

PROCESS PARAMETERS IN COMBING

INTRODUCTION

Combing is a process which is meant for upgrading the cotton raw material so that the following yarn properties will improve compared to the normal carded yarn. U% of yarn tenacity gms/tex trash in the yarn(or kitties in the yarn) Lustre and visual appearance

POINTS TO BE CONSIDERED

Following parameters are very critical as far as the yarn quality of combed yarn is concerned

- Noil percentage(waste percentage)
- Type of feed
- feed length
- feed wight in grams per meter
- Piecing length
- Top comb penetration depth
- The distance between unicombed to nipper
- unicombed specification
- Number of needles in top comb
- The cleaning of unicombed
- Variation in nipper grip
- Variation in noil percentage
- type of lap preparation
- total draft between carding and comber i.e total draft employed in lap preparation
- Drafting roller settings in comber
- Drafting roller settings in lap preparation machines
- No of doublings in lap preparation
- Short fibre content
- Fibre micronaire
- the type and the amount of trash in the card sliver

WASTE PERCENTAGE

- The noil percentage from a comber depends upon the following
 - short fibre content
 - detaching distance
 - feed length
 - top comb penetration
 - The distance between unicombed to top comb
- The basic idea of removing the waste is to remove the short fibres i.e to improve 50% span length or mean length.
- The two important basic parameters to be considered in deciding the waste percentage are, 1.Yarn quality requirement and 2.Short fibre content in the raw material
- Let us assume that the following cotton is used
 - 2.5 span length = 28 to 30 mm
 - uniformity ratio = 50 to 53%
 - FFI % = 6 to 14
 - Micronaire = 3.8 to 4.2
 - fibre strength = 24 to 28 gms/texand the quality requirement for counts 30s to 40s, is to meet 5% uster standards in U%, imperfection, strength and classmate faults.
To meet this quality requirement with the above rawmaterial ,the amount of noil to be extracted may be around 16 to 18% if E7/4(RIETER MAKE)comber is used or 15 to 16 % if E-62(RIETER MAKE) comber is used. The above example is given to highlight the effect of noil removed and the quality achieved. This is just an approximate figure, the parameters may vary depending upon the application.
- Combing efficiency is calculated based on the improvement in 50% span length, expressed as a percentage over 50% span length of the lap fed to the comber multiplied with waste percentage.
i.e.

$$((S-L)/(L*W))*100$$

where

S- 50% span length of comber sliver

L- 50% span length of comber lap

W- waste percentage

- Higher the noil %ge , lower will be the combing efficiency.
- Given a chance, it is better to remove waste more from top comb penetration than increasing the waste percentage by increasing the detaching distance. When the detaching distance is more the control during detaching will be less.

Given a chance, it is better to work with backward feed than forward feed for the same waste percentage. Nep removal will be better, loss of long fibres in the waste during detaching will be less.

- With backward feed, top comb penetrates into the fibre fringe which is already combed by the unicom, therefore combing action done by top comb will be better and there will not be longer fibres in the waste
- Waste percentage depends upon the feed length and type of feed. In backward feed, higher the feed length, higher the waste percentage. In forward feed, higher the feed length, lower the waste percentage.

- With backward feed, the detaching distance will be less for the same waste percentage compared to forward feed. Therefore fibre control during detaching and during top comb action will be better.
- Higher the noil, higher the yarn strength. But this is true upto certain level of waste. Further increase may not increase the yarn strength. Very high %ge of noil will reduce the yarn strength and will increase the breakage rate in ring frames.

