

Basic Combing and Roving

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(i) In this operation, fine-toothed combs continue straightening the fibers until they are arranged with such high degree of parallelism that the short fibers called 'noils' are combed out and completely separated.

(ii) This procedure is not done when processing man-made staple fibers because they are cut into predetermined uniform length.

(iii) This operation eliminates, as much as 25% of the original card sliver, thus almost one-fourth of the raw cotton becomes waste.

(iv) The combing process forms a comb sliver made of the longest fibers, which, in turn, produces a smoother & more even yarn.

Fig 1.4 Combing

(4) Drafting / Drawing

(i) The draw frame has several pairs of rollers, each advance set of which revolves at a progressively faster speed.

(ii) This action pulls the staple lengthwise over each other, thereby producing longer & thinner slivers.

(iii) After several stages of drawing out, the condensed sliver is taken to the slubber, where rollers similar to those in the drawing frame draw out the cotton further.

(iv) The slubbing is passed to the spindles, where it is given its first twist & is then wound on bobbins.

Roving

(i) Roving is the final product of several drawing out-operation.

(ii) These bobbins are placed on the roving frame, where further drawing out and twisting take place until the cotton stock is about the diameter of a pencil lead

(iii) To this point, only enough twist has been given the stock to hold the fibers together.

(iv) Roving has no tensile strength, it will break apart easily with any slight pull.

COMBER

Combing is the process which is used to upgrade the raw material. It influences the following yarn quality

1. yarn evenness
2. strength
3. cleanness
4. smoothness
5. visual appearance

In addition to the above, combed cotton needs less twist than a carded yarn.

TASK OF THE COMBER:

To produce an improvement in yarn quality, the comber must perform the following operation.

1. elimination of short fibres
2. elimination of remaining impurities
3. elimination of neps

- The basic operation of the comber is to improve the mean length or staple length by removing the short fibres.
 - Since fineness of short fibres (noil) is low, the overall micronaire of the sliver after combing is high.
 - Because of combing, fibre parallelisation increases. Please note that this is a side effect which is not an advantage always. The high degree of parallelisation might reduce inter-fibre adhesion in the sliver to such an extent that the fibres slide apart while pulled out of the can. This may lead to sliver breaks or

false draft.

- SEQUENCE OF OPERATION IN A COMBER
 1. Feeding, lap is fed by feed roller
 2. fed lap gripped by the nipper
 3. gripped lap is combed by circular comb
 4. detaching roller grips the combed lap and moves forward
 5. while the detaching roller delivers the material, top comb comes into action to further clean the lap
 6. While going back, nipper opens and receives a new bit of lap
- The rawmaterial delivered by the carding machine can not be fed directly to the comber. Lap preparation is a must
- A good lap fed to the comber should have
 1. highest degree of evenness so that lap is gripped uniformly by the nipper
 2. a good parallel disposition of fibres so that long fibres will not be lost in the noil
 3. trailing hooks from carding should be fed as leading hooks to reduce long fibre loss in the noil
- Degree of parallelisation of lap fed to the combers should be optimum. If fibres are over parallelised lap licking will be a major problem. Because of fibre to fibre adhesion, mutual separation of layers within the sheet is very poor.

Moreover the retaining power of the sheet can be strongly reduced that it is no longer able to hold back the neps as it usually does. Some of these neps also pass thro the top comb. Neppiness of the web is increased.
- Retaining power of the fibres results in self cleaning of the lap during combing operation. A thick sheet always exerts a greater retaining power than a thin one. To certain extent, the bite of the nipper is more effective with a higher sheet volume. On the negative side, a thick sheet always applies a strong load to the comb and this can lead to uncontrolled combing. A compromise should be struck between quality and productivity.
- If the sheet is more even across the width, clamping effect at the bite of the nipper will be better. Evenness of the lap is therefore of considerable significance. The most effective method of obtaining a high degree of evenness of the sheet is through more number of doublings in the web form. (as it is done in RIBBON LAP)
- Fibres must be presented to the comber so that leading hooks predominate in the feedstock. This influences not only the opening out of the hooks themselves, but also the cleanliness of the web. If the sheet is fed to the comber in the wrong direction, the number of neps rises markedly.
- Both quantity and form of fibre hooks depend mainly upon the stiffness of the fibres. This rises to the second or third power with fine fibres. Fine and long fibres will always exhibit more and longer hooks than short and coarse fibres. Accordingly, the role of fibre hooks in the spinning process becomes more significant as fibres become finer.
- There are two types of feeds in COMBER
- Forward feed (concurrent feed): Feed of the sheet into the nippers occurs
 1. while the nippers move towards the detaching roller
 2. Backward feed (counter-feed) : Feed of the sheet occurs during return of the nippers
- Higher Noil % always improves the imperfections in the final yarn. But the strength and other quality parameters improve upto certain noil %, further increase in noil results in quality deterioration.
- In backward feed, the cylinder comb combs through the fibres more often than in forward feed Therefore, the elimination of impurities and neps is always good. However the difference is usually undetectable in modern high performance combers of the latest generation.
- The FEED LENGTH has a direct influence on production rate, noil %, and the quality of combing. High feed length increases the production rate but cause deterioration in quality. Higher the quality requirement, feed length should be lower. To some extent, the feed length may be decided by the length of the fibre also.

Detaching length is the distance between the bite of the nippers and the nip of the detaching rollers.

- This distance directly affects the noil %. More the detaching distance, higher the elimination of noil.
- Needles of the top comb have a flattened cross section and are used with a point density in the range of 22 to 32 needles per centimeter. More the needles, more the noil%.
 - The Depth of Penetration of top comb also affects the Noil %. If the comb depth is increased by 0.5mm, approximately 2% increase in noil will occur. When the depth is increased, the main improvement in quality is seen in Neps. Over deep penetration of top comb disturbs fibre movement during piecing which will deteriorate the quality.
 - Since the web from detaching roller is intermittent because of the intermittent functions like feeding, combing and detaching, to have a continuous web from the comber, fibre fringes are laid on the top of each other in the same way as roofing tiles. This process is called Piecing. This is a distinct source of fault in the operation of Rectilinear Combing. The sliver produced in this way exhibits a periodic variation.
 - As large a lap as possible with adapted lap weight which is as high and as uniform as possible must be positioned in front of the comber. The better the comber lap is prepared, the heavier the lap weight can be set on the comber and the less the resultant noil waste with the same degree of cleanliness of the yarn.
 - The higher degree of combing out are used in order to permit final spinning of ultra-fine yarns or to increase the strength of a yarn. Reducing the lint content improves the medium staple. However, not all cottons meet these requirements. Low degree of combing out, on the other hand, frequently serve to improve purity. When the card sliver is pulled through the needle bars, these separate off foreign bodies, large neps and torn fibres. Light combing out has also been introduced to a greater extent owing to the impairments in cotton purity influenced by mechanical harvesting. Even when combing with minimum noil percentages, there is a noticeable improvement in fibre parallelism in the sliver. Even the smoothness and shine of the yarn are improved. It must thus be anticipated that this method will become more and more popular in the future.
 - Production of the comber is dependent upon the following
 1. N- Nips per min
 2. S- feed in mm/nip
 3. G- lap weight in g/m
 4. K- Noil percentage
 5. A- tension draft between lap and feed roller(from 1.05 to 1.1)
 6. E- efficiency

$$\text{Production} = (E * N * S * G * (100-K) * 60 * 8) / (1000 * 1000 * A * 100)$$