Basic Carding

Carding

(i)

This is the process of arranging the fibers in a parallel fashion. This is necessary for all staple fibers; otherwise, it would be impossible to produce fine yarns from what is originally a tangled mass.

(ii)

Before the raw stock can be made into yarn, the remaining impurities must be removed, the fibers must be disentangled, and they must be straightened.

(iii) The lap is passed through a beater section and drawn on a rapidly revolving cylinder covered with very fine hooks or wire brushes.

(iv)

A moving belt of wire brushes slowly moves concentrically above this cylinder. As the cylinder rotate, the cotton is pulled by the cylinder through the small gap under the brushes, the teasing action remove the remaining trash, disentangles the fibers and arranges them in a relatively parallel manner in the form of a thin web.

(v)

This web is drawn through a funnel – Shaped device that molds it into a round ropelike mass called the card sliver (about thickness of a broom stick).

CARDING

INTRODUCTION

"Card is the heart of the spinning mill" and "Well carded is half spun" are two proverbs of the experts. These proverbs inform the immense significance of carding in the spinning process.High production in carding to economise the process leads to reduction in yarn quality.Higher the production, the more sensitive becomes the carding operation and the greater danger of a negative influence on quality.The technological changes that has taken place in the process of carding is remarkable. Latest machines achieve the production rate of 60 - 100 kgs / hr, which used to be 5 - 10 kgs / hr, upto 1970.

THE PURPOSE OF CARDING:

1. to open the flocks into individual fibres
2. cleaning or elimination of impurities
3. reduction of neps
4. elimination of dust
5. elimination of short fibres
6. fibre blending
7. fibre orientation or alignment
8. sliver formation

TECHNOLOGICAL POINTS IN CARDING

- There are two types of feeding to the cards
    1. feeding material in the form of scutcher lap
    2. flock feed system (flocks are transported pneumatically)
- lapfeeding
    1. linear density of the lap is very good and it is easier to maintain(uniformity)
    2. the whole installation is very flexible
    3. deviations in card output will be nil, as laps can be rejected
    4. autolevellers are not required, hence investment cost and maintenace cost is less
    5. transportation of lap needs more manual efforts(more labour)
    6. lap run out is an additional source of fault, as it should be replaced by a new lap
    7. more good fibre loss during lap change
    8. more load on the taker-in, as laps are heavily compressed

- flock feeding
    1. high performance in carding due to high degree of openness of feed web
    2. abour requirement is less due to no lap transportaion and lap change in cards
    3. flock feeding is the only solution for high prouduction cards
    4. linear density of the web fed to the card is not as good as lap
    5. installation is not felxible
    6. autoleveller is a must, hence investment cost and maintenance cost is more
- Type of flock feed(chute feed)
    1. there are two basic concepts of flock feed
        1. one piece chute without an opening device
        2. two piece chute with an opening system
    2. one piece chute is simple, economical and requires little maintenance
    3. two piece chute is complex, expensive, but delivers a uniform batt.
    4. One piece chut is a closed system, i.e.excess flock returns to the distrbutor, if too much material is present,
       neps can be increased
    5. one piece chute is not flexible to run different mixings
    6. layout restrictions are more with one piece chute
- A feeding device is a must to feed the web to the Taker-in region and it should perform the following tasks
  to clamp the batt securely throughout its width
  to grip the fibres tightly without slippage during the action of taker-in
  to present the fibres in such a manner that opening can be carried out gently
- The divertor nose(sharp or round) and the length of the nose(guide surface) have a significant influence on
  quality and quantity of waste removed. Shart nose divertor avoids fibre slippage but the opening action is not gentle.
  If the length of the guide surface is too short, the fibres can escape the action of the taker-in. They are scraped
  off by the mote knives and are lost in the waste receiver.
- Feed roller clothed with sawtooth is always better , because it gives good batt retention. Thus the opening effect
  of the taker-in is more as it is in combing
- Rieter has devloped a "unidirectional feed system" where the two feed devices(feed roller and feed plate are oppositely arranged when compared with the conventional system. i.e. the cylinder is located below and
  the plate is pressed against the cylinder by spring force. Owing to the direction of feed roller, the fibre batt runs downwards without diversion directly into the teeth of the taker-in(licker-in) which results in gentle fibre treatment. This helps to reduce faults in the yarn.
- The purpose of the taker-in is to pluck finely opened flocks out of the feed batt, to lead them over the dirt eliminating parts like mote knives, combing segment and waste plates, and then to deliver the fibres to the
  main cylinder. In high production cards the rotational speed ranges from 700-1400
- The treatment for opening and cleaning imparted by Taker-in is very intensive, but unfortunately not very gentle.Remember that around 60% of the fibres fed to the main cylinder is in the form of individual fibres.
- The circumferential speed of Taker-in is around 13 to 15 m/sec and the draft is more than 1000.It clearly shows that fibre gets deteriorated at this opening point. Only the degree of deterioration can be controlled by adjusting the following
    1. the thickness of the batt
    2. the degree of openness of the rawmaterial
    3. the degree of orientation of the fibres
    4. the aggressiveness of the clothing
    5. the distance between the devices
    6. the rotational velocity of the taker-in
    7. the material throughput
- Latest TRUTZSCHLER cards work with three licker-ins compared to one liker-in.The first one is constructed as
  needle roll. This results in very gentle opening and an extremely long clothing life for this roll. The other two
  rollers are with finer clothing and higher speeds, which results in feeding more %of individual fibres and

smallest tufts compared to single lickerin, to the main cylinder. This allows the maing cylinder to go high in speeds and reduce the load on cylinder and flat tops. There by higher productivity is achieved with good
quality. But the performance may vary for different materials and different waste levels.

