BASIC TEXTILE OPERATIONS

NTQF Level -1

Learning Guide -36

Unit of Competence: Perform Pre-Spinning operations

Module Title: Performing Pre-Spinning operations

LG Code: IND BTO1 M10 LO2-LG-36

TTLM Code: IND BTO1TTLM 0919v1

LO2: Operate and monitor pre-spinning machine

Instruction Sheet	Learning Guide #36

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

- Starting and stopping pre spinning machines
- Monitoring pre spinning machine operations
- Cleaning machines
- Sorting waste
- Identifying and correcting product process and machine faults
- Reporting major machine faults

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, **you will be able to:**

- ❖ Start and stop machine in accordance with manufacturer requirements
- ❖ Monitor machine operations to ensure correct operation
- ❖ Sort waste according standard procedure
- ❖ Clean machine when required
- ❖ Identify and correct product process and machine faults where necessary to meet specified requirements
- ❖ Report major machine faults

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 3 to 31.
3. Read the information written in the “Information Sheets 1”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the “Self-check 1.1, 1.2, 1.3, 1.4, 1.5” respectively.
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 1.1, 1.2, 1.3, 1.4, 1.5,).
6. If you earned a satisfactory evaluation proceed to “Information Sheet 2”. However, if your rating is unsatisfactory, see your teacher for further instructions.
7. Read the information written in the “Information Sheet 2”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
8. Accomplish the “Self-check 2” in.
9. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 2).
10. If you earned a satisfactory evaluation proceed to “Information Sheet 3”. However, if your rating is unsatisfactory, see your teacher for further instructions.
11. Read the information written in the “Information Sheets 3”. And Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
12. Accomplish the “Self-check 3”.
13. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 3).
14. If you earned a satisfactory evaluation proceed to “information sheet 4”. However, if your rating is unsatisfactory, see your teacher for further instructions
15. Read the “information sheet 4” and try to understand the procedures discussed.
16. Accomplish the “Self-check 4”.
17. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 4).

18. If you earned a satisfactory evaluation proceed to “Information Sheet 5”. However, if your rating is unsatisfactory, see your teacher for further instructions.
19. Read the information written in the “Information Sheets 5”. And Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
20. Accomplish the “Self-check 5”.
21. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 5).
22. If you earned a satisfactory evaluation proceed to “information sheet 6”. However, if your rating is unsatisfactory, see your teacher for further instructions
23. Read the “information sheet 4” and try to understand the procedures discussed.
24. Accomplish the “Self-check 6”.
25. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 6).
26. Accomplish the “operation sheet 1”.
27. Accomplish the “operation sheet 2”.
28. Accomplish the “operation sheet 3”.
29. Accomplish the “operation sheet 4”.
30. Accomplish the “operation sheet 5”.
31. Do the “LAP test” (if you are ready). Request your teacher to evaluate your performance and outputs. Your teacher will give you feedback and the evaluation will be either satisfactory or unsatisfactory. If unsatisfactory, your teacher shall advice you on additional work. But if satisfactory you can proceed to other learning outcome.

Information Sheet-1	Starting and stopping pre spinning machines

1.1. Blow room

Blow room is the first section in the process of spinning of short staple fibers. It consists of a sequence of different machines, and it can be chute feeding system or lap feeding system for card.

1.1.1. Basic operations in blow room

- ☐ Opening
- ☐ Cleaning
- ☐ Removal of foreign materials
- ☐ Blending\mixing
- ☐ Even feed of material to card.

The need for opening

- ☐ To clean, mix and blend fibers' they have to be brought into the smallest aggregate form.
- ☐ O To enable the fibers to be blended they must be thoroughly opened
- ☐ To prepare the fibers for the carding and subsequent operations they must be opened to the point where there will be minimal fiber damage.
- ☐ only well opened material can be effectively cleaned

The need for cleaning

- ☐ The trash and other impurities contained in cotton received by the spinner must be removed as completely as possible to enable an effective spinning operation to be performed at high speeds.

The need for Blending or mixing

- ☐ to get the required characteristics of end product
- ☐ to compensate for variations in the characteristics of the raw material
- ☐ to hold down raw material cost
- ☐ to achieve effects by varying fibre characteristics

How blow room machines fulfil their objectives?

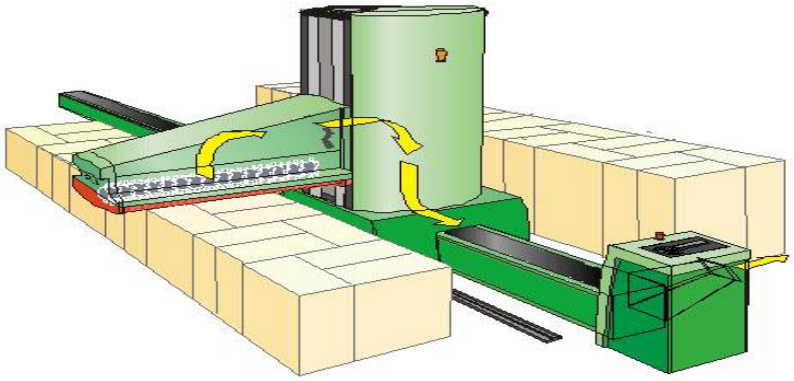
- To fulfil the objectives of blow room, the action of the machines in any blow room range fall into one or more of four main groups namely-
    - The action of opposing spikes
    - The action of beaters
    - The action of air currents
    - The regulating actions
- feed roll/feed plate combination to restrain the cotton whilst it is opened into very small tufts by
    - wire wound cylinders
    - pinned beaters
    - Blade beaters.
- At each stage of opening a cleaning operation can be performed.
- Cotton has to be opened more than once because trash is removed only from the surface of tufts and multiple opening actions are needed to expose all the trash.
- Normally trash is separated from the cotton by centrifugal force. The material is moved at high speed in a circular motion. The trash tends to sling out from the fiber surface. Grid bars are provided to allow the trash to escape and separate from the fiber that passes over the grid bars.

1.1.2. **Blow room machines**

- Modern blow room line consists of the following machines
    - Bale opener
    - Coarse cleaner(pre cleaner)
    - Mixer
    - Fine cleaner
    - Foreign material separators
    - Metal detectors and fire sensors
    - Cage condensers
    - Waste feeder

Bale opener

- It is the first machine in blow room line used to open and prepare the material properly for the subsequent cleaning stages.
- It can be automatic bale opener or manual bale opener.



Benefits of automatic bale opener

- ❑ Automatic changeover for bale opening from one side to the other
- ❑ Continuous production without manual intervention or supervision
- ❑ Long operator-free runs
- ❑ Savings of manpower cost
- ❑ Controlled pick amount from each bale
- ❑ Possibility of running more than one mix

Pre-cleaner

- ☐ It is an efficient cleaning and opening machine which is used immediately after bale opening
- ☐ It is pre-cleaning machine having a roller with specially designed pins
- ☐ It has high cleaning efficiency and equipped with adjustable grid bars
- ☐ The raw material is beaten above the grid bars several times in order to remove the impurities.

Foreign material separator

- ☐ Used to detect and remove foreign materials (contaminants)
- ☐ Works on the principle of

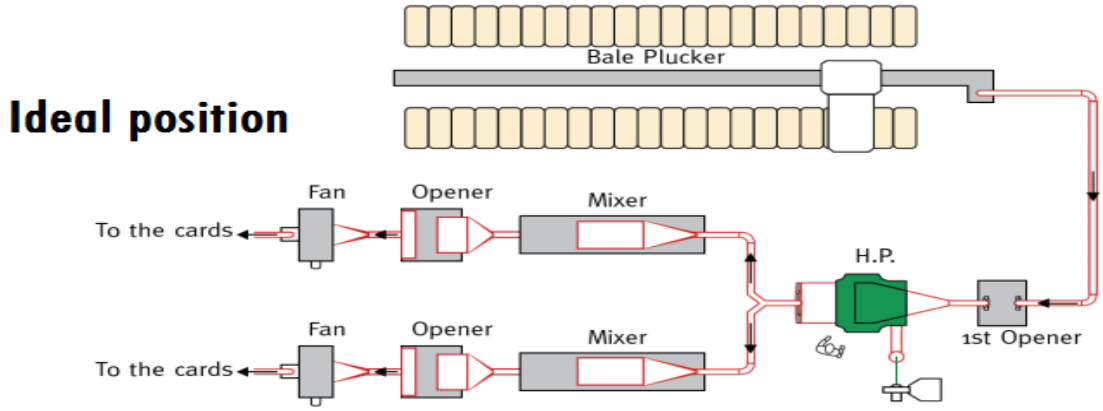
- cameras for colored materials detection like, rubber, colored fabric, colored yarns
- ultrasonic system for white contaminants like sisal, jute

Steps in extraction

- CHECK - ultra fast color cameras scan the cotton tufts from both sides for recognition of the actual size and shape of each particle
- DETECT - recognizes the color of the cotton automatically.
- ELIMINATE - Contaminations are ejected at minimum loss of good cotton.

