

COMBED YARN FOR KNITTING

Yarn quality requirement is changing everyday. Quality requirement is different for different end uses and it is different for different customers. It is easy to make the highest quality yarn just for the sake of achieving the best yarn results. But it is difficult to produce a good quality yarn with a minimum deviations. Very high fluctuation in yarn quality is an EVIL for any enduse. Some times it is better to keep same level of yarn quality (around 25% USTER STANDARDS) by strict quality control than achieving 5% USTER STANDARD but without consistency.

Consistent quality will be very much appreciated by the clients.

"I often say that when you can measure what you are speaking about and express it in numbers, you know something about it. But when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meagre and unsatisfactory kind; it may be the beginning of knowledge, but you have scarcely in your thoughts advanced to the stage of science, whatever the matter may be" (attributed to Lord Kelvin, 1883). Hence it is advisable to fix the standards for different yarn characteristics for cotton spun yarns for different end uses. The following table gives the quality requirement for

KNITTING YARNS.

Table: Quality Standard for 4 Ringframe Cop

Yarn Characteristic	required value for 30S Combed	other combed counts
Average count	30 (29.6 to 30.4)	nominal count plus or minus 1.3%
Count C.V%	less than 1.5	less than 1.5%
Twist Multiplier	3.5 to 3.6	3.5 to 3.6
TPI C.V%	less than 2.5	less than 2.5%
U%	9.2 to 9.8	5 to 10 % Uster Stat . value
-50% thin place / 1000m	less than 4	5 to 10 % Uster Stat . value
-30% thin place / 1000m	less than 650	5 to 10 % Uster Stat . value
+50% thick place / 1000 m	less than 30	5 to 10 % Uster Stat . value
+200 Neps / 1000m	less than 50	5 to 10 % Uster Stat . value
Total Imperfection / 1000 m	less than 85	5 to 10 % Uster Stat . value
RKM (tenacity) gms /tex	more than 16.5	more than 16.5
RKM C.V%	less than 7.5 %	5 to 10 % Uster Stat . value
Elongation %	more than 5.5	more than 5.5
Hairiness H	4.0 to 4.5	<>
Hairiness Standard Deviation	less than 1.5	25% Uster stat value
Objectionable classimat faults(both short and long)	less than 1 per 100 km	less than 1 per 100 km
Total classimat faults	less than 150	5 to 10 % Uster Stat . value
H1- thin faults	less than 5 per 100 km	5 to 10 % Uster Stat . value
shade variation on cones in UV lamp	no shade variation	no shade variation

GUIDE LINES TO ACHIEVE THE ABOVE:

RAW MATERIAL:

Raw material should be selected properly. There is a direct relationship between certain quality characteristics of the fibre and those of the yarn. 70 to 80 % of basic yarn quality is decided by cotton.

- Short fibre content is very important for yarn quality. Uniformity Ratio should be more than 47%. Fibres of length 4 to 5 mm will be lost in processing (as waste and fly). Fibres upto 12 to 15mm do not contribute to strength but only to fullness of the yarn. Only the fibres above these lengths produce the other positive characteristics in the yarn.
- 2.5% span length should be more than 28 mm. Span length affects yarn strength and yarn uniformity. End breakage rate also depends upon the fibre length. Longer the fibre, lower the end breakage rate, better the yarn quality.
- Average Micronaire should be between 3.8 to 4.3 for counts 24s to 40s (Ne). It can be between 4.1 to 4.7 for counts coarser than 24s.
- If the micronaire is coarse, the number of fibres in the yarn cross section will be less. This always results in lower strength and lower elongation. But it is easy to process coarse micronaire fibres in blowroom and cards.
- Nepping tendency is less for coarse micronaire fibres. On the contrary, spinnability (in both speed frame and ringframe) is not good with coarser micronaire fibres.
- U% is affected by Micronaire. Coarser the micronaire, higher the U%. Coarser the fibre, higher the end breakage rate in spinning.
- Uster Thin place (-30%) in the yarn vary depending upon the fibre micronaire. Lower the micronaire, lower the thin places vice versa
- Strength of the fibre should be more than 23 grams/tex
- Elongation of the fibre should be more than 6%.
- No of neps per gram should be less than 250
- should not mix two cottons with wide Reflectance value (Rd value) and yellow ness value (+b)
- sticky cotton should not be used. If cotton is sticky, it is better to reduce the percentage of sticky cotton in the mixing. Low humidity and high temperature should be maintained in the departments
- cottons with less contamination should be used (cottons like Andy, SJV, alto etc)

PROCESSING REQUIREMENTS:

MIXING:

- Average Micronaire of the mixing should be same for the entire lot. The difference in average micronaire of different mixings of the same lot should not be more than 0.1
- The micronaire C.V% of a mixing should be less than 10%
- The micronaire Range should be same
- Cottons with two different origins should not be mixed
- Cottons with too wide micronaire range should not be mixed
- Cottons with too wide reflectance value(Rd) and Yellowness value(+b) should not be mixed
- immature fibre content should be minimum as it will affect dyeing and will result in white-specks
- If automatic bale openers are used, bale laydowns should be done properly, so that different micronaire bales and colors are getting mixed up homogeneously even if small quantity is being checked
- If manual mixing is carried out, bales should be arranged and mixed properly so that different micronaire bales and colors are getting mixed up homogeneously even if small quantity is being checked
- for manual mixing, the tuft size should be as low as 10 grams
- If cottons with contamination is used, the best way is to open the bales into small tufts and segregate the contaminants. There are mills who employ around 60 to 80 persons to pick up contamination from a mixing of 20tons.
- Japanese insist on mixing atleast 36 bales for one mixing to avoid Barre problem

BLOWROOM:

- If the micronaire is low, blowroom process parameters become very critical.
- It is better to do a perfect preopening and reduce the beater speeds in fine opening. If required one more fine opener can be used with as low as beater speed, instead of using very high speed in only one fine opener
- If the micronaire is lower than 3.8, it is not advisable to use machines like CVT4 or CVT3
- Nep increase in cotton after blowroom process should be less than 80%. (i.e. 180 % of rawcotton nep)
- If the nep increase is more, then beater speeds should be reduced instead of feed roller to beater setting
- If the trash percentage in cotton is less and the neps are more in the sliver, no of beating points can be reduced. 3 beating points should be more than enough.
- variation in feed roller speed should be as low as possible especially in the feeding machine
- beater types and specification should be selected properly based on the positions of the beater and the type of raw material (fibre micronaire and trash percentage)
- the material pressure in the ducts should be as high as possible to reduce feeding variation to the cards
- feed rollers in the chute should work continuously without more speed variation if pressure filling concept is used. (i.e. balancing of the chute should be done properly). For others, the feed roller should work at the maximum speed for a longer time.
- material density between different chutes should be same. The difference should not be more than 7%
- The difference in duct pressure should not be more than 40 pascals in chute feed system.
- air loss should be avoided in the chute feed system, to reduce the fan speed and material velocity
- blow room feeding should be set in such a way that the draft in cards is same for all the cards and the variation in feed density is as low as possible
- fibre rupture in blowroom should be less than 2.5%

CARDING:

- 70% of the quality will be achieved in carding, if the wires are selected properly
- following table can be used as a guide line for cylinder wire selection

carding production	wire height	angle of wire(degrees)	points per square inch
less than 30 kgs/hr	2 mm	30	around 840
more than 30 kgs	2mm	35 to 40	900 to 1050

- Flat tops with 400 to 500 points per square inch should be used
- if the micronaire is lower than 3.5, the cylinder speed should be around 350rpm. If the micronaire is between 3.5 to 4.0, it can be around 450 rpm. If the micronaire is more than 4.0, it can be around 500 rpm.
- Lower the micronaire, lower the lickerin speed. It should range from 800 to 1150 rpm depending upon the micronaire and production rate
- pointed wires should be used for cylinder
- TSG grinder should be used once in 2 months for consistent quality
- Flat tops should be ground frequently (once in 3 months) for better yarn quality. Because, flat tops plays a major role in reducing neps and kitties in the yarn. Emery fillet rollers should be used for flat tops grinding, instead of using grinding roller grinding stone
- Licker-in wire should be changed for every 150000 kgs production in carding
- stationary flats should be changed for every 150000 kgs production in carding
- Individual card studies upto yarn stage should be conducted regularly, and if the quality is deteriorated by 25% from the average quality. card should be attended (wire mounting, grinding, full-setting etc to be done)
- setting between cylinder and flat tops should be as close as possible, depending upon the variation between cylinder and flat tops. Care should be taken so that , wires do not touch each other.
- Card autolevellers should be set properly. Nominal draft should be correct. Draft deviation should not be more than 5% during normal working.
- card stoppages should be as low as possible
- slow speed working of cards should be avoided. slivers produced during slow speed should be removed

- 10 meters C.V% of card sliver should be less than 2.0
- Sliver weight difference between cards should not be more than 2.5%
- Sliver U% should be less than 3.5 and spectrogram peaks should be attended
- cylinder loading should be nil. If cylinder is loaded, wire should be inspected. If required grinding should be done or wire should be changed
- sliver diameter difference should be less. Calender roller pressure should be same in all the cards
- trash in sliver should be less than 0.1%
- uniformity ratio of sliver should be same or better than raw cotton
- if kitties or seed coat fragments are more, higher flat speeds should be used and as much as flat waste should be removed to reduce seed coat fragments in the yarn
- in general sliver hank varies from 0.12 to 0.14
- individual card studies should be conducted upto yarn stage, if the quality from a particular card is bad, immediate action to be taken to rectify the problem. Lower the variation better the yarn quality.

