/DIS 13433	-
16	Geo-synthetic sealing sheets, tensile tests on wide strips	ASTM D 4885	This test method covers the determination of the performance strength of synthetic geomembranes by subjecting wide strips of material to tensile loading.
17	Geo-synthetic sealing sheets, tensile tests on notched specimen	ASTM D 5397	-
18	Geo-synthetic sealing sheets, pyramid penetration resistance	ASTM D 5494	-
19	Geo-plastics, burst test	EN 14151	-
20	Geo-plastics, puncture resistance	ASTM D 4833	This test method is used to measure the index puncture resistance of geomembranes and related products.
21	Geotextiles and geotextile-related products - Determination of mass per unit area	ONORM EN 965	This test method is used to measure the mass per unit area of geotextiles and related products.
22	Geotextiles and geotextile-related products - General tests for evaluation following durability testing	ONORM EN 12226	The document specifies test methods for determining the change in specific properties of aged geotextiles. It is applicable to geotextiles and geotextile-related products.
23	Standard Test Method for Determining Filtering Efficiency and Flow Rate of a Geotextile for Silt Fence Application Using Site-Specific Soil	ASTM D5141-96	This test method is used to determine the filtering efficiency and the flow rate of a geotextile used exclusively in silt fence or silt barrier application.
24	Standard Test Method for Biological Clogging of Geotextile or Soil/Geotextile Filters	ASTM D1987-07	This test method is used to determine the potential for, and relative degree of, biological growth which can accumulate on geotextile or geotextile/soil filters.

S No	Test Parameter/Standard	Specification Standard	Scope
25	Standard Test Method for the Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe	ASTM D6241-04	This test method is an index test used to measure the force required to puncture a geotextile and geotextile related products. The relatively large size of the plunger provides a multidirectional force on the geotextile.
26	Standard Test Method for Measuring the Soil-Geotextile System Clogging Potential by the Gradient Ratio	ASTM D5101-01	This test method covers a performance test applicable for determining the soil-geotextile system permeability and clogging behavior for cohesionless soils under unidirectional flow conditions.
27	Standard Test Method for Hydraulic Conductivity Ratio (HCR) Testing of Soil/Geotextile Systems	ASTM D5567-94	This test method covers laboratory measurement of the hydraulic conductivity of water-saturated porous materials with a flexible-wall permeameter.
28	Geotextiles and geotextile-related products - Dynamic performation test (cone drop test)	SS-EN 918	-
29	Geotextiles and geotextile-related products - Required characteristics for use in the construction of railways	DIN EN 13250	This standard applies in superstructure-ballast or substructure-blanket layer, within a subgrade. This standard is not applicable to geomembranes.
30	Geotextiles and geotextile-related products -- Identification on site	ISO 10320	Specifies the information accompanying geotextiles and geotextile-related products to enable the user on site to identify the goods as being identical to the goods ordered.
31	Geotextiles and geotextile-related products -- Method for installing and extracting samples in soil, and testing specimens in laboratory	ISO 13437	The method is also appropriate to test for mechanical damage, much of which occurs during installation, and to provide an owner with information about the state of the geotextile or geotextile-related product in his structure.

S No	Test Parameter/Standard	Specification Standard	Scope
32	Geotextiles and geotextile-related products - Required characteristics for use in external erosion control systems	DIN EN 13253	This standard covers applications in coastal protection and bank revetment. This standard does not cover surface erosion, where the geotextile or geotextile-related product is located at the surface.
33	Geotextiles and geotextile-related products - Required characteristics for use in the construction of roads and other trafficked areas	DIN EN 13249	This document specifies the relevant characteristics of geotextiles and geotextile-related products used in the construction of roads and other trafficked areas and the appropriate test methods to determine these characteristics
34	Geotextiles and geotextile-related products - Required characteristics for use in drainage systems	DIN EN 13252	This document specifies the relevant characteristics of geotextiles and geotextile-related products used in drainage systems and the appropriate test methods to determine these characteristics.
35	Geotextiles and geotextile-related products - Required characteristics for use in the construction of canals	DIN EN 13255	This document specifies the relevant characteristics of geotextiles and geotextile-related products used in the construction of canals, and the appropriate test methods to determine these characteristics.
36	Geotextiles and geotextile-related products - Required characteristics for use in solid waste disposals	DIN EN 13257	This ducument specifies the relevant characteristics of geotextiles and geotextile-related products used in solid waste disposals and the appropriate test methods to determine these characteristics.
37	Geotextiles and geotextile-related products - Required characteristics for use in liquid waste containment projects	DIN EN 13265	This document specifies the relevant characteristics of geotextiles and geotextile-related products used in liquid waste containment projects, and the appropriate test methods to determine these characteristics

S No	Test Parameter/Standard	Specification Standard	Scope
38	Geotextiles and geotextile-related products - Required characteristics for use in the construction of reservoirs and dams	DIN EN 13254	This document specifies the relevant characteristics of geotextiles and geotextile-related products used in the construction reservoirs and dams, and the appropriate test methods to determine these characteristics.
39	Geotextiles and geotextile-related products - Determination of thickness at specified pressures - Part 1: Single layers	ONORM EN 964-1	-
40	Standard Guide for Selection of Test Methods for Prefabricated Vertical Drains (PVD)	ASTM D6917-03	This guide provides recommendations for the selection of appropriate test methods for prefabricated vertical geocomposite drains (sometimes referred to as Wick Drains) used in geotechnical engineering applications to provide consistency in data reporting.
41	Geotextiles and geotextile-related products - Determination of the resistance to weathering	DIN EN 12224	The document specifies methods for the exposure of geotextiles and geotextile-related products to weathering conditions more intense than those of natural weathering.
42	Standard Specification for Silt Fence Materials	ASTM D6461-99	This specification covers requirements and test methods for geotextile fabrics and associated components used in temporary silt fence applications. This is a material purchasing specification based on AASHTO M288.
43	Geotextiles and geotextile-related products - Screening test method for determining the resistance to hydrolysis in water	DIN EN 12447	Specifies a screening test method for determining the resistance of geotextiles and geotextile-related products to hydrolysis by exposing test specimens to water at elevated temperatures, followed by an evaluation of the changes in properties resulting from such exposure.

S No	Test Parameter/Standard	Specification Standard	Scope
44	Geotextiles and geotextile-related products - Determination of water permeability characteristics normal normal to the plane, without load	NBR15223	-
45	Geotextiles - Methods of test - Determination of durability - Resistance to certain microbiological agents	AS 3706.13	The Standard sets out a method for determining the resistance of geotextiles to microbiological agents that are present in certain soils.
46	Geotextiles - Methods of test - Determination of pore-size distribution - Dry-sieving method	AS 3706.7	This Standard sets out the method for determining the pore-size distribution and apparent opening size (AOS) of a geotextile using the dry sieving method, and, in consequence, the equivalent opening size (EOS).*
47	Geotextiles - Tensile test for joints/seams by wide-width method	ONORM EN ISO 10321	Specifies an index test method for determination of the tensile properties of joints and seams in geosynthetics, using a wide-width strip.
48	Geotextiles and geotextile-related products -- Abrasion damage simulation (sliding block test)	ISO 13427	The method is applicable to woven and nonwoven geotextiles and geotextile-related products.
49	Standard Test Method for Effects of Temperature on Stability of Geotextiles	ASTM D4594-96	This test method provides a procedure for determining the effects of climatic temperature on the tensile strength and elongation properties of geotextiles.
50	Standard Test Method for Permittivity of Geotextiles Under Load	ASTM D5493-06	This test method covers the determination of the water permittivity behavior of geotextiles in a direction normal to the plane of the geotextile when subjected to specific normal compressive loads. Use of this test method is limited to geotextiles. This test method is not intended for application with geotextile-related products such as geogrids, geonets, geomembranes, and other geocomposites.