Auto-mixer

- This machine used for only blending the cotton by means of different boxes or chambers. It consists of three parts;
  - A storage section
  - Intermediate chamber
  - Delivery section
- Flocks of cotton are feed to six or eight J shaped chutes arranged one behind other in storage section.



Fine cleaner

- ☐ It is used for fine cleaning, opening and de dusting.
- ☐ Forms a homogeneous length and width, lap type feeding and the air is extracted from this lamina chute.
- ☐ the machine have opening and cleaning roller and guides the fiber over grid bars and adjustable mot knives which separates trash intensively but gently from the material
- ☐ Metal detectors(magnets) remove metallic materials
- ☐ Dust particles removed by air suction system

Transportation of the material

- ☐ Machines in the blow room are arranged in a sequence and the material should be given to each machine properly.
- ☐ First this was done manually but now a day's automatic transport of the material is accomplished. For these purpose "condensers" are used which suck the material with air pressure

Basic process parameters in Blow room

- ☐ Number of opening machines
- ☐ type of beater
- ☐ type of beating

- ☐ Beater speed
- ☐ setting between feed roller and beater
- ☐ production rate of individual machine
- ☐ production rate of the entire line
- ☐ fiber micronaire
- ☐ size of the flocks in the feed
- ☐ type of clothing of the beater
- ☐ point density of clothing
- ☐ type of grid bar and grid bar settings
- ☐ air flow through the grid bar
- ☐ position of the machine in the sequence
- ☐ amount of trash in the material
- ☐ type of trash in the material
- ☐ temp and relative humidity

Self-Check -1.1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Why we need cleaning machine in blow room? (2 point)
2. Why we say blow room is the first section of spinning technology? (2 point)
3. List at least 3 basic operations of blow room. (2 point)
4. Explain the function of the following machines. (4 point)

- Bale opener -condenser

- Bale cleaner - Auto mixer

Choose the best answer from the given alternative. (2 point each)

1. One of the following is not benefit of automatic bale opener?
   a. Continuous production without manual intervention or supervision
   b. Long operator-free runs
   c. Savings of manpower cost
   d. Tedious to open the bale
2. Which of the following is not the advantage of mixing/blending in blow room?
   a. to gets the required characteristics of end product
   b. to compensate for variations in the characteristics of the raw material
   c. to hold down raw material cost
   d. convert the bale into smallest aggregate form

Note: **Satisfactory rating - 14 points** **Unsatisfactory - below 14 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1. _____

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_____

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2. _____

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3. _____

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4. _____

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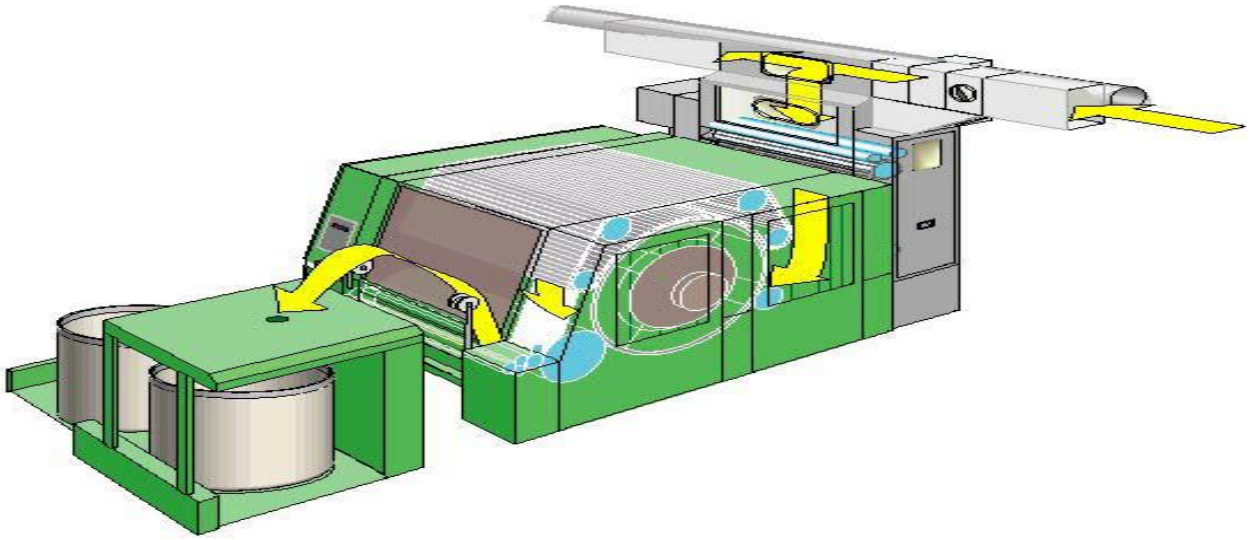
1.2. Carding



Introduction

- ✓ The word “Card” means “heart”
- ✓ Card is the heart of spinning
- ✓ The carding operation is the most important phase of short staple spinning
- ✓ “Well carded is half spun”
- ✓

Objectives of carding

- Extensive opening or individualization
- Removal of very short fibers, neps and foreign materials
- In the case of cotton, removes majority of the trash
- To some extent fibers are made parallel
- sliver formation

Major components of card

Feed plate

Licker-in

Cylinder and flats

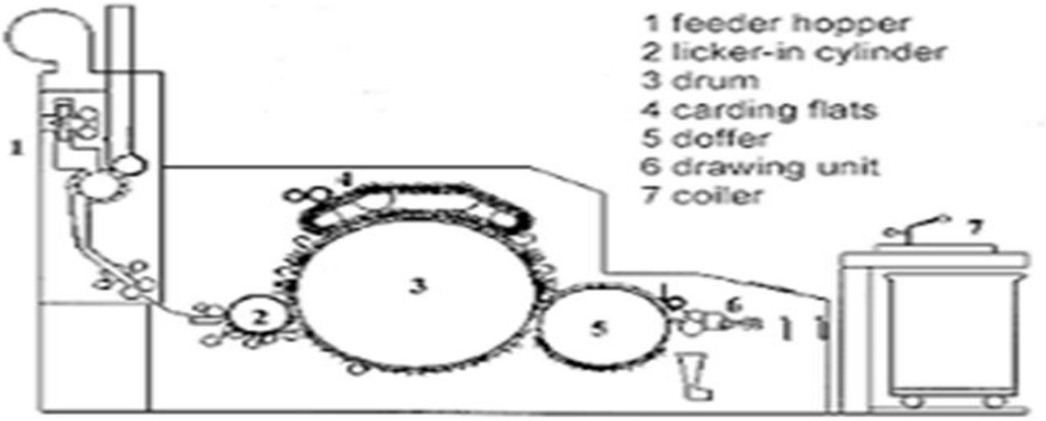
Doffer

Stripping and redirecting roller

Cross rollers

Trumpet

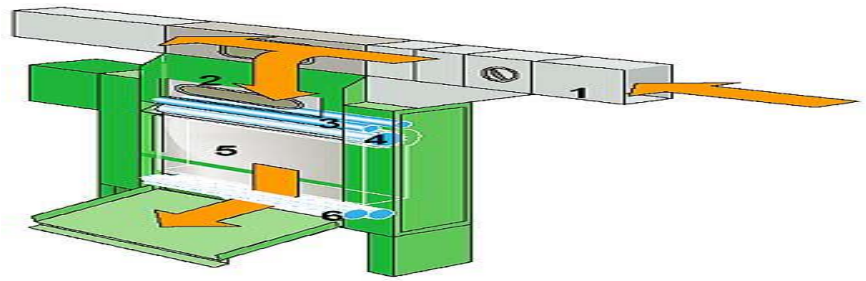
Coiler



Feed plate

It is a plain, smooth and polished plate situated between lap roller and licker-in. Feed roller is fitted over it.

The adjustment of the feed plate (feed trough) is normally made according to the fiber staple length.



Licker-in

It is a hollow grooved cylinder covered with saw toothed wire. Its main objective is to further reduce the tufts into small bunches of fibers. During the opening process embedded waste like seed particles, leaf and very small fibers get released and separated. The material on the licker-in is transferred to the cylinder.

Generally, the ratio of licker-in surface speed to cylinder surface speed should be about 1:2.

Cylinder and flats

The primary carding action takes place between the cylinder and the flats. The fibers carried by the cylinder wire tend to move toward the flats that resist fiber movement. Many of the fibers “float” between the flats and the cylinder wire. The working flats move from the doffer side to the licker-in side. This is in the opposite direction of the cylinder movement.