COMBER:

- In lap preparation, total draft, fibre parallelisation ,no of doublings, lap weight etc should be decided properly(based on trial)
- higher the lap weight(grams /meter) lower the quality. It depends upon the the type of comber and the fibre micronaire
- if fine micronaire is used, lap weight can be reduced to improve the combing efficiency
- if coarse micronaire is used, lap weight can be increased
- if fibre parallelisation is too much, lap sheets sticking to each other will be more(It will happen if the micronaire is very low also). If the lap sheets are sticking to each other, the total draft between carding and comber should be reduced
- If the draft is less, fibre parallelisation will be less, hence loss of long fibres in the noil will be more
- top comb penetration should be maximum for better yarn quality. But care should be taken so that top comb will not get damaged.
- damaged top comb will affect the yarn quality very badly
- setting between unicom and top nipper should be same and it should be around 0.4mm to 0.5 mm
- feed weight is approximately 50 to 58 grams for combers like E7/4 and is 65 to 75 grams for combers like E62 or E7/6
- lower the feed length, better the yarn quality. Trials to be conducted with different feed lengths and it should be decided based on quality and production requirement
- required waste should be removed with the lowest detaching distance setting
- for cottons with micronaire upto 3.5, top comb should have 30 needles/cm and for cottons with more than 3.8 micronaire, the top comb should have 26 needles/cm
- Trials to be conducted to standardise the waste percentage
- piecing wave should be as low as possible. Piecing index should be decided based upon cotton length and feed length
- spectrograms should be attended. Comber sliver uster should be less than 3.5
- head to head waste percentage should be as low as possible
- variation in waste percentage between combers should be as low as possible(less than 1.5%)
- If cotton with low maturity coefficient is used, it is better to remove more noil to avoid dyeing variation problem

DRAWFRAME:

- Drawframe with a short term Autoleveller is a must
- no of doubling should not be less than 7 and the total draft also should be more than 7
- U% should be around 1.5 to 1.8
- 1 meter C.V% (from Uster Evenness Testing machine) should be less than 0.6
- top roller lappings should be almost nil
- If group creeling is used, all the sliver piecings from the creel should not enter the tongue and groove roller at the same time
- no sliver should be removed from the machine after the tongue and groove roller (which is meant for sensing the feed variation) for any reason. Because, draft correction will be done according to tongue and groove roller sensing and there is a time lag between sensing and correction.

- top rollers should be checked by the operators atleast once in a shift
- top rollers should be checked by the operators , whenever there is a lapping
- top roller buffing should be done once in 20 days(maximum 30 days)
- If the top roller eccentricity is more than 0.05 mm, it should be buffed
- top roller eccentricity should be zero after buffing.
- diameter variation between top rollers should be less than 0.1mm
- sliver test should be conducted atleast once in 15 days and the A% should be less than 0.8
- the delivery speed should be around 400 to 500 meters per minute depending upon the make of the machine
- whenever there is a top roller lapping, min 10meters of sliver should be removed from the can
- creel breaks should be as low as possible and it need to be pieced properly. Trials should be taken to see the yarn made out of piecing. Piecings should not be too thick and high twisted

SPEED FRAME:

- Total draft should be around 10 for 4 over 4 drafting system
- better to use floating condenser in the front zone to reduce hairiness and the diameter of the roving
- cots buffing should be done once in two months. top roller runout to be checked and it should be nil. There should not be any compromise on top roller quality. Top roller cost for speed frame is negligible if it is compared with ringframe
- If possible it should be treated with surface treatment like treatment with LIQIMIX or treated with acid to reduce top clearer waste which is caused by top roller surface
- Twist Multiplier should be high enough to reduce stretch in Ringframe. Higher the T.M lower the classimat "H1" faults
- If single speed for flyer is used, it is advisable to run less than 1000 rpm
- When the speed frame bobbin is full, flyer speed should be less than 1000 rpm. Otherwise surface cuts will increase and thin places also will increase
- False twisters should be changed once in two years. Variation in false twister will result in high count C.V%
- Roving tension should be as low as possible and as uniform as possible. Higher the roving tension, higher the count C.V% and higher the thin places
- Density of all roving bobbins should be same. Higher the variation, higher the count C.V%
- Break draft should be around 1.18 to 1.24 depending upon the type of drafting system and total draft
- Roving hank should be decided in such a way that the ring frame draft is around 20 to 34 for different counts.
- no sliver piecing or roving piecing from speedframe should be worked in Ringframe. All sliver piecing and roving piecing will result in thin and thick yarn. Some times it may be cut by the clearer, but all yarn faults created by piecings are not cut by the clearers.