S No	Test Parameter/Standard	Specification Standard	Scope
51	Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products	ASTM D4833-07	This test method is used to measure the index puncture resistance of geomembranes and related products. This standard may be inappropriate for testing some woven geotextiles or related products which have large openings, such as geonets and geogrids.
52	Standard Specification for Geocomposites for Pavement Edge Drains and Other High-Flow Applications	ASTM D7001-06	This specification covers geocomposite drainage panels used in highway, turf, and other high volume subsurface drainage applications. These products consist of a geotextile wrapped around a polymer core.
53	Standard Test Methods for Water Permeability of Geotextiles by Permittivity	ASTM D4491-99a(2004)e1	-
54	Geosynthetics - Test method for the determination of mass per unit area of geotextiles and geotextile-related products	ISO 9864:2005	ISO 9864:2005 specifies a method for the determination of mass per unit area of geotextiles and geotextile-related products for identification purposes and for use in technical data sheets.
55	Buried flexible pipelines - Installation	AS/NZS 2566.2	This Standard specifies requirements for the installation, field testing and commissioning of buried flexible pipelines. These pipelines rely primarily upon side support to resist vertical loads without excessive deformation by adopting an elliptical shape.

Standards for Technical Textiles in Oekotech

S No	Test Parameter/Standard	Specification Standard	Scope
Waste Disposal			
1	Mobile waste containers - Colours, markings, and designation requirements	AS 4123.7	Specifies colours, markings and designation requirements for mobile waste containers

S No	Test Parameter/Standard	Specification Standard	Scope
2	Management of clinical and related wastes	AS/NZS 3816	Sets out requirements for the identification, segregation, handling, storage, transport, treatment and ultimate safe disposal of clinical and related wastes which may be hazardous, in an environmentally responsible manner.
3	Mobile waste containers - Health, safety and environment	AS 4123.6	Provides the most essential safety and health requirements for mobile waste containers.
4	Mobile waste containers - Containers with four wheels with a capacity from 770 L to 1300 L with dome lid(s), for trunnion and/or lifting devices - Dimensions and design	AS 4123.3	Specifies dimensions and design requirements for mobile waste containers with four wheels, with a nominal capacity up to 1300 L.
5	Mobile waste containers - Containers with four wheels with a capacity from 500 L to 1200 L with flat lid(s), for trunnion and/or lifting devices - Dimensions and design	AS 4123.2	Specifies dimensions and design requirements for mobile waste containers with four wheels, with a nominal capacity up to 1200 L.
6	Mobile waste containers - Containers with two wheels and a capacity up to 400 L for lifting devices - Dimensions and design	AS 4123.1	Specifies dimensions and design requirements for mobile waste containers with two wheels, with a nominal capacity up to 400 L.
7	Mobile waste containers - Part 5: Performance requirements and test methods	SS-EN 840-5	-
8	Mobile waste containers - Colours, markings, and designation requirements	AS 4123.7-2006/Amdt 1-2008	Specifies colours, markings and designation requirements for mobile waste containers
9	Mobile waste containers - Performance requirements and test methods	AS 4123.5	Specifies performance requirements and test methods for mobile waste containers.
10	Stationary waste containers - Part 3: Safety and health requirements	ONORM EN 12574-3	This part of the European Standard specifies essential safety and health requirements for stationary waste containers, not including special containers for hazardous waste.
11	Mobile waste containers - Part 6: Safety and health requirements	ONORM EN 840-6	-

S No	Test Parameter/Standard	Specification Standard	Scope
12	Characterization of waste - Sampling of waste materials - Part 4: Guidance on procedures for sample packaging, storage, preservation, transport and delivery	ONR 2915310-4	-
13	Non-reusable containers for the collection of sharp medical items used in health care areas	AS 4031	Specifies requirements for non-reusable containers intended for the safe collection and transport, in health care areas, of used sharp objects which may be infectious, and are disposed of with their contents.
14	Packaging - Paper sacks for household waste collection - Types, requirements and test methods	DIN EN 13593	This European Standard specifies the general characteristics, types and test performance for sacks or liners made from paper, used for household waste collection.
15	Food Waste Disposers	AHAM FWD-1	This standard establishes a uniform, repeatable procedure measuring specified product characteristics of household food waste disposers.
16	Moulded plastics household garbage cans	AS 1535	Provides for two classes of can of capacity up to 0.085 cubed on the basis of resistance to impact at low temperatures, viz. cans tested for impact resistances at -14 to -10°C, and cans tested at -2 to 0°C.
17	Specification for standard performance requirements for incineration plant for the destruction of hospital waste.	BS 3316-1	-
18	Stationary emission sources – Automated monitoring of the mass concentration of particles – Characteristics, testing methods and specification	CSN ISO 10155	Specifies conditions and criteria for the automated monitoring of the mass concentration of particulate matter in stationary source gas streams, including performance characteristics and test procedures. Provides the field evaluation test program and its application to automated monitoring systems.

S No	Test Parameter/Standard	Specification Standard	Scope
19	Photography – Waste water from treatment – Determination of the silver content	CSN ISO 10348	Three analytical procedures are given with two supporting sample treatment methodologies: a flame atomic absorption spectroscopy (AAS) method and two potentiometric iodide titration (PT) methods. The choice of treatment is dependent on the analysis method and form of sample. The AAS method allows cyanogen iodide-treated or preserved samples to be analyzed directly; the PT method requires one of two digestion procedures given.
20	Containers – Automatic identification	CSN EN ISO 10374	Specifies all necessary user requirements. Includes: a container idenfication system, data coding systems, description of data, performance criteria and security features.
21	Quality of soil – Sampling – Part 6: Instructions for taking, handling and storing of soil samples intended for study of aerobic microbial processes in laboratory	CSN ISO 10381-6	Describes the procedure to be observed: selection of sampling locations, description of field site, sampling conditions, sampling methods, sample marking, transportation conditions, soil processing, storage conditions, storage period, pre-incubation, test report.
22	Characterization of wastes – Methodology for determination of leaching properties of wastes under special conditions	CSN P ENV 12920	This standard is used for Wastes, Chemical analysis and testing, Leaching, and Extraction, Waste handling, Waste disposal, Biological analysis and testing, Physical testing, Testing conditions, Verification and Identification methods.
23	Transport packaging – Reusable solid plastic containers	CSN EN 131177	-
24	Transport equipment. Equipment for loading and unloading. Basic parameters	CSN 26 7004	-

S No	Test Parameter/Standard	Specification Standard	Scope
25	Mobile waste containers – Part 1: Containers with two wheels and volume from 80 l to 390 l for rack unloading equipment – Dimensions and design	CSN EN 840-1 SS EN 840-1	This standard states the dimensions, dimensional tolerances and design for Containers, Mobile, Refuse containers, Waste handling, Waste disposal, Materials handling equipment, Bins, Environmental cleanliness, Wheels, Volume, Lifting equipment and Locking and locating devices
26	Mobile waste containers – Part 2: Containers with four wheels and volume from 500 l to 1 200 l with dumping lid(s) for pin and/or rack unloading equipment – Dimensions and design	CSN EN 840-2 SS EN 840-2	This standard states the dimensions, dimensional tolerances and design for Containers, Mobile, Refuse containers, Waste handling, Waste disposal, Materials handling equipment, Bins, Environmental cleanliness, Wheels, Volume, Lifting equipment and Locking and locating devices
27	Mobile waste containers – Part 3: Containers with four wheels and volume from 770 l to 1,300 l with draw-out lid(s) for pin and/or rack unloading equipment – Dimensions and design	CSN EN 840-3 SS EN 840-3	This standard states the dimensions, dimensional tolerances and design for Containers, Mobile, Refuse containers, Waste handling, Waste disposal, Materials handling equipment, Bins, Environmental cleanliness, Wheels, Volume, Lifting equipment and Locking and locating devices
28	Mobile waste containers – Part 4: Containers with four wheels and volume from 750 l to 1 700 l with dumping lid(s) for pin and/or rack unloading equipment or suspension unloading equipment	CSN EN 840-4 SS EN 840-4	This standard states the dimensions, dimensional tolerances and design for Containers, Mobile, Refuse containers, Waste handling, Waste disposal, Materials handling equipment, Bins, Environmental cleanliness, Wheels, Volume, Lifting equipment and Locking and locating devices
29	Mobile waste containers – Part 5: Requirements for design and testing procedures	CSN EN 840-5 SS EN 840-5	Gives the Performance requirement and Performance testing form Containers (Mobile and Refuse containers) and Bins used for Waste handling, Waste disposal, Materials handling and Environmental cleanliness,