This “carding action”:

- Separates individual fibers,
- Opens entangled fibers,
- Separates and retains the naps in the flats,
- Frees / removes trash particles and vegetable matter from the fibers,
- Removes dust collected in the flat strips,
- Orients the fibers in the direction of the cylinder movement.

Doffer

The fibers are removed from the cylinder by the “doffer”. The cylinder and doffer surfaces move in the same direction at the transfer zone.

The doffer rotates at a considerably slower surface speed than does the cylinder and consequently fibers accumulate on the doffer wire.

Stripping and re-directing roll

Stripping and re-directing roll take out the sheet of fibers/web from the doffer and forward it to cross-roller & trumpet.

Cross roll and trumpet

Cross roll crushes the seed/foreign particles of web for their easy separation. Trumpet converts the sheet of fibers (web) to sliver form.

Coiler

It laid down sliver in coil form (layer by layer) in the cans mostly of predetermined length

Auto levelling

In modern spinning plants it is essential that the card sliver weight is controlled. The uniformity of matt weight delivered to the card is dependent upon the chute feed system and the condition of the material being processed. Unfortunately irregularities of feed are inherent and have to be corrected at the card.

Process control in card

- ✓ Cleaning Efficiency
- ✓ Sliver hank
- ✓ Sliver irregularity
- ✓ Neps per gram
- ✓ Production per shift
- ✓ Waste

Settings:

The setting between cylinder and doffer is the closest setting in the card. This setting mainly depends upon the cylinder speed, hank of the delivered sliver and the type of wire. Cylinder speed up to 360, the setting should be 0.1mm. For cylinder speeds more than 450, the setting ranges from 0.125 to 0.15.

If the setting between cylinder and doffer is very close, the wires will get polished and this will affect the fiber transfer. If the setting is too wide, the fibers will not be transferred to doffer from the cylinder, hence cylinder will get loaded. While processing synthetic fibers cylinder loading will badly affect the yarn quality

The most critical setting in a carding machine is between cylinder and flat tops. While processing cotton, it can be as close as 0.175 mm provided the mechanical accuracy of flat tops is good. Since most of the cards are with stationary flats at the licker-in side, the setting from the back to front for flats can be 0.25, 0.2.0.2, 0.2, 0.2mm.

Closer the setting between cylinder and flats, better the yarn quality. Neps are directly affected by this setting. Of course, very close setting increase the flat waste. For processing cotton the setting can be 0.25, 0.2, 0.2, 0.2, 0.2mm. For synthetic fibers it can be 0.3, 0.25, 0.25, 0.25, 0.25mm.

The setting between feed plate and Licker-in depends upon the type of feed plate. Conventional feed plate setting is decided mainly by the feed weight and to some extent by the fiber length and type. With the latest feed plate and feed roller arrangements, the setting is decided mainly by the fiber length and to some extent by the feed weight.

Normally the setting between the feed plate and Licker-in is around 0.45 to 0.7mm, depending upon the feed weight and fiber type.

SPEEDS:

Higher cylinder speed helps fiber transfer. Higher the production, higher should be the cylinder speed.

Higher cylinder speed improves carding action, thereby imperfections are reduced.

Higher Licker-in speed for coarse fibers and dirty cotton helps to remove the trash and improves the yarn quality. For fine and long cottons, higher speed results in fiber rupture, therefore, flat waste and comber noil will be more.

Higher flat speed, improves yarn quality and at the same time increases the flat waste

With the same flat speed, higher the carding production, lower the flat waste and vice-versa.

(1). P = (L x 1.0936 x 60 x eff) / (hank (Ne) x 36 x 840 x 2.2045)

- P - Production in kgs / hr
- L - Delivery speed in m/min
- eff- efficiency
- Ne - English count (number of 840 yards in one pound)
- 840 - constant
- 2.2045- to convert from **lbs to kilograms**

(2).production in kgs / hr = (L x Ktex x 60 x eff) / (1000)

- L - delivery speed in m/min
- Ktex- sliver count in Ktex (kilotex)
- eff - efficiency
- 1000- to convert to kilograms from grams

(3). production in kgs / 8 hrs = (0.2836 x L x effy) / (Ne)

- L - delivery speed in m/min
- effy - efficiency
- Ne - English count

(4).Prodn / 8 hrs = (Hank x Nd) / (Ne x 2.2045)

- Hank = no of hank (840 yards) delivered by the machine
- Nd = no of deliveries
- Ne = hank of the material

(5).Total draft in card = (feed weight in g/m) / (sliver weight in g/m)

Self-Check 1.2	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Why we say carding m/c is the heart of spinning technology? (2 point)
2. Why the doffer rotates at a considerably slower surface speed than does the cylinder? (2 point)
3. Write components of carding m/c & explain their function. (2 point)

Choose the best answer from the given alternative. (1 point each)

1. Which of the following is not the objective carding machine?

a. Extensive opening or individualization

b. Removal of very short fibers, neps and foreign materials

c. In the case of cotton, removes majority of the trash

d. To some extent fibers are made parallel

e. Blending sliver

2. From carding m/c in which part Waste like seed particles, leaf and very small fibers get released and separated?

A. trumpet C. licker-in

B. coiler D. doffer

3. Which of the following is not the function of licker-in?

a. Reduce the tuft into small bunches c. accumulation of fiber
b. Removal of seed & leaf particles d. transferring the lap into the cylinder

4. Which of the following is not the function of carding machine?

a. Individualization c. parallelization/straitening
b. Mixing d. sliver formation

5. Main Carding action takes place b/n……&……..

a. Licker –in & cylinder c. cylinder & flat
b. Cylinder & doffer d. doffer & flat

6. One of the following is opposite movement/ revolution with the others.

a. Licker-in c. flat
b. Doffer d. cylinder

7. Why cylinder speed (rev/min) greater than licker-in speed (rev/min)? b/c

a. Cylinder take away the chute fastly from the licker -in
b. To increase productivity
c. To increase efficiency
d. All

8. Which part /component of card machine convert sheet /web form of fiber into sliver form?

   a. Licker –in b. doffer c. cross roll d. trumpet

9. Laid down sliver coil form (layer by layer) in the card can occurred by

   a. Trumpet c. doffer
   b. coiler d. cylinder

10. Which of the following is not the function of licker-in?

   a. Reduce the tuft into small bunches c. accumulation of fiber
   b. Removal of seed & leaf particles d. transferring the lap into the cylinder

Note: **Satisfactory rating - 16 points Unsatisfactory - below 16 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1. _____

   _____

   _____

   _____

2. _____

   _____

   _____

   _____

3. _____

   _____

   _____

1.3. Draw frame

1. objectives of draw frame

- Reduction in unevenness by way of doubling and drafting process besides lowering weight per unit length of sliver.
- Straightening and parallelization of fibers.
- Blending of slivers of different types of fibers in desired proportion by doubling and drafting process.
- Removal of short fibers

2. What should not happen at draw-frame?

- Unevenness in sliver should not increase
- Basic properties of the fibers should not deteriorate.

3. Main parts and functions of draw-frame

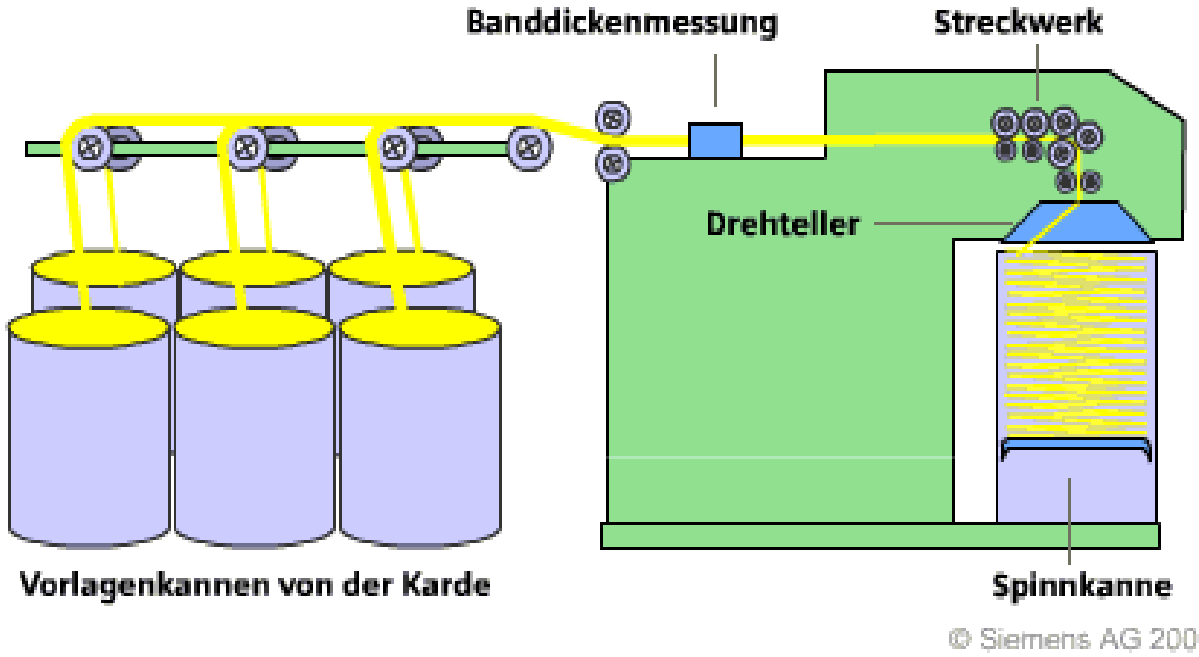
Creel Creel roller

Sensing roller Bottom drafting roller

Top drafting roller Trumpet

Coiler calendar roller and coiler Auto leveler

Can changer



Creel: is a plain polished steel surface. Slivers from the cans are passed over it and taken to the drafting zone.