RINGFRAME:

- Front zone setting should be as close as possible
- breakdraft of 1.14 and back zone setting of 60 mm is recommended
- 65 degree shore hardness for front top roller
- buffing should be carried out once in 45 days
- if the top roller diameter is less by 1.5 mm from the standard diamter, top roller should be changed
- the gap between front top roller and apron nip should be as low as possible(around 0.5 to 1 mm). If it is more imperfections will be high
- bottom and top aprons should be changed atleast once in 1.5 years
- It is better to use lighter travellers instead of using heavier travellers.

Enough trials should be taken , because traveller size depends upon, speed, micronaire, humidity condition, count, ringdiameter etc

- It is advisable to use Elliptical travellers for hosiery counts
- ring travellers should be changed before 1.5% of travellers burn out
- whenever there is a multiple break, ring travellers should be changed
- At any point of time, fluff accumulation on travellers should be less. Ring traveller setting should be close enough to remove the waste accumulation but at the same time it should not disturb the traveller running

- hairiness variation between spindles should not be high. To achieve this, traveller should be changed in time, bad workings (multiple breaks) should be avoided, rings like TITAN rings (from Breaker) should be used, damaged rings should be removed
- Ring frame breaks should be as low as possible (less than 10 breaks per 1000 spindle hours)
- Start up breaks after doffing should be less than 3 %.
- Overhead cleaners is a must for processing combed cotton
- Exhaust trenches should be between machines and for every 200 spindles there should be a trench
- ring centering should be perfect. Abc rings and lappet hook centering should also be done perfectly
- If ring diameter is more than 40 mm, ring centering plays a major role. If ring centering is not done properly, hairiness variation within the chase will be very high
- good quality spindle tapes should be used and changed for every 24 months. Spindle speed variation will affect yarn strength, tpi and hairiness

WINDING:

- Winding speed should be around 1250 meters/ min
- machines with tension management is preferred
- Clearers settings should be as close as possible. Loephe Yarn master setting is given below

N -4.0 (nep) : DS-2.0 (short) : LS-1.6 (short) : DL-1.18 (long) : LL-40 : (long) -DS-14%(thin) : -DL-40(thin)

Since loephe has a facility of class clearing. "C"s to be added in such a way that the following faults which are displayed in Loephe class clearing should be cleared.

A4,A3,B4,B3, B2(50%),C1,C2,C3,C4,D1,D2,D3,D4,E,F,G,H1(50%),H2,I1,I2

- Count channel setting should be less than 7%
- setting for cluster faults should be set such that, if a yarn produced without bottom apron, or damaged rubber cots is fed, it should be cut by the clearer
- long thick faults in the cone yarn should be zero
- long thin faults should be zero
- If the waxing attachment is below the clearers, the clearers should be cleaned once in a day
- splice strength should be more than 75% of yarn strength
- splice appearance should be good and all the splicers should be checked atleast once in a week
- good quality wax should be used
- wax pick up should be around 0.1%
- uniform application of wax to ensure uniform coefficient of friction (0.125 to 0.15)
- uniform moisture in the cones is important, because coefficient of friction varies as a function of moisture
- all wax rollers should rotate properly
- repeaters should be as low as possible, because this will affect the package quality
- It is advisable to produce cones with 1.8 to 2.4 kgs
- yarn tension in winding should not be very high
- imperfection increase between ringframe and winding should not be more than 30% for cotton combed yarns

GENERAL:

- finished garments rejection should be less than 1%
- yarn faults contribute to 25% of the rejections. Major yarn faults are

contamination

thick and thins

Unevenness

periodicity

Stiff yarn - Higher TPI (holes)

higher friction

high hairiness variation

mixed properties of yarn - "Barre"

Neps

white specs(immature fibres)

Kitties (vegetable matters, dust content)

Lower elongation and elasticity

- It is better to use cottons with less contaminations like Andy, SJV, Alto, etc
- contaminations of length more than 20 mm should be nil in the yarn
- as per japanese standard, the no of contamination per Kg of fabric should be less than 5
- If cotton has contamination, it is compulsory to use manual picking on preopener lattice, cotamination detectors at blowroom, visual clearer(siro) at winding.
- It is advisable to go to the supplier(cotton ginner) for quality - a concept of Japanese
- 10 meter C.V% of yarn should be controlled and it should be as low as possible. This affects the fabric appearance