S No	Test Parameter/Standard	Specification Standard	Scope
30	Mobile waste containers – Part 6: Requirements for safety and protection of health	CSN EN 840-6 SS EN 840-6	This European Standard provides the essential safety, health and ergonomic requirements for mobile waste containers according to EN 840-1 to EN 840-4, not including hazardous wastes containers.
Landfill textiles			
31	Geosynthetic barriers - Characteristics required for use as a fluid barrier in the construction of tunnels and underground structures	DIN EN 13491	This document specifies the relevant characteristics of geosynthetic barriers, including polymeric geosynthetic barriers, clay geosynthetic barriers and bituminous geosynthetic barriers, when used as fluid barriers in the construction of tunnels and underground structures, and the appropriate test methods to determine these characteristics.
32	Geosynthetic barriers - Characteristics required for use in the construction of reservoirs and dams	DIN EN 13361	This document specifies the relevant characteristics of geosynthetic barriers, including polymeric geosynthetic barriers, clay geosynthetic barriers and bituminous geosynthetic barriers, to be used as fluid barriers in the construction of reservoirs and dams
33	Geotextiles and geotextile-related products -- Guidelines on durability	ISO/TR 13434	This guide is intended to introduce the reader to the basic concepts of geotextiles durability and its assessment. This guide does not cover products designed to survive for a limited time, such as erosion control fabric based on natural fibers, nor does it cover geomembranes, nor geotextiles for asphalt reinforcement.
34	Geosynthetics - Screening test method for determining chemical resistance for landfill applications	DIN EN 14414	This European standard describes a test method to determine the chemical resistance of geosynthetics to liquid municipal, agricultural and industrial wastes, using a laboratory immersion procedure.

S No	Test Parameter/Standard	Specification Standard	Scope
35	Standard Test Method for Biological Clogging of Geotextile or Soil/Geotextile Filters	ASTM D1987-07	This test method is used to determine the potential for, and relative degree of, biological growth which can accumulate on geotextile or geotextile/soil filters.
36	Standard Guide to Assess the Compostability of Environmentally Degradable Nonwoven Fabrics	ASTM D6094-97	This guide covers suggested criteria, procedures, and a general approach to establish the compostability of environmentally degradable nonwoven fabrics and products.
37	Standard Practice for In Field Immersion Testing of Geosynthetics	ASTM D5496-98	This practice describes an approach and methodology for immersion testing of geosynthetics (for example, geomembranes used for landfill liner).
Water Filter Systems			
38	Drinking water treatment systems	CSA B483.1-07	
39	Ultraviolet microbiological water treatment units	NSF/ANSI 55	This Standard covers ultraviolet microbiological water treatment systems and components for point-of-use and point-of-entry applications.
40	Small wastewater treatment systems for up to 50 PT - Part 4: Septic tanks assembled in situ from prefabricated kits	DIN EN 12566-4	This standard specifies general requirements for the execution of prefabricated septic tanks, built in situ from prefabricated kits.

S No	Test Parameter/Standard	Specification Standard	Scope
41	On-site domestic wastewater treatment units - Aerated wastewater treatment systems	AS/NZS 1546.3	AS/NZS 1546.3 provides: 1. a set of performance statements which define the requirements of an aerated wastewater treatment system. 2. a basis against which an aerated wastewater treatment system may be assessed; manufacturers of aerated wastewater treatment systems with basic specifications that will enable the testing agency to check that a product conforms to the Standard. 3. purchasers of an aerated wastewater treatment system with confidence that the system will perform as checked by a testing agency. 3. and sets out performance requirements, design requirements, means of compliance, installation requirements, requirements for operation and maintenance and specifications for testing aerated wastewater treatments systems and associated fittings.
42	Design of fixed granular-bed filters for water treatment	DIN 19605	The document defines the different types of filters for water treatment in water works and describes the technical requirements and parameters. Additional advices for operation and control of the filters are given.

Standards for Technical Textiles in Buildtech

S No	Test Parameter/Standard	Specification Standard	Scope
Hoardings / Signages			
1	Temporary fencing and hoardings	AS 4687-2007	Sets out requirements for the construction and installation of temporary fencing and hoardings
Scaffolding Nets and Safety Nets			

S No	Test Parameter/Standard	Specification Standard	Scope
2	Safety nets	EN 1263-1	Gives the safety requirements and test methods for Safety Nets
3	Safety Nets Used During Construction, Repair, and Demolition Operations	ANSI A10.11	Establishes safety requirements for the selection, installation, and use of personnel and debris nets during construction, repair, and demolition operations.
4	Guidelines for scaffolding	AS/NZS 4576	Gives practical guidance for the training and certification of scaffolders, the preparation of sites for scaffolding, and the safe selection, supply, erection, alteration, dismantling, maintenance, inspection and use of scaffolding and scaffolding equipment.
5	Safety nets - Part 1: Safety requirements, test methods	DIN EN 1263-1 SS-EN 1263-1	This European Standard is applicable to safety nets and their accessories for use in construction, scaffolding, falsework and assembly work and specifies safety requirements and test methods. This product standard does is not applicable to the installation of safety nets.
6	German construction contract procedures - Part C: General technical specifications for building works - Scaffolding works	DIN 18451	The document specifies the contract conditions regarding materials, workmanship, ancillary labours and invoicing to be obeyed in scaffolding works.
Awnings & canopies			
8	Household and similar electrical appliances - Safety - Particular requirements for drives for rolling shutters, awnings, blinds and similar equipment	AS/NZS 60335.2.97 IEC 60335-2-97	Gives Particular requirements for drives for rolling shutters, awnings, blinds and similar equipment
9	Sports and recreational equipment - Fabrics for awnings and camping tents - Specification	ISO 10966	ISO 10966:2005 specifies the most important material characteristics for woven fabrics for awnings and camping tents. It can also be applied to other types of fabric.

S No	Test Parameter/Standard	Specification Standard	Scope
10	Standard Specification for Woven Awning and Canopy Fabrics	ASTM D4847-02	This performance specification covers woven awning and canopy fabrics composed of any textile fiber or mixture of fibers.
11	External blinds and shutters - Resistance to wind loads - Method of testing	ONORM EN 1932	Gives testing requirements for resistance to wind load for external blinds and shutters
Tarpaulins			
12	Textiles - Tarpaulins	AS 3520	Specifies requirements for tarpaulins and shaped covers including canopies manufactured from: (a) rot and water-resistant duck, or (b) coated fabrics made from natural or synthetic fibers.
13	Textiles - Coated fabrics for tarpaulins	AS 2930	Specifies the requirements for coated fabrics using natural or synthetic fibers or their blends, either in woven or knitted construction, suitable for manufacture of tarpaulins.
14	PVC-coated fabrics for tarpaulins -- Specification	ISO 8095	This International Standard specifies requirements for fabric coated on one or both sides with a suitably plasticized coating, pigmented or otherwise, of poly(vinyl chloride) (PVC) or copolymer the major constituent of which is Vinyl chloride and which is suitable for use in the making-up of tarpaulins.
15	Textiles - Burning behaviour of materials for marquees, large tents and related products - Ease of ignition	DIN EN 14115	The document specifies a test method for the burning behaviour of industrial textiles, used for tarpaulins, large tents, marquees, related structures, airducts etc.
16	Standard Test Method for Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting	ASTM D2582-07	This test method covers the determination of the dynamic tear resistance of plastic film and thin sheeting subjected to end-use snagging-type hazards.