Creel rollers: are cylindrical in shape, made of steel and are mounted on the creel and used to keep sliver under tension and help in moving it forward.

Sensing roller/scanning rollers: these rollers scan the thickness of the sliver and then the draft of the machine is regulated automatically.

Trumpet: trumpet is also made of steel. Different whole size trumpets are used for different count.

Bottom drafting roller: bottom drafting rollers are made of steel and drafting of sliver is done by these rollers.

Top drafting rollers: top drafting rollers are made of steel. These rollers help in drafting.

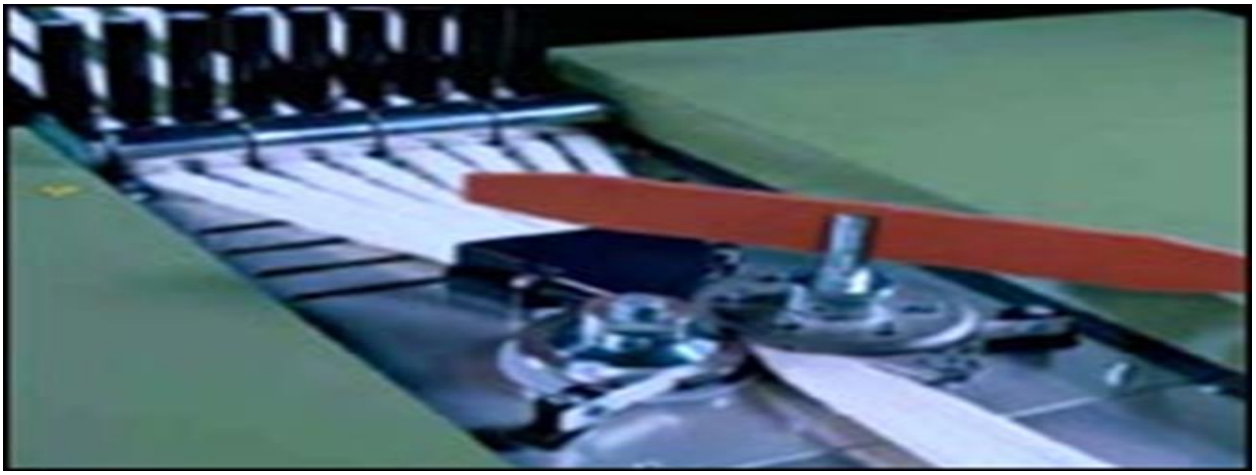
Coiler calendar rollers and coilers: downstream from the trumpet the sliver runs between two calendar rollers which are pressed towards each other. This condensing of the sliver enables material to be filled into the cans. Finally the sliver is deposited in the cans kept over the can plate by the can coilers.

Auto-leveler: Auto leveler reduces or increases the draft and removes unevenness in the feed slivers.

Can changer: when doff is full, can change takes out the full can and replace empty can**.**

4. Functioning of auto-leveler

Sensing rollers sense the thickness of the slivers which is passing to the drafting zone of the machine. Then the measured potential is transformed in electrical signals which finally increases or reduce the draft. This regulates the weight/unit length of the slivers and unevenness of the sliver is reduced to a great extent.



5. Factors affecting the efficiency of draw-frame operator

- To have the knowledge of different stop motions, indicator lights and attends the fault in time and restart the machine.
- Skill of piecing.
- Poor understanding of the mechanical faults of the machine.
- Poor knowledge of the correct working practices.

Self-Check 1.3	**Written Test**

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List the Objectives of draw-frame. (2 point)
2. List main parts of draw- frame. (2 point)
3. What is the function of draw frame trumpet? (2 point)
4. How the sense rollers activate stop motion in draw frame? (2 point)

Choose the best answer from the given alternative. (1 point each)

1. One of the following is not the function of draw frame.
   a. Doubling & drafting
   b. Reduction of un evenness
   c. blending of sliver
   d. twisting

2. From the following in which types of spinning machines straightening & parallelization of fibers takes place?
   a. Blow room & draw frame
   b. Carding & draw frame
   c. draw frame & roving
   d. carding & blow room

3. Which of the following is not the function of sensing roller?
   a. Sense the thickness of sliver
   b. Stop motion during sliver breakage
   c. straightening & parallelization of fiber
   d. regulate drafting

4. The main draw frame actions takes place in……..
   a. Sensing roller
   b. Drafting zone
   c. creel roller
   d. trumpet

5. One of the following components of draw frame is not used transportation the sliver from the can into the drafting zone.
   a. Creel
   c. sensing roller
   b. Creel roller
   d. top roller
6. Take out the full can & replace the empty one activated in draw frame by……
   a. Trumpet
   c. calendar roller
   b. Can changer
   d. top roller

Note: **Satisfactory rating - 14 points** **Unsatisfactory - below 14 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1. _____
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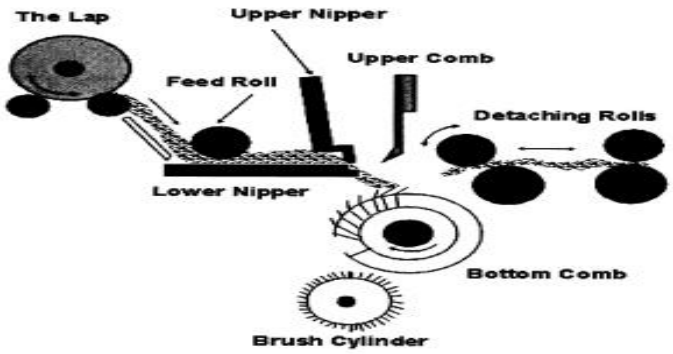
   _____
2. _____
   _____
   _____
   _____
3. _____
   _____
   _____
4. _____
   _____

1.4. Comber

The combing process is producing Smoother, finer, stronger and more uniform yarns

Tasks of combing:

- ❖ Elimination of precisely pre-determined quantity of short fibers
- ❖ Elimination of the remaining impurities
- ❖ Elimination of a large proportion of the neps
- ❖ Formation of a sliver having maximum possible evenness
- ❖ Producing of more straight and parallel fibers



Partial View Combing machine

Self-Check 1.4	**Written Test**

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What are the tasks combing? (4 point)

Note: **Satisfactory rating – 4 points** **Unsatisfactory - below 4 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1. _____

1.5. Roving frame

This machine is called in different names: - such as speed frame/ Flyer frame/ Roving frame/ Simplex m/c. The draw frame produces a sliver that already exhibits all the characteristics required for the creation of a yarn, namely an ordered, clean strand of fibers laying parallel to one another. Use of the roving machine is forced upon the spinner as a necessary evil for two principal reasons.

1. Draft

- Sliver is a thick, untwisted strand that tends to be hairy and to create fly.
- The draft needed to convert this to a yarn is in the region of 300 - 500.
- The drafting arrangements of ring spinning machines, in their current forms, are not capable of processing this strand in a single drafting operation.
- So, fine and twisted roving is significantly better suited to the above purpose.