TOP COMB AND UNICOMB

- The number of needles in Top comb depends on the Fibre micronaire , the lap weight and fibre parallelisation in the lap. If the fibre Micronaire is less than 3.6, number of needles per centimeter in top comb can be 30. In general for fibres above 3.8 Micronaire, 26 needles per centimeter is used.
- Top comb plays a major role in removing the waste. Around 40 to 60% of noil is removed by top comb. But top comb will get damaged very fast. Top comb damage will result in slubs in the sliver. Even 4 to 5 needle damages will result in bad webs. Top comb maintenance is very very important to produce good quality yarn.
- Different types of unicombs are used in different combers. The circumference of unicombs , the number of wire points and its variation in the unicom are different. It is not true that 110 degree unicom will produce good quality yarn compared to 90 degree unicom.
- In most of the cases, 75 degree unicom has given better results compared to 90 degree unicom in E7/4 combers, for different types of cottons.
- Rieter has standardised 90 degree unicom for its E-62 combers. 110 degree unicom can not be used in this comber.
- Unicom action will be effective as long as nipper and unicom moves in opposite direction. If unicom and nipper move in the same direction, unicom can not do its work properly. Moreover the finer needles will not be utilised properly. That may be the reason why 90 degrees unicom do not produce a good quality yarn compared to 75 degrees unicom.
- The setting between unicom and nipper should be same. When nipper is loaded with the the feed roller, the setting may be around .4 to .5 for E7/4 combers and .5 to .7 for E-62 combers. This setting can be corrected by fixing spacers between unicom and unicom body. Some unicom manufacturers supply the spacers along with the unicombs.

LAP PREPARATION:

- There are different types of lap preparation. The best combination is drawframe and unilap combination. Lap piecing will be less in this combination compared to sliver lap and ribbon lap combination. Every lap piecing is a major fault compared to sliver piecing. If number of lap piecings are less, top comb damages will also be less.
- The total draft for sliver lap and ribbon lap combination should be around 9 .
- If Micronaire is less than 3.8, the lap licking tendency will be more. For such fibres, the total draft between card and comber should be kept as low as possible, i.e around 8.5.
- For drawframe and unicom preparation the total draft can be from 9.5 to 11, depending upon the fibre and lap weight.
- Fibre parallelisaion in a lap should be reasonably good, to avoid long fibres in the noil. With the

modern cards, the fibre parallelisation is improved because of the stationary flats.

- The self cleaning effect of the lap sheet arises from the retaining power of the fibres relative to the impurities. This depends on the lap weight. If lap weight is more, the uncomb efficiency may not be good. But the nipper grip will be good for heavier lap weight. Therefore an optimum lap weight should be decided, It depends on
- Fibre micronaire (the number of fibres present to the nipper)
- Nipper type
- For E7/4 comber, lap weight of 52 to 60 gms per meter can be selected to produce a fairly good quality yarn. In case of E-62 comber (latest from RIETER), it can range from 65 to 75 grams per meter to produce a fairly good yarn.
- Lesser the number of piecings in comber, better the quality. Every piecing in comber is a defect. Therefore, it is better to increase the lap weight as high as possible. For modern lap preparation it is around 20 to 23 kgs/lap and for older lap preparation, it is around 12 to 13 kgs per lap.

OTHERS

- Piecing is a distinct source of fault in comber operation. It is a periodic variation. The amplitude of this fault should be as low as possible. The following affect this fault
 - detaching roller timing
 - arranging this fault before entering the draft zone, so that this faults cancel each other (by adjusting the delivery guide.)
- Detaching roller timing depends upon the index setting and feed length. This setting should be selected in such a that with the minimum length of overlapping comber works without any problem.
- Drafting setting should be done according to the recommendation. Trials can be taken with different setting to optimise the same. (both in lap preparation and in comber)
- Lower the feed length, lower the production. But better the yarn quality.
- But in some application, lower feed length with forward feed (concurrent feed) has resulted in inferior quality. But in general lower feed will improve the yarn quality. It is always better to take a trial and confirm this. Feed length to some extent depends on the fibre staple length also.
- With backward feed, the uncomb penetrates thro the fibre fringe more often than in the case of forward feed. Therefore the quality of the combing operation is increased in the case of backward feed.

In combing operation, the hank of the sliver will not affect the comber production. Therefore, if old type of combers are used, where the drafting is not good, lower drafts can be preferred in comber and the draft can be increased in a good drawframe like RSB-951 OR RSB-D-30 if it is used as a finisher.