S No	Test Parameter/Standard	Specification Standard	Scope
17	Textile fabrics -- Determination of resistance to water penetration -- Hydrostatic pressure test	ISO 811	This standard tests textile fabrics for water penetration wherein a specimen is subjected to a steadily increasing pressure of water on one face, under standard conditions, until penetration occurs in three places.
Floor & wall coverings			
20	Pile carpets, mass of pile per unit area,thickness and density	DIN 54325	Testing of textiles; determination of mass of effective pile per unit area above backing, of effective pile thickness and of measured surface pile density of pile carpets; band knife shearing machine method
21	Floor coverings, thickness	DIN 53855-3	This standards gives the specifications and mehtod for determination of thickness of textile fabrics; floor coverings.
22	Textile floor coverings, wear	DIN 54323-1	-
23	Textile floor coverings, penetration behaviour	DIN 54316	Gives the etst method for determination of thickness loss of textile floor coverings at static load.
24	Textile floor coverings, change in appearance	DIN 54328	-
25	Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile Coverings on Full Height Panels and Walls	NFPA 265	This standard describes a test method for determining the contribution of textile wall coverings to room fire growth during specified fire exposure conditions.
26	Wall coverings in roll form - Specification for textile wall coverings	ONORM EN 266	This standard describes the specifications for textile wall coverings in rolled form.
27	Standard Classification of Wall Covering by Use Characteristics	ASTM F793-07	This classification covers the classification of wall covering by use characteristics, that is, according to its serviceability in use, recognizing that certain wall covering is designed primarily for decorative effect, while other wall covering is also designed to achieve a high degree of serviceability.

S No	Test Parameter/Standard	Specification Standard	Scope
28	Decorative wallcoverings - Roll and panel form products	DIN EN 15102	This standard applies to all forms of wallcoverings supplied for hanging onto walls or ceilings by means of an adhesive whose primary purpose is decorative. It also provides for the evaluation of conformity of products to the requirements of this standard.
29	Methods for fire tests on building materials, components and structures - Simultaneous determination of ignitability, flame propagation, heat release and smoke release	AS/NZS 1530.3	Describes a single test method for grading building materials on the basis of ignition tendency, flame spread, heat development and tendency to produce smoke. Apparatus, test procedure, indices for grading and mounting procedures for specimen materials are provided.
30	Standard Method of Test for Critical Radiant Flux for Floor Covering Systems Using a Radiant Heat Energy Source	NFPA 253	Describes a procedure for measuring critical radiant flux behavior of horizontally mounted floor covering systems exposed to a flaming ignition source in a graded radiant heat energy environment in a test chamber.
31	Textile floor coverings - Fire propagation of the use-surface using a small ignition source	AS 2404	States the level of fire propagation acceptable for the use-surface of any textile floor covering when ignited using a small ignition source.
32	Textile floor coverings - Metric units and commercial tolerances for measurement	AS/NZS 1385	Provides guidance for the specification of carpet technical properties and basic metric units.
Architectural membranes			
33	Standard Specification for Preformed Architectural Strip Seals for Buildings and Parking Structures	ASTM E1783-96	This specification covers the physical requirements for the fully cured elastomeric alloy and the movement capabilities of preformed architectural compression seals used for sealing expansion joints in buildings and parking structures.
34	Wet area membranes	AS/NZS 4858	Sets out to classify membranes based on elastic properties, which can then be used to give guidance on the type of detailing for a specific

S No	Test Parameter/Standard	Specification Standard	Scope
			membrane
Roofing - Roofing felts, scrims and Woven Roofing			
35	Bitumen roofing felt - Requirements and testing	DIN 52130	This document applies to sheeting for water-proofing of roofs produced using bitumen covered by sand and slate. This document specifies concepts, designation and requirements to bitumen sheeting for water proofing.
36	Polymeric bitumen roofing felt - Requirements and testing	DIN 52132	This document applies to polymer bitumen sheeting for water proofing of roofs covered by sand or slate and specifies concepts, designation and requirements.
37	Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing	ASTM D226-06	This specification covers asphalt-saturated organic felts, with or without perforations, intended to be used with asphalts conforming to the requirements of Specification D 312 in the construction of built-up roofs, and with asphalts conforming to the requirements of Specification D 449 in the construction of water proofing systems.
38	Torch-on bitumen felt - Requirements and testing	DIN 52131	This document applies to bitumen water-proof sheeting for fusion welding produced using bitumen covered with talcum or slate. It is used in civil engineering and can be processed by melting the cover layers.
39	Standard Specification for Thermoplastic Fabrics Used in Cold-Applied Roofing and Waterproofing	ASTM D5665-99A	This specification covers thermoplastic fabrics such as polyester, polyester/polyamide bicomponent, or composites with fiberglass or polyester scrims that can be used during the construction of cold-applied roofing and waterproofing.

S No	Test Parameter/Standard	Specification Standard	Scope
40	Standard Specification for Thermoplastic Fabrics Used in Hot-Applied Roofing and Waterproofing	ASTM D5726-98	This specification covers thermoplastic fabrics such as polyester, polyester/polyamide bicomponent, or composites with fiber glass or polyester scrims that can be used during the construction of hot-applied roofing and waterproofing.

9. Policies and regulations mandating and recommending the use of technical textile products

In the technical textile segment, the use of most of the products is not mandated, only regulations exist for some of the products. Most of the segments do not have mandatory or recommended usage policies at all. Moreover the regulations vary from region to region and there are no universal policies and regulations mandating the use of technical textile products. Below is a brief description of policies and regulations mandating and recommending the use of technical textile products in different technical textile segments.

Geotech

For Geotech there are hardly any mandatory usage policies and standards worldwide, regulating the use of geotextiles. Instead, as a general practice worldwide, the works/contracts awarded by the respective authorities' mandates the use of geotextile for the work, if required. The kind, standard and the amount of the geotextile to be used for the particular work are also usually specified in the contract.

Some standard practices are also there which recommends the use of geotextiles in certain works. For example the Federal Government, U.S. recommends *"Wetlands Best Management Practices"* which suggests/recommends the use of technical textiles. The following are the highlights of the same:

- The code recommends considering use of geotextile fabric during construction to minimize disturbance, fill requirements, and maintenance costs.
- It also recommends the use of geotextiles in drainage. It recommends the material to be separated from the adjacent fill layers by geotextile fabric.
- The code also recommends the use of geotextiles to increase the bearing strength of the road and to preserve the bearing strength of fill material by preventing contamination with fine soil particles.
- Geotextile fabric use at landing sites is recommended in wetlands and on soils with low bearing strength to minimize soil erosion and compaction.

There are also certain other policies which are mandatory to be followed for geotextiles, but the same does not mandates the usage of geotextiles. For ex. in Europe CE marking has been made mandatory for the geotextile products to be supplied for public works. These requirements have been introduced to standardise test methods throughout Europe and provide a consistent framework for the specification of

geotextiles based on their application. The policy has divided geotextile applications into 10 broad categories as follows:

- EN 13249: Roads and other trafficked areas
- EN 13254: Reservoirs and dams
- EN 13250: Railways
- EN 13255: Canals
- EN 13251: Earthworks, foundations and retaining walls
- EN 13256: Tunnels and underground structures
- EN 13265: Liquid waste containment
- EN 13252: Drainage systems
- EN 13257: Solid waste disposals
- EN 13253: Erosion control works

For each application one or more of 5 geotextile functions are defined (Filtration (F), Drainage (D), Reinforcement (R), Separation (S) and Protection (P)), and for each of the relevant functions certain specification properties are required (Using approved test standards).

Packtech:-

The use of technical textiles in the area of packaging is mandated by a number of packaging regulations prevalent in different countries. Europe, Japan, Australia and New Zealand already have the packaging regulations in place. These regulations mandate and govern the use of all the materials used in packaging, including technical textile materials. The highlights of the Packaging regulations prevalent internationally and in different countries are as follows:

- In Europe "*The Packaging (Essential Requirements) Regulations 1998"* mandates the packers/manufacturers to meet design conditions for packaging. These regulations could be summarized as follows:
    - The policy mandates the minimal use of the packaging material and has a provision of fining over-packaging
    - The policy encourages the design and production of re-usable, recyclable packaging material to minimize the impact on the environment.
    - The policy recommends the packaging to be manufactured in such a way that the presence of noxious and hazardous materials and its emissions or waste residues is minimized.