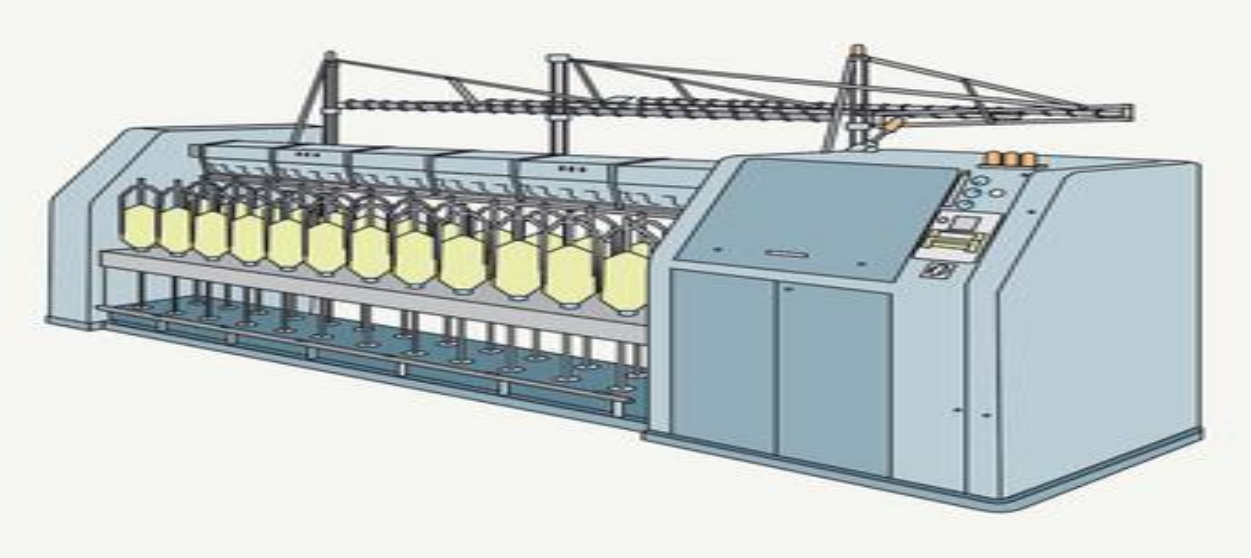
2. Draw frame cans represent the worst possible mode of transport and presentation of feed material to the ring spinning frame.

- In spite of this, considerable effort has been expended over decades to eliminate the roving frame. The effort is justified, but unfortunately in relation to ring spinning it remains without success.

Tasks of the roving frame

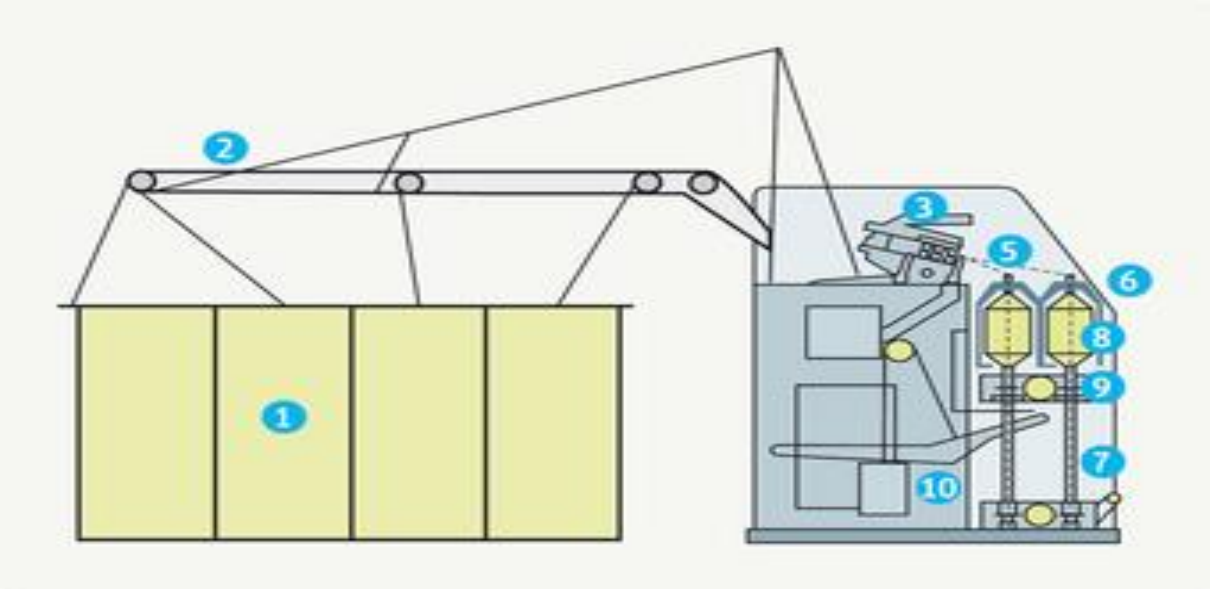
- Attenuation of the sliver.
- Since the resulting fine strand has scarcely any coherence, protective twist must be inserted in order to hold it together.
- Winding the roving into a package that can be transported, stored and get into or donned on the ring spinning machine.

Speed frame machine



Main components of roving frame

Operating sequence



Cross-section through a roving frame

1. Cans
2. Transporting roller
3. Drafting arrangement
5. Unsupported roving
6. Flyer
7. Spindle
8. Bobbin
9. Bobbin rail
10. Raising & Lowering Lever

Why cans behind roving machine are not arranged in one row but in several?

Draw frame sliver is presented to the roving frame in large cans (1). The can diameter does not correspond to the spindle gauge, so the cans are not arranged in one row but in several, which have to be set out behind the machine. Driven transport rollers (2) are provided above the cans. The rollers draw the slivers from the cans and forward them to drafting arrangement (3). The drafting arrangement attenuates the slivers with a draft between 5 to 22. The strand delivered is too thin to hold itself together and a strength imparting step is necessary immediately at the exit of the drafting arrangement. This is performed by inserting protective twist, usually in the range of 25 - 70 turns per meter.

The turns are created by rotating flyer (6) and are transmitted into the unsupported length of roving (5) between the flyer and the delivery from the drafting arrangement. The flyer is rotated with the spindle (7). To ensure that the roving is passed safely and without damage to the wind-up point, it runs through the flyer top and the hollow flyer leg, and is wound 2 - 3 times around the presser arm before reaching bobbin (8).

To enable winding to be performed, the bobbin is driven at a higher peripheral speed than the flyer so that the roving is drawn off the flyer leg. The coils must be arranged very closely and parallel to one another. Bobbin rail (9) with the packages on it must move up and down continuously and this can be effected by continual raising and lowering of lever (10), on which the bobbin rail is mounted.

During winding operation

- diameter of the packages increases
- length of roving increase per coil
- bobbin rail speed must be reduced after each layer
- the bobbin‘s rotation speed must be reduced after each layer, because delivery is constant.

Effects of the arrangement of the bobbins in two rows

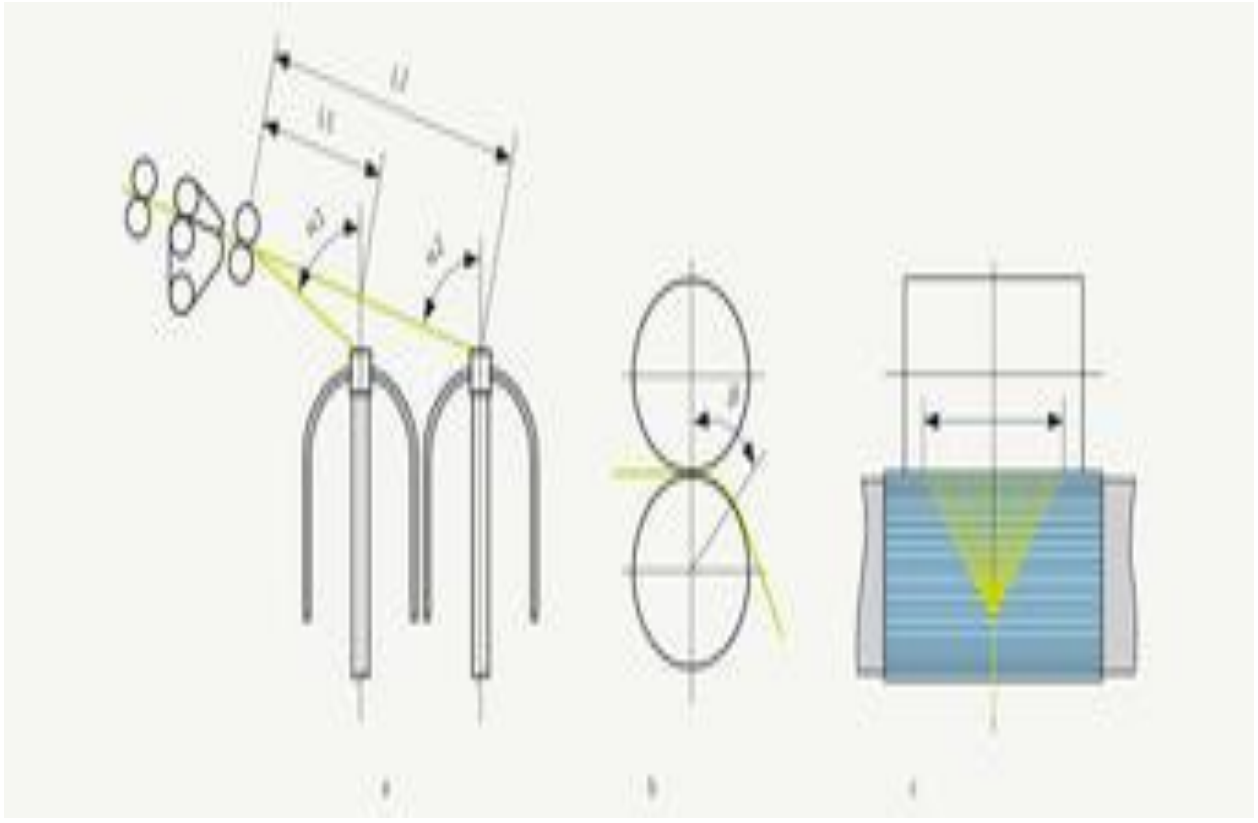
Bobbins are arranged in the delivery section in two rows one behind the other, with the bobbins of one row offset relative to those of the other.