- between the taker-in and main cylinder , the clothings are in the doffing disposition. It exerts an influence on the sliver quality and also on the improvement in fibres longitudinal orientation that occurs here. The effect depends on the draft between main cylinder and taker-in.The draft between main cylinder and taker-in
  should be slightly more than 2.0.
- The opening effect is directly proportional to the number of wire points per fibre. At the Taker-in perhaps 0.3 points/ fibre and at the main cylinder 10-15 points /fibre.If a given quality of yarn is required, a corresponding degree of opening at the card is needed. To increase production in carding, the number of points
  per unit time must also be increased. this can be achieved by
  1. more points per unit area(finer clothing)
  2. higher roller and cylinder speeds
  3. more carding surface or carding position

  speeds and wire population has reached the maximum, further increase will result in design and technological
  problems. Hence the best way is to add carding surface (stationary flats). Carding plates can be applied at

  4. under the liker-in
  5. between the licker-in and flats
  6. between flats and doffer
- Taker-in does not deliver 100% individual fibres to main cylinder. It delivers around 70% as small flocks to main cylinder. If carding segments are not used, the load on cylinder and flats will be very high and carding
  action also suffers. If carding segemets are used, they ensure further opening, thinning out and primarily, spreading out and improved distribution of the flocks over the total surface area.carding segments bring the following advantages
  1. improved dirt and dust elimination
  2. improved disentanglement of neps
  3. possibility of speed increase (production increase)
  4. preservation of the clothing
  5. possibility of using finer clothings on the flats and cylinder
  6. better yarn quality
  7. less damage to the clothing
  8. cleaner clothing
- In an indepth analysis, all operating elements of the card were therefore checked in regard to their influence on carding intensity. It showed that the "CYLINDER-FLATS" area is by far the most effective region of the card for.
  1. opening of flocks to individual fibres
  2. elimination of remaining impurities(trash particles)
  3. elimination of short fibres(neps also removed with short fibres)
  4. untangling the neps
  5. dust removal
  6. high degree of longitudinal orientation of the fibres
- The main work of the card, separation to individual fibres is done between the main cylinder and the flats Only by means of this fibre separation, it is possible to eliminate the fine dirt particles and dust. When a flat enters the working zone, it gets filled up very quickly. Once it gets filled, after few seconds, thereafter , hardly any further take-up of fibres occurs, only carding.Accordingly, if a fibre bundle does not find place at the first few flats, then it can be opened only with difficulty.It will be rolled between the working surfaces and usually leads to nep formation
- In princile, the flats can be moved forwards or backwards, i.e. in the same direction as or in opposition to the cylinder.In reverse movement, the flats come into operative relationship with the cylinder clothing on the doffer side. At this stage, the flats are in a clean condition. They then move towards the taker-in and fill up during this movement.Part of their receiving capacity is thus lost, but sufficient

remains for elimination of dirt, since this step takes place where the material first enters the flats.
At this position, above the taker-in, the cylinder carries the material to be cleaned into the flats. The latter take up the dirt but do not transport it through the whole machine as in the forward movement system.
Instead , the dirt is immediately removed from the machine. Rieter studies show clearly that the greater part
of the dirt is hurled into the first flats directly above the taker-in.

- Kaufmann indicates that 75% of all neps can be disentagled, and of these about 60% are in fact disentagled. Of the remaining 40% disentaglable nep
    1. 30-33% pas on with the sliver
    2. 5-6% are removed with the flat strips
    3. 2-4%are eliminated with the waste

    The intensity of nep separation depends on

    4. the sharpness of the clothing
    5. the space setting between the main cylinder and the flats
    6. tooth density of the clothing
    7. speed of the main cylinder
    8. speed of the flat tops
    9. direction of flats with reference to cylinder
    10. the profile of the cylinder wire
- The arrangement of the clothing between the cylinder and the doffer is not meant for stripping action, It is for CARDING ACTION.This is the only way to obtain a condensing action and finally to form a web. It has both
advantages and disadvantages.The advantage is that additional carding action is obtained here and it differs
somewhat from processsing at the flats.A disadvantage is that leading hooks and trailing hooks are formed
in the fibres , beause the fibres remain caught at one end of the main cylinder(leading hook) and some times on
the doffer clothing(trailing hook).
- There are two rules of carding
    1. The fibre must enter the carding machine, be efficiently carded and taken from it in as little time as possible.
    2. The fibre must be under control from entry to exit
- Carding effect is taking place between cylinder and doffer because, either the main cylinder clothing rakes
through the fibres caught in the doffer clothing, or the doffer clothing rakes thro the fibres on the main cylinder.
Neps can still be disentangled here, or non-separated fibre bundles can be opened a bit in this area and can be separated during the next passage through the flats
- A disadvantage of web-formation at the card is the formation of hooks. According to an investigation by morton and Yen in Manchester, it can be assumed that
    1. 50% of the fibres have trailing hooks
    2. 15% have leading hooks
    3. 15% have both ends hooked
    4. 20% without hooks

Leading hooks must be presented to the comber and trailing hooks to the ring spinning frame.
There must be even number of passages between card and comber and odd number between the card and ringframe.