- The regulations mandates the availability of Packaging technical documentation and proof in case of Trading standard/ Environment agency controls"

- Apart from Europe, Japan has a "Container and Packaging Recycling Law, 1995", which is more or less similar to the European regulations. In Australia and New Zealand "The National Packaging Covenant, 1999" launched by the Australian and New Zealand Environment & Conservation Council (ANZECC) governs usage of packaging products.

- In Republic of Korea, there are mandatory packaging requirements for poultry products sold in the market to be packaged (slaughtering plants, meat packers, sellers, and importers are subject to these requirements). These mandatory requirements encourage the use of packaging material.

- There is an Aerospace Recommended practice in place, drafted by International Air Transport Association (**IATA**), which recommends the use of Cargo Pallet nets. It recommends the use of cargo pallet nets and states that "The normal means of restraining cargo on a pallet is using the corresponding airworthiness certified net: when properly installed and closed over the pallet load, it provides an effective means of restraint (i.e., will not release its contents) up to the ultimate load factors applicable to the pallet position within the aircraft's certified flight envelope".

- The recommended practice by IATA also recommends the use of Pallet Covers. The policy recommends the usage of airworthiness mandated fire resistant covers required in FAR 25.857 Class B (Combi-aircraft main deck) compartments and also recommends proper use of common type pallet covers to prevent crushing of wet packaging, to avoid cargo stacks shifting out of contour or collapsing and potentially interfering with the aircraft structure

In developing countries including Asian countries like Malaysia, Indonesia, Thailand, Singapore and India, there is no system in place, regulating the usage of products/materials used for the purpose of packaging. Only business guidance is available for the packaging industry in these countries.

Sportech

Sports Protective Equipment: There are hardly any mandatory requirements/standards for the use of technical textile products in sports. Instead, the use of various sports protective equipment made up of

technical textiles is recommended for almost all the outdoor and recreational sports where injury risk is there. These protective equipments are used as a part of standard practice in different sports. High quality protective safety equipment have been developed and recommended for many different sports. The purpose of the equipment is to help prevent and reduce the severity of injuries. The use of safety equipment is usually recommended as a result of research by health professionals that identified a high risk of injury in a particular sport or recreational activity. The use of safety equipment may be advocated by the government, national medical organizations, public health professionals, safety groups, and national governing bodies of sports or sports associations to prevent many different types of injuries, especially catastrophic injuries.

Below is a brief description of various personal protective equipments (PPE) used in sports:

- Helmets:- Helmets have been proven effective in either preventing brain injury or reducing the severity of brain and head injuries. The use of helmets has been either mandated or recommended for the following sports and recreational activities:

Auto & motor sports	Baseball	Boxing
Equestrian sports	Wrestling	Rugby
Skateboarding	Hockey	Bicycling
Snowmobiling	Lacrosse	Skiing
Women's softball	Rollerblading	Football

  Standards for helmets have been developed by the American Society for Testing & Materials, National Operating Committee on Standards for Athletic Equipment, Snell Memorial Foundation, and the American National Standards Institute.

- Mouth Guards: Mouth protectors help prevent injury to the mouth, teeth, lips, cheeks and tongue. As a standard practice, mouth guards are used by athletes and players in different sports. The mouth guards are also recommended to be worn by and athletes during practice and competition of contact and collision sorts. The American Dental Association recommends mouth guards for the following sports:

Acrobatics	Football	Martial arts	Skiing
Basketball	Gymnastics	Racquetball	Skydiving
Boxing	Handball	Rugby	Soccer
Discus throwing	Ice hockey	Shot putting	Squash
Field hockey	Lacrosse	Skate boarding	Surfing
Volleyball	Water polo	Weight lifting	Wrestling

- PPE in Ice Hockey: In U.S., it is mandatory to wear a face-mask (helmet) to provide maximum side and back-of-head protection. The other protective equipments mandated for use in Ice Hockey are elbow and knee pads, hip girdle with tail-bone protection and shin guards (for goalkeeper).

- Parachutes: There are hardly any government policies/guidelines mandating the use of parachutes, but several race clubs/associations have mandated the use of parachutes in car racing activities, following are a few amongst other mandating the same:
    - Tulsa Raceway Park, Oklahoma
    - Pro Outlaw Door Slammers, Virginia

  In 1923, the use of parachute was also mandated for U.S. Army Corp Personnel, by order of the Adjutant General.

Mobiltech

Only a few products in the Mobiltech segment have mandatory usage requirements according to the various regulations and policies prevailing. The products for which policies recommending and mandating the usage are Helmets, Airbags, Seat belts and Air filters. Following is a summary of different regulations mandating and recommending the usage of textile products for Mobiltech applications:

- Seat belt:-Most western countries have some seat belt legislation. The move towards seat belt wearing legislation started in Australia in the late 1960s, although it was echoed elsewhere. In Hungary, front-seat occupants of all motor vehicles have been required to use safety belts since 1976 and since March 1993, rear-seat passengers have also been required to wear safety belts in nonurban areas. In U.K., the law mandating the compulsory wearing of seat belts for front seat occupiers came into force on January 31, 1983. In the USA, where first seat belt legislation was

passed in 1984, law varies by state and wearing seat belt is mandatory except in New Hampshire. 25 states have primary seatbelt laws, while 24 have secondary seatbelt laws.

In Hungary, front-seat occupants of all motor vehicles have been required to use safety belts since 1976. Since March 1993, rear-seat passengers have been required to wear safety belts in nonurban areas. Drivers in violation of the law are subject to fines and potential suspension of driving privileges.

The following is the table containing summary of mandatory seat belt legislation in most of the countries:

Country	Compulsory wearing				Compulsory fitting	
	Cars			Bus passengers	Cars	Buses
	Driver	Front passengers	Rear passengers			
Australia	1970					
EU	1993					
France	1973 (outside cities), 1975 (cities at night), 1979 (all)		1990	2003	1979	
Germany	1976	1976	1984	1999	1970, 1979 (back seat)	1999
Hungary	1976		1993			
Hong Kong	1983	1983	1996		1996 (back seat)	
Ireland	1979		1992			
Japan			2008		1969	

New Zealand	1972	1972 (15 years and over), 1979 (8 years and over)	1989		1972 (vehicles registered after 1965), 1975 (after 1955)	
Spain	1975					
Sweden	1975	1975	1986	1986	1969 (front) 1970 (rear)	2004
United Kingdom	1983		1989 (children), 1991 (all)	2007 (if fitted)	1965 (front) 1986 (rear)	
United States	1985-1994 (except New Hampshire and American Samoa)				1966	2004

- Airbags:- Currently for Airbags, there are mandatory usage requirements in the U.S. only. The Federal standards required airbags to become mandatory on all cars produced after April 1, 1989. This requirement was made in lieu of the failed initiative to require automatic seat belts. Airbag introduction was stimulated by the U.S. DOT (Department of Transport). However, airbags were not mandatory on light trucks until 1995. In 1998 dual front airbags were mandated by the National Highway Traffic Safety Administration (NHTSA), U.S. and de-powered, or second-generation airbags were also mandated. This was due to the injuries caused by first-generation airbags that were designed to be powerful enough to restrain people who were not wearing seat belts. When the federal government began making air bags mandatory in the 1990s, the standard requirements of force with which an air bag deploys has proven deadly to children or small adults in some circumstances, however. Over 80 accidental deaths have been attributed to air bag deployments in relatively minor, low-speed accidents. Because of this For this reason, children

aged 12 and under, as well as rear-facing infant car seats, should not be allowed in the front seat of a vehicle equipped with an air bag on the passenger side.