Advantage

Extreme Bobbins are arranged in the delivery section in two rows

Disadvantage

- ✓ design is made more complicate
- ✓ operation of the machine is made less convenient
- ✓ automation is hindered
- ✓ angle of approach of the roving to the flyer top(**α)** is different
- ✓ difference in the angles of withdrawal (**β**)
- ✓ difference in lengths of the spinning triangles
- ✓ difference in the unsupported lengths (**L**)



Three-cylinder, double-apron drafting arrangement

Effect

The unsupported lengths differences result in

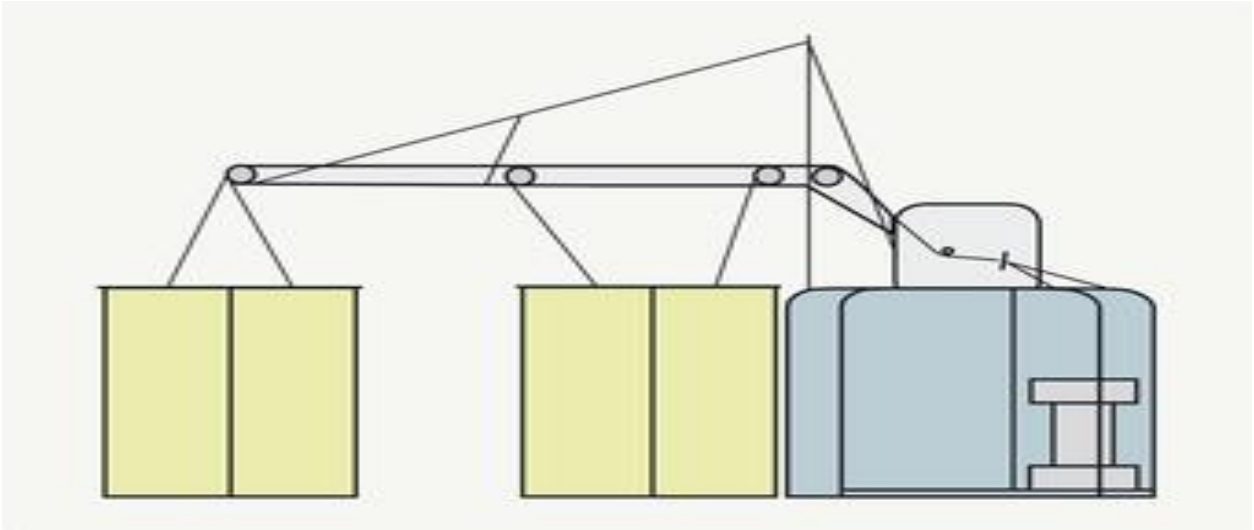
- ✓ uneven take-up of twist,
- ✓ different degrees of integration of the fibers
- ✓ Variations in roving fineness between front and rear rows.

Remedy

In modern roving frames, the flyers in the rear row are equipped with an extension, which eliminates the above-mentioned differences in angles.

The operating zones of the roving frame

The creel



Above the cans, there are several rows of driven rollers to help the slivers on their way to the drafting arrangement.

Things to be considered in relation to the creel

- If degree of parallelization of the fibers in the slivers is high, strand coherence will often not be very great and false drafts can easily be created.
- Slivers shall be drawn more or less vertically out of the cans; and that the guide rollers run smoothly.

2 the drafting arrangement

- ✓ Apron arrangement
- ✓ Roller arrangement

Double-apron arrangement permits drafts of 22 while holding the fibers more or less under control during their movements.

Three-cylinder arrangements are used, but four cylinders may be needed for high drafts.

They usually contain fluted lower rollers and rubber coated pressure rollers.

Hardness of the upper rollers is specified in terms of degree shore the following ranges are distinguishing

SOFT 60-70°

MEDIUM 70-90°

HARD 90°

The hardness is between 80° and 85° shore, but the rollers over which the apron runs often have a hardness only slightly above 60° Shore.

If the drafts is below the lower limits, the fiber masses to be moved are too large, drafting resistance becomes too high and the drafting operation is difficult to control.

Break drafts are usually selected around 1.1 (1.05 to 1.15).

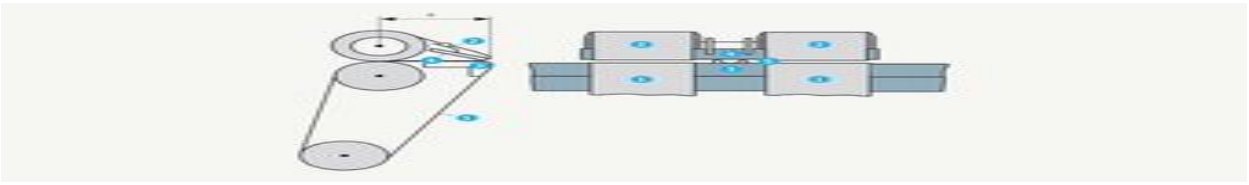
The aprons

The upper aprons (2) are short and made either of leather or synthetic rubber. They are about 1 mm thick and are held taut by tensioning devices (4).

The lower aprons (1) are longer and usually made of leather, although synthetic rubber is also used. They run over guide bars (nose bars) (3) to positions close to the nip line of the delivery rollers.

The guiding length, referred to as the cradle length (a), must be adapted approximately to the staple length. In accordance with data provided by Rieter, the following cradle lengths should be used:

Apron guidance in the drafting arrangement



Cradle length (mm)	Material
short	Cotton up to 1 1/8″; 40 mm synthetic fibers
medium	Cotton above 1 1/8″; 50 mm synthetic fibers
long	Synthetic fibers, 60 mm

Applying pressure to the top rollers

The top rollers must be pressed with relatively high force against the lower rollers to ensure guidance of the fibers. Today, the required pressure is achieved by springs or by pneumatic means and in the past there was also a magnetic weighting system.

The condenser

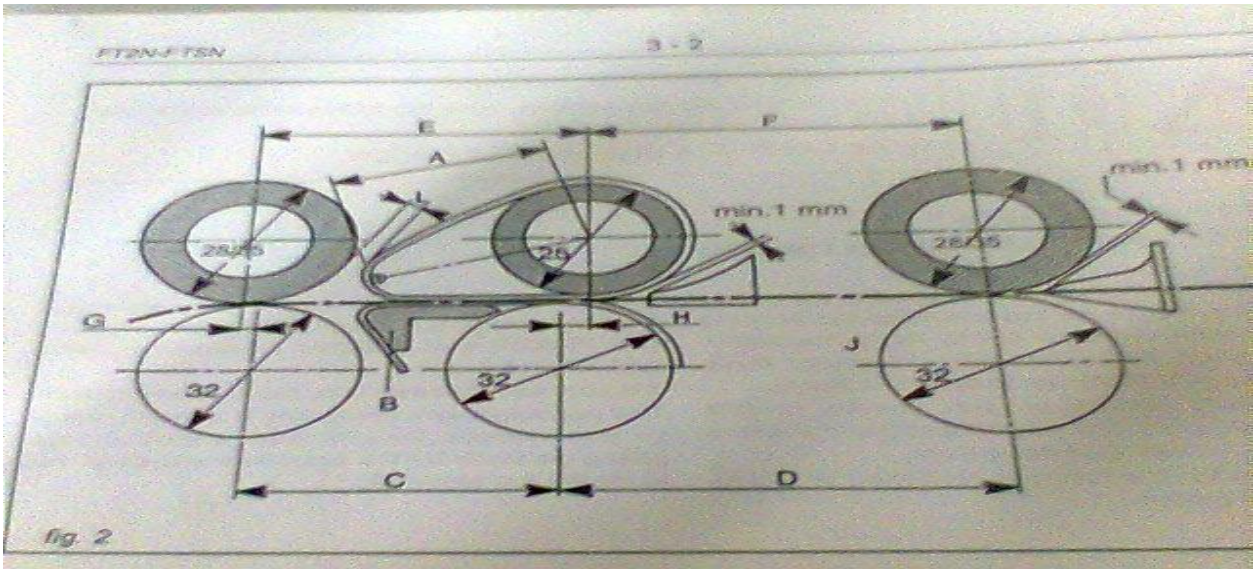
Spreading fiber masses cause

- ✓ Unevenness
- ✓ high fly

- ✓ Hairiness.

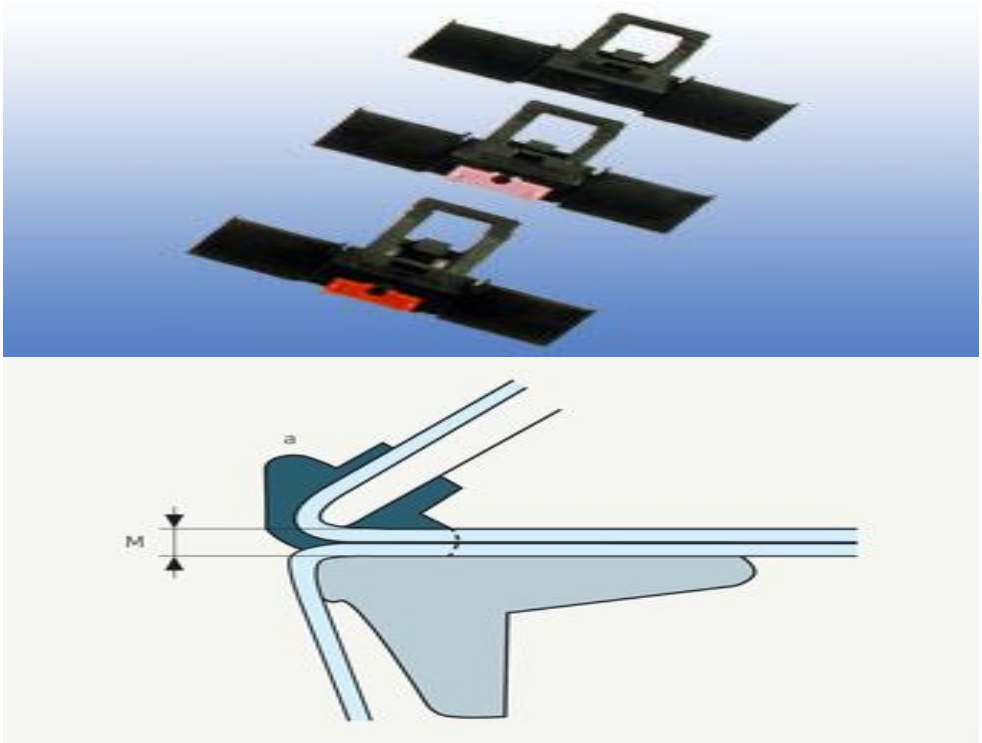
The purpose of the condensers is to control the width of the fiber strand.

- Sliver trumpets (in feed condensers) are mounted behind the rear cylinder of the drafting arrangement. They are designed to guide the sliver into the drafting arrangement.
- A second sliver condenser is provided in the break draft zone.
- A third condenser is located in the main drafting zone.



Spacing the top and bottom aprons

The top aprons are forced by spring pressure against the lower aprons. The intensity of fiber clamping, and thus fiber guidance, depends upon this pressure and also upon the distance between the two aprons. To maintain the distance between the aprons, distance pieces (Fig.**a**) are inserted between the nose bar of the lower apron and the cradle edge of the top apron, i.e. at exit opening **M**.



Cradles, Cages & Short Cradles

These distance pieces are given various names, such as spacers (Rieter), distance clips (Texparts), cradle spacers (Suessen). The correct distance piece to use can be determined within a broad range from tables provided by the manufacturers, but fine settings have to be established by experiment.

Spindle and flyer

Each flyer rotation creates one turn in the roving. Since the flyer rotation speed is kept constant, twist per unit length of roving depends upon the delivery speed, and can be influenced accordingly.

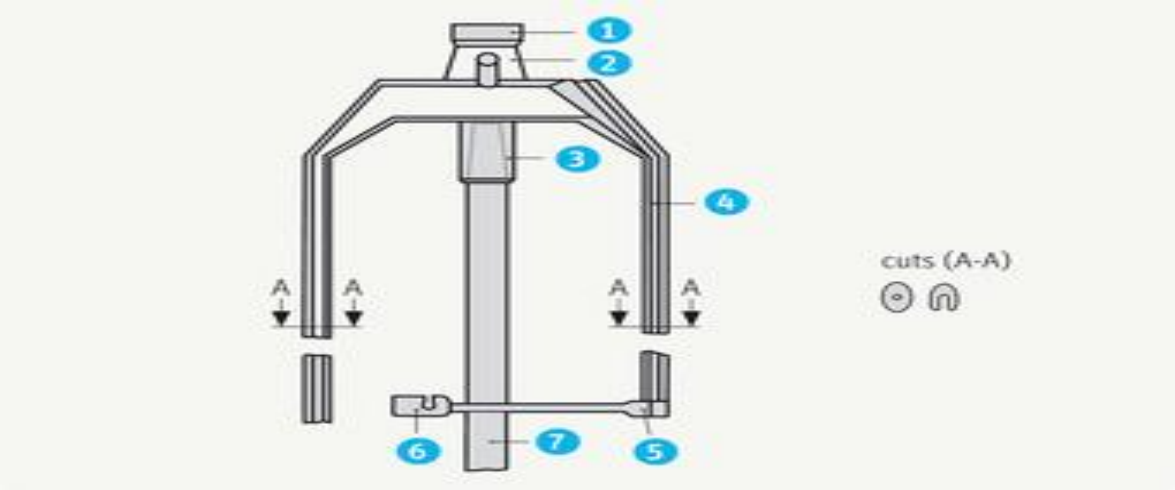
- High levels of roving twist represent production losses and might lead to draft problems in the ring spinning machine.
- Low twist levels can cause false drafts or even roving breaks during bobbin winding.

Turns per meter= flyer rotation speed (rpm)

Delivery speed (m/min)

The flyer

Earlier flyers were invariably made of steel, but they are now mostly made of light alloy. At the high speeds normal steel flyers would spread at the legs. When the speed varies, e.g. during starting and stopping, the presser arm (5) adopts a continually varying inclination, which causes continual shifting of the winding point of the bobbin.



Component parts and structure of the flyer

Why one of the two flyer legs has usually been hollow?

The flyer has to guide the very sensitive strand from the flyer top to the package without introducing false drafts.

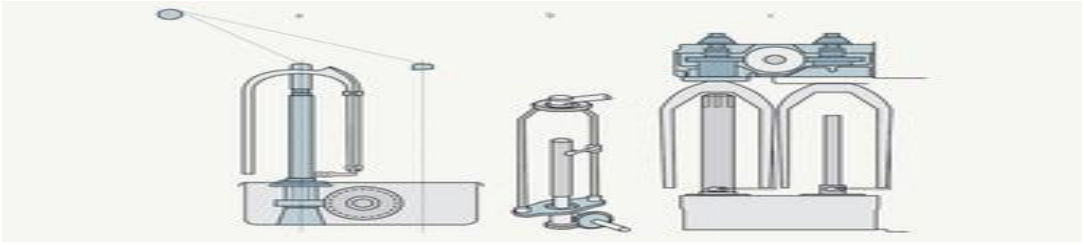
The flyer is rotating, along with the roving, at a speed of up to 1 500 rpm. The fiber strand must therefore be protected against strong air currents. For this purpose, in most roving frames, one of the two flyer legs (4) has usually been hollow. The strand is drawn through this groove. The second, solid flyer leg serves to balance the grooved leg.

Various designs of flyers

Performance of the roving frame are determined by both the delivery speed and the rotation speed of the flyer. The influence of the flyer depends upon its form and drive. The following are the three flyer types:

1. spindle-mounted flyers (Fig.a); 2. Closed flyers (Fig.b); and 3. Top-mounted flyers (Fig.c).

- The standard form has in the past been the spindle-mounted flyer.
- The closed flyer, supported both above and below, and used only by Platt Saco Lowell in the Rovematic machine. It has the advantage of reduced spreading of the legs at high operating speeds.
- Today, the standard design is the top-mounted flyer.

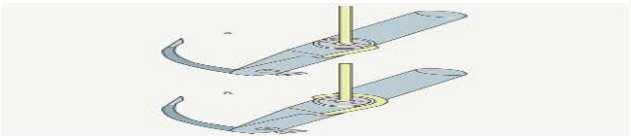


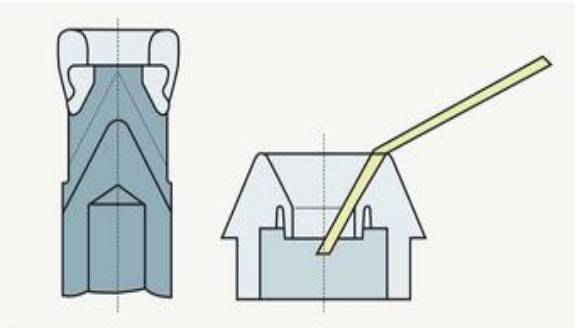
The flyer top

The roving entrance to the flyer determines the degree of twist and the winding tension. A one-turn of wrap, as shown in (B), is selected for high-speed frames winding large packages with high twist levels. The wrap permits better control of roving tension and the package build becomes more even owing to the harder coils.

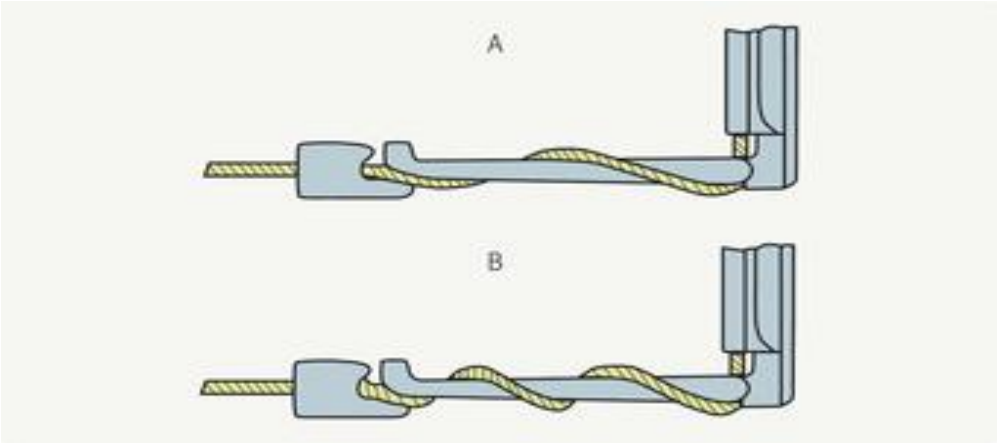
Older flyers have flyer tops of smooth metal. However, most modern flyers have an insert of rubber formed with grooves, notches or indentations.

Entry of the strands into the flyer top **the flyer top**





The presser arm



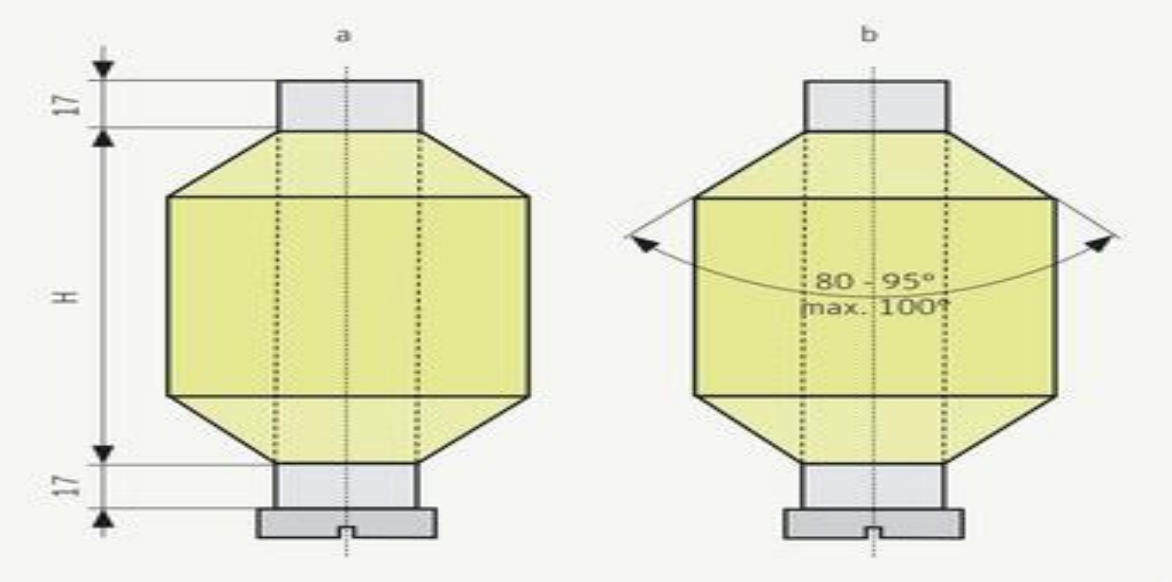
Guidance of the roving by the presser arm

Why the rove is wrapped two or three times around the yoke?

A steel yoke, the so-called presser arm, is attached to the lower end of the hollow flyer leg. The arm has to guide the roving from the exit of the flyer leg to the package. The roving is wrapped two (A) or three (B) times around the yoke. The number of turns determines the roving tension.

If this is high, then a hard, compact package is obtained. If it is too high, false drafts or roving breaks can be caused. The number of wraps depends upon the material and twist level.

WINDING OF THE BOBBIN



The bobbin form

Why roving bobbin ends are designed to be tapered and how this can be achieved?

A roving bobbin is a cylindrical body with tapered ends. It is created by building layer upon layer of parallel coils of roving on wooden or plastic bobbin tubes acting as package cores. To form the tapered ends, the height of the lift must be reduced after each layer has been completed.

The roving bobbin is the ideal package form for supplying material to the ring spinning frame.

The angle of taper of the ends is normally between 80° and 95°, and depends upon the adherence of the material.

Large angle- much roving will be wounded onto the package.

Small angle- to ensure that layers do not slide apart.

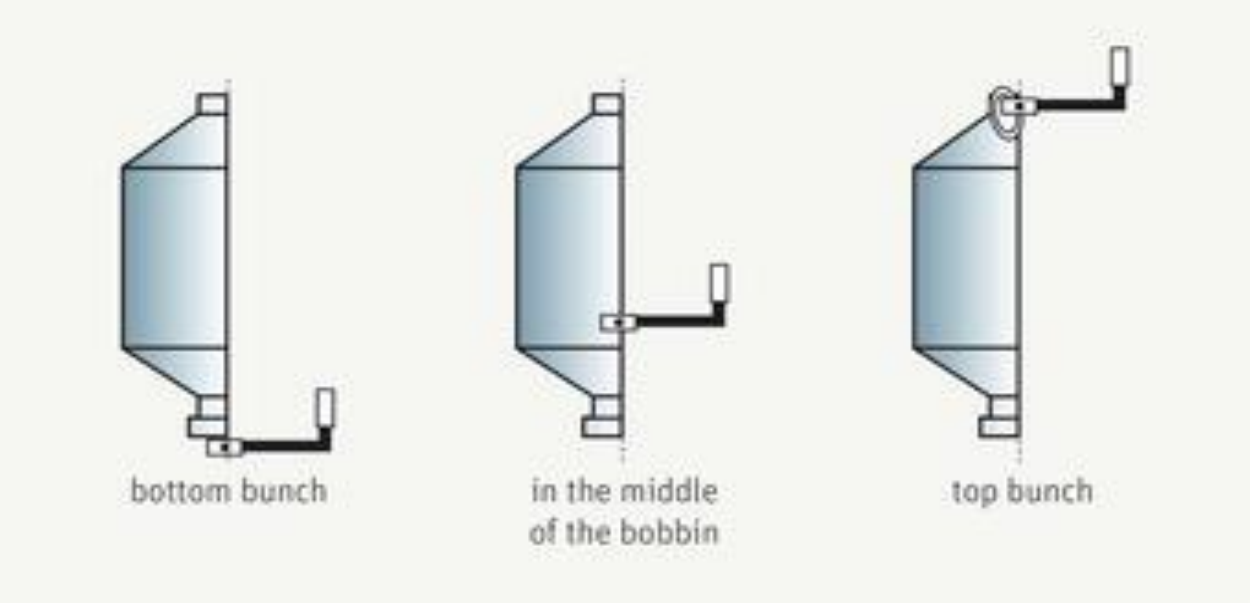
Doffing

Preparation for doffing

For successful doffing, the roving end must be placed in a specific position on the roving package. Three positions are possible.

- Roving end as top bunch top bunch is ideal for automated roving frames with automatic roving bobbin transport systems.
- Roving end in the middle of the roving bobbin position is mainly used for machines with manual doffing.
- Roving end as bottom bunch