In the United Kingdom, and most other developed countries there is no direct legal requirement for new cars to feature airbags. Instead, the Euro NCAP vehicle safety rating encourages manufacturers to take a comprehensive approach to occupant safety; a good rating can only be achieved by combining airbags with other safety features. Thus almost all new cars now come with at least two airbags as standard.

- Helmets:-For Motorcyle helmets, in most of the countries, both developed and developing, there are regulation mandating their usage. The regulations depend on the area of the kind of vehicle and the place location of. The first motorcycle helmet use law in the world took effect on January 1, 1961, in Victoria, Australia. In 1967, the federal government, U.S., began requiring states to enact motorcycle helmet use law to qualify for certain federal safety program and highway construction funds. Forty states enacted universal helmet use laws that went into effect by the end of 1969. A number of policy amendments took place thereafter. At present, 20 states and the District of Columbia have helmet laws covering all riders, and 27 states have laws covering some riders, usually people younger than 18. Illinois, Iowa, and New Hampshire do not have helmet laws.

  In Canada, there is universal Motorcycle helmet law mandating the use of helmets by the motorcycle occupants.

  Laws requiring motorcyclists to wear helmets are in effect in most countries outside the United States. Among them are Andorra, Argentina, Australia, Austria, Belgium, Brazil, Bulgaria, Canada, Czech Republic, Denmark, Finland, France, Germany, Hungary, India, Indonesia, Ireland, Italy, Japan, Latvia, Liechtenstein, Luxembourg, Malaysia, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russian Federation, San Marino, Singapore, Slovakia, South Africa, Spain, Sweden, Switzerland, Thailand, United Kingdom, Venezuela, and Yugoslavia.

  Following is a summary of laws mandating/regulating helmet usage in different countries:

COUNTRY	INSIDE BUILT-UP AREAS				OUTSIDE BUILT-UP AREAS			
	MOPEDS <50CC	***LIGHT MC <125CC***	***HEAVY MC <125CC***	***SIDECARS***	***MOPEDS <50CC***	***LIGHT MC <125CC***	***HEAVY MC <125CC***	***SIDECARS***
AUSTRIA	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory
AZERBAIJAN	-	-	-	-	-	-	-	-
BELGIUM	Mandatory **3/**	Mandatory	Mandatory	Mandatory	Mandatory **3/**	Mandatory	Mandatory	Mandatory
BULGARIA	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory
CZECH REPUBLIC	Optional **2/**	Mandatory	Mandatory	Mandatory	Optional **2/**	Mandatory	Mandatory	Mandatory
DENMARK	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory
FINLAND	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory
FRANCE	Mandatory **7/**	Mandatory	Mandatory	Mandatory	Mandatory **7/**	Mandatory	Mandatory	Mandatory
GERMANY	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory
HUNGARY	Mandatory **8/**	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory
ICELAND	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory
ISRAEL	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory
ITALY	Mandatory **10/**	Mandatory	Mandatory	Mandatory	Mandatory **/10**	Mandatory	Mandatory	Mandatory
LATVIA	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory
LITHUANIA	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory
MONACO	Mandatory	Mandatory **11/**	Mandatory	Mandatory	Not Applicable	Not Applicable	Not Applicable	Not Applicable
HOLLAND	Mandatory **4/**	Mandatory	Mandatory	Mandatory	Mandatory **4/**	Mandatory	Mandatory	Mandatory
NORWAY	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory

POLAND	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory
PORTUGAL	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory
ROMANIA	Mandatory	Mandatory	Mandatory	-	Mandatory	Mandatory	Mandatory	-
RUSSIAN FEDERATN.	Optional	Mandatory	Mandatory	Mandatory	Optional	Mandatory	Mandatory	Mandatory
SLOVAKIA	Optional	Mandatory	Mandatory	Mandatory	Optional	Mandatory	Mandatory	Mandatory
SLOVENIA	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory
SPAIN	Mandatory **5/**	Mandatory **6/**	Mandatory	Mandatory	Mandatory **5/**	Mandatory **5/**	Mandatory **6/**	Mandatory
SWEDEN	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory
SWITZERLAND	Mandatory **9/**	Mandatory	Mandatory	Mandatory	Mandatory **9/**	Mandatory **9/**	Mandatory	Mandatory
TURKEY	Optional			Optional	Optional			Optional
UNITED KINGDOM	Mandatory	Mandatory	Mandatory	Optional	Mandatory	Mandatory	Mandatory	Optional
U.S.A 1/	Different regulations are applied by particular States							
YUGOSLAVIA	Optional	Mandatory	Mandatory	Mandatory	Optional	Mandatory	Mandatory	Mandatory

1/ Different regulations in particular States

2/ Drivers not required to use helmets for mopeds not exceeding 40km/h

3/ Optional for mopeds which do not exceed 25km/h

4/ Except for slow capacity (20km/h) mopeds ("anorfiets")

5/ As of 1 Septembet 1992

6/ As of 15 June 1992

7/ As of 1 January 1992 - including passengers

8/ As of 1 January 1985 outside built-up areas

9/ As of January 1990

10/ Optional for drivers of mopeds over 18 years

11/ Except for the light motorcycle C1 made by BMW

- Diesel Particulate filter (Air filter):-While no jurisdiction has made filters mandatory, the increasingly stringent emissions regulations that engine manufactures must meet mean that

eventually all on-road diesel engines will be fitted with them. The American 2007 heavy truck engine emissions regulations cannot be met without filters. In the European Union, filters are expected to be necessary to meet Euro.VI heavy truck engine emissions regulations currently under discussion and planned for the 2012-2013 time frame.

As of July 2006 the California Air Resources Board was looking at introducing regulations that will require retrofit of all diesel engines operating in the state by the year 2013. Other jurisdictions may also do this. A variety of retrofit programs have been done, these are summarised as follows:

- 2008 - Milan Ecopass area (pollution charge) charging a hefty entrance tax on all diesel vehicles except for those with a particulate filter, either stock or retrofit
- 2008 - London Low Emission Zone charges charging vehicles that do not meet emission standard encourages retrofit filters
- 2004 - New York City retrofit program (non-road)
- 2003 - Mexico City started a program to retrofit trucks
- 2002 - In Japan the Prefecture of Tokyo passed a law banning trucks without filters from entering the city limits.
- 2001 - Hong Kong retrofit program

- Tiedown:-The Aerospace Recommended practice in place, drafted by **IATA**, recommends the use of tiedowns along with Cargo Pallet nets and Pallet covers for Air transport purposes. This is because significant load shifting or deformation out of contour (without being released from the net) which may not be always entirely avoided with a net has a potential for aircraft structural damage. The Association therefore recommends the use of tiedowns straps in complement to net restraint.

Meditech

Though there are a number of standards/test requirements in place for the technical textile and other products used in Meditech segment, there are hardly any regulations mandating the use of Meditech products. The standard usage practice in the field of Healthcare recommends and encourages the use of these products. As a standards practice, the following technical textiles are very commonly used and have

gained importance in the day to day healthcare activities (both surgical and non-surgical) because of increased awareness of the user segment:

- Surgical dressings (wound care products, Bandages, absorbent pads etc.)
- Baby diapers
- Incontinence diapers
- Sanitary napkins
- Surgical clothing (gowns, caps, masks, uniforms etc.),
- Surgical covers (drapes, covers etc.)
- Surgical beddings (sheets, blankets, pillow cases etc.)
- Eye contact lenses
- Sterile packaging
- Wipes
- Wound care absorbent pad

A summary of regulations and standard practices recommending the use of Meditech products is given below:

- Sutures:- Food and Drug Administration, U.S., has approved and recommended synthetic absorbable sutures for almost all surgical uses with the exception of certain cardiovascular and neurologic surgical procedures. Later use non-absorbable sutures as a standard practice, as, for example, in the suturing of prosthesis to tissue. Synthetic absorbable sutures have been used in many thousands of surgical operations of many types and show prospects of replacing other absorbable suture materials traditionally used in surgical operations. As a standard practice, the synthetic absorbable materials are also being used in some procedures in place of non-absorbable materials because of their retained strength and low tissue reactivity.

- Sterile Packaging:- Though there is no law mandating the use of sterile packaging, in U.S., International Association of Healthcare Central Service Material Management (IAHCSMM) has given the “Sterile Storage and Transport Standards” . The standards/law recommends the use of sterile packaging for safe medical procedures.

- Healthcare Textiles:- Healthcare textiles includes surgical clothing (gowns, caps, masks, uniforms etc.), surgical covers (drapes, covers etc.) and beddings (sheets, blankets, pillow cases etc.). These healthcare textiles are of two types, disposable and non-disposable. As standard practice

these healthcare textiles are currently being used by healthcare professionals all over the world because these are an important measure to control infection in a healthcare setting. Following are the key benefits provided by the healthcare textiles, because of which the use of these textiles has gain popularity recently:

- Prevent the penetration of bacteria, microorganisms, or particulates (wet and dry).
- Avoid penetration of liquids to the skin
- Controls spread of infections from visitor to the hospital environment and vice versa.

The use of these textile materials (both disposable and non-disposable) has also gained popularity in developing countries because of increased awareness in the user segment. According to the standard practice, trend is now changing and the use of disposable healthcare textiles is increasing.

AAMI is the Association for the Advancement of Medical Instrumentation. This organization consists of healthcare professionals, professional organizations, medical device manufacturers and trade organizations.AAMI is dedicated to increasing the safety and efficacy of medical instrumentation through education and the creation of uniform standards. Within AAMI there are technical committees (representing users, manufacturers, academia and regulators) that create the different standards and recommended practices. AAMI's standard PB70:2003 provides the specifications relating to Liquid Barrier Performance and Classification of Protective Apparel and Drapes Intended for Use in Health Care Facilities. The main objectives of the standard are:

- To help end-users select the types of drapes and gowns most appropriate for a particular task
- Assist manufacturers in qualifying, classifying and labeling the barrier performance of their products

These objectives are accomplished through a system of classification based on the products' liquid barrier performance (in the critical zones). There are four levels of barrier performance, level 4 being the highest protection available.

Level	Test	Result
1	AATCC 42 Water Impact (WI)	≤ 4.5 g
2	AATCC 42, WI AATCC 127 Hydro Head (HH)	≤ 1.0 g ≥ 20 cm
3	AATCC 42, WI AATCC 127, HH	≤ 1.0 g ≥ 50 cm
4	ASTM F1671, Gowns ASTM F1670, Drapes	Pass Pass

Protech

Personal Protective Clothing/Equipment: - In the Protech segment there are regulations mandating the use of personal protective clothing /equipment in most of the developed countries. In U.S. and U.K., these regulations mandate the usage of PPE at the workplace. The highlights of the regulations prevalent in different countries mandating the use of protech products are as follows:

- U.S.:- In U.S., federal regulations mandate the use of personal protective equipments (PPE) under "Occupational Health and Safety Act (OHSA)". The highlights of the OHSA regulations related with PPEs are as follows:

    - The act obliges an employer to eliminate any reasonably foreseeable risk to the health and safety of any person at the place of work. If it is not reasonably practicable to eliminate the risk, the employer is mandated to control the risk and the usage of PPE is advised and recommended for the same.
    - The act mandates the employer to provide and ensure the use of protective equipment at the place of work wherever it is necessary by reason of hazards of processes or environment, chemical hazards, radiological hazards, or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation or physical

contact. The act also mandates the equipment to be maintained in a sanitary and reliable condition.

- In case the employees provide their own protective equipment, the employer shall be responsible to assure its adequacy, including proper maintenance, and sanitation of such equipment.
- The Regulation also mandates the use of particular types of PPE in certain circumstances as a means of control. This include use of harnesses in elevated work platforms and use of specific types of PPE in asbestos removal processes
- The following table summarizes the OHSA regulations mandating the use of PPE products for protection from various hazards:

Category	**PPE Product**	**Hazards Protected**
Eye and face protection	Face mask, eye glasses and other eye and face protection equipments	Hazards from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, or potentially injurious light radiation
Respiratory protection	Filtering facepiece (dust mask), Helmet, High efficiency particulate air (HEPA) filter and other respiratory protection products	Hazards from dust and other respiratory related hazards.
Head Protection	Protective Helmets	Hazards when working in areas where there is a potential for injury to the head from falling objects.
Occupational Foot protection	Protective footwear	Hazard of foot injuries due to falling or rolling objects, or objects piercing the sole, and where there are electrical hazards.
Hand protection	Gloves a other related PPE	Hazards to hands such as those from skin absorption of harmful substances; severe cuts or lacerations; severe abrasions; punctures; chemical burns; thermal burns; and harmful temperature

		extremes.
Torso Protection	PPE including fire retardant wool and specially treated cotton clothing items and other types of protection including leather, rubberized fabrics, and disposable suits for Torso protection	Torso protection: heat, splashes from hot metals and liquids, impacts, cuts, acids, and radiation.

- Europe:- In Europe, "The Personal Protective Equipment at Work Regulations act" governs and mandates the use of PPEs at the workplace. The regulations are somewhat similar to those in OHSA. Following points summarizes the act
    - The regulations mandate the employers to provide free of charge PPEs to his employees who may be exposed to a risk to their health or safety while at work except where and to the extent that such risk has been adequately controlled by other means which are equally or more effective.
    - The regulation also mandates the use of PPEs by self-employed persons.
    - The law also mandates the employer to take into account the seriousness and frequency of the risk when deciding on the frequency of use of PPE.
    - The law also states the requirements for compatibility, assessment, maintenance, and accommodation etc. of the PPEs.
    - The regulation applies to and mandates the usage of PPEs like safety helmets, gloves, eye protection and high-visibility clothing, Safety footwear, chemical protective clothing, thermal protection clothing etc.

- South Africa:- The South African Department of Health has a protective clothing policy for radiation control. The policy regulates the use of protective clothing at the places having radiological emission. The policy mandates the use of:-
    - Protective aprons (workers)
    - Protective gloves (workers)
    - Thyroid shields for patients and radiation workers
    - Gonad shields for patients

- Australia:- In Australia, 'Motorcycling Australia', the governing body of motorcycle sport, encourages and recommends the use of PPEs for all motorcycle activities. But, the body does not support the mandatory imposition of the use of protective clothing. The body also supports enforcement and registration authorities which act to encourage the use of protective equipment by motorcyclists. The body has taken a number of initiatives for the same, including the following:
    - The body supports the removal of GST and all other taxes on CE Standards approved protective clothing with a belief that this will reduce the price of protective clothing.
    - It supports the adoption of the CE standards for impact protection, back protectors, protective clothing, protective footwear and stone and debris shields by all manufacturers.
    - It supports the prosecution of any person or organisation importing or selling protective clothing which purports to meet any Standard but does not.
    - The institute also supports the prosecution of any person or organisation importing, manufacturing or selling labels which are intended to mislead as to compliance of any protective equipment with a Standard.

Buildtech:-

The usage of technical textile products in Building/Construction is governed by the respective building codes prevalent in different countries. These building codes regulate the usage of different technical textiles used in buildings. Though these codes do not mandate the use of technical textiles, these codes have the mandatory specification standards for different products used (roof coverings, floor coverings, membranes, textile structures etc.). These specifications include fire testing standards among others. Different test requirements/standards are specified in different building codes and the manufacturer/builder should refer to the building code prevalent applicable to the area of work for conforming to the local standards.

These building codes generally apply to the following:

- construction materials regarding their combustibility;
- floor coverings;
- roofings;
- surface layers of construction materials and structures;
- textile furnishing materials;

- protective layers of structures of combustible materials;
- steel structures;
- walls, posts, beams, inserted ceiling and roof structures;
- fire doors;
- feedthroughs;
- closing fire barriers;
- smoke channels;
- smoke valves.

The Building codes safeguard life and protect the public welfare by regulating design, construction practices, construction material quality (including fire performance), location, occupancy, and maintenance of buildings and structures. When regulating materials, many of the model building codes refers to quality consensus standards for products or tests developed by standard-setting organizations such as ASTM and the National Fire Protection Association (NFPA).

Following is a brief description of building codes/regulations, currently in place in different countries:

- Europe:-The European Commission published the building products directive (89/106/EEG) in 1989 to promote free trade of building products. The directive contains six essential requirements that apply to the building itself. One of the requirements is safety in case of fire. Therefore building products must have a fire classification based on the same standards throughout Europe. A member state that regulates for a certain safety level will be able to identify the fire properties of a building product corresponding to that level. Products complying with the essential requirements of the directive are labelled CE. The function of the building directive relies on a number of specifications. In the fire area a definition of European fire classes, harmonised test standards and rules for attestation of conformity are such important specifications. The European fire classes and the rules for attestation of conformity are published by the European Commission. The reactions to fire standards are published by CEN.

- U.S.:-Building codes in the U.S. have developed over the years principally by locality and region. Local municipalities can choose to adopt their own building code version. Thousands of such jurisdictions across the country could make this potentially unworkable for material suppliers, designers, architects, and the construction industry. Even today there are virtually no nationally mandated building codes or regulations. There are three Model Building Codes in the U.S. that

have been in effect since about 1940. These codes, until recently, have been updated every 2 or 3 years. Their use has been preferred in the following regions:

- The West: The Uniform Building Code (CBC) issued by the International Conference of Building Officials (ICBO).
- The Midwest and Northeast: The BOCA National Building Code issued by Building Officials and Code Administrators International, Inc.
- The South: The Standard Building Code issued by the Southern Building Code Congress International, Inc. (SBCCI).

Following are the brief points summarizing the building codes in U.S.

- These model building codes are favoured in the areas where they originate and are adopted in full or in part in state or city building regulations.
- Local or regional variations in building code acceptance allow for particular concerns of that area; for example, heavy wind resistance is needed along the Gulf Coast and Florida because of the hurricane threat and building codes and regulations have been altered in California because of the likelihood of earthquakes.
- Localities can adopt a model building code but with specific changes or provisions needed in their particular location.
- Fire precautions are dealt with comprehensively in these model building codes. Many of the fire standards referenced in the codes are issued by the American Society for Testing and Materials (ASTM). Many building authorities also use the nationally available NFPA 101 Life Safety Code of the National Fire Protection Association (NFPA), which also covers fire precautions.

- U.K.:- As in U.S., in U.K. also there is no universal building code applicable. Following are building regulations apply in the various parts of the United Kingdom:

  - England and Wales: The Building Regulations 1991.
  - Scotland: The Building Standards (Scotland) Regulations 1990-1997.
  - Northern Ireland: The Building Regulations (Northern Ireland) 1991.

These regulations give the technical provisions for use and fire performance of building materials and components in the supporting documents to the Building Regulations. All the technical provisions are based on the same test methods specified in British Standards.

- Japan:- In Japan, The Building Standards Law came into effect on November 16, 1950. The law lays down guidelines and standards for plots of land, building design, furnishing and use. The law after subsequent revisions defines:

  Basic requirements - definition of categories of building parts and materials

  - Fireproof, fire preventive construction, non-combustible materials, etc.
  - Quasi non-combustible materials, fire retardant materials, and so forth.

  Performance criteria required for defined building parts and materials

  - Fireproof, quasi-fireproof, fire preventive construction
  - Noncombustible, quasi-noncombustible, fire retardant materials.

  Approval of building parts and materials with the required performance

  - Approval for "performance evaluation report" of tested materials (based on specific test methods and technical criteria) are submitted by designated examination bodies
  - Among the specification-based materials listed in the previous notifications, those that proved to satisfy the new fire performance requirements are presented in the new regulation system.

- Other Countries:- The other countries where there are building codes regulating the products used in the building construction are: China, Germany, France, Belgium, Ethiopia and Nordic countries (Denmark, Finland, Iceland, Norway and Sweden) amongst others.

Apart from the building regulations explained above there are other regulations which recommends and mandates the usage of technical textile products for building applications. Some regulations and standard practices also require the technical textile products to be used for enhanced performance and safety purposes. The regulations for some of the products are explained as below:

- Scaffolding nets:- In US, OHSA regulates and mandates the use of fall protection system including the safety nets and personal fall arrest systems. The act requires the employer to determine if the walking/working surfaces on which its employees are to work have the strength and structural integrity to support employees safely. The act mandates the employer to protect the employees from falling by the use of guardrail systems, scaffolding/safety net systems, or personal fall arrest systems. There are also other regulations mandating the use of safety nets at specified places of work.

- House-wrap:- In US, the building code requirements for air infiltration and moisture protection barriers encourages the use of Housewraps. All Model codes recommend the use of a weather-resistant barrier paper behind porous veneers. Though the codes usually cite 15-pound felt, all the codes allow for the substitution of "equivalent" materials, opening the door for plastic house-wraps. The house-wraps are mandated to pass performance tests conducted by an independent lab to qualify as an equal. There are also some states (Massachusetts, Michigan and Wisconsin), which have incorporated air barrier requirements into their commercial energy conservation codes. This encourages the use of housewraps.

Hometech

- In U.K., for the hometech segment, there are regulations in place for fire safety of Furniture and Furnishings. The Furniture and Furnishings (Fire) (Safety) Regulations 1988 set levels of fire resistance for domestic upholstered furniture, furnishings and other products containing upholstery. These regulations do not mandate the use of technical textile products but encourages the use of these products as technical textile products are manufactured to meet these standards:

    - furniture intended for private use in a dwelling, including children's furniture
    - beds, head-boards of beds, mattresses (of any size)
    - sofa-beds, futons and other convertibles
    - nursery furniture
    - garden furniture which is suitable for use in a dwelling
    - furniture in new caravans
    - scatter cushions and seat pads
    - pillows

- loose and stretch covers for furniture

These regulations mandate the use of textile products meeting the set standards, resistance requirements etc.

- In U.S., there are also set Flammability Test Procedure for Seating Furniture for Use in Public Occupancies. These test procedures are mandatory to be followed and standards are mandated to be met.

Oekotech:-

In Oekotech, there are mandatory waste disposal policies in various countries in the world, but these are very limited. Most of the developed countries including U.S., Germany, U.K., have the waste collection and disposal policies, under which the waste is calculated by the residential and industrial premises and is then disposed off in an appropriate manner. These policies mandate the usage of waste containers in certain cases. The main policies are highlighted as under:

- In U.S., the Code of Federal Regulations (CFR) gives the guidelines for the storage and collection of residential, commercial and institutional solid waste under Title 40 Part 243. The code gives the design specifications for different type of containers and mandates the usage of these containers. The law gives the requirements and recommended procedures and operations for safety, collection equipment, collection frequency and collection management. The code highlights the following:-

    - All solid waste containing food wastes shall be securely stored in covered or closed containers which are nonabsorbent, leak-proof, durable, easily cleanable (if reusable), and designed for safe handling so that that they do not constitute a fire, health, or safety hazard.
    - Containers shall be of an adequate size and in sufficient numbers to contain all food wastes, rubbish, and ashes that a residence or other establishment generates in the period of time between collections.
    - In the design of all buildings or other facilities which are constructed, modified, or leased after the effective date of these guidelines, there shall be provisions for storage in accordance with these guidelines which will accommodate the volume of solid waste

anticipated, which may be easily cleaned and maintained, and which will allow for efficient, safe collection.

- Waste containers used for the storage of solid waste must meet the standards established by the ANSI for waste containers.

- In District of Columbia, the government has a mandatory Solid Waste Management Policy under which The District's Executive Branch must provide a clearly labeled box for separation and collection of recyclable paper for every government employee's office work area. Paper deposited in such boxes shall be moved to appropriate designated collection points in each building to be collected by the custodial staff and, finally hauled and delivered to a recycling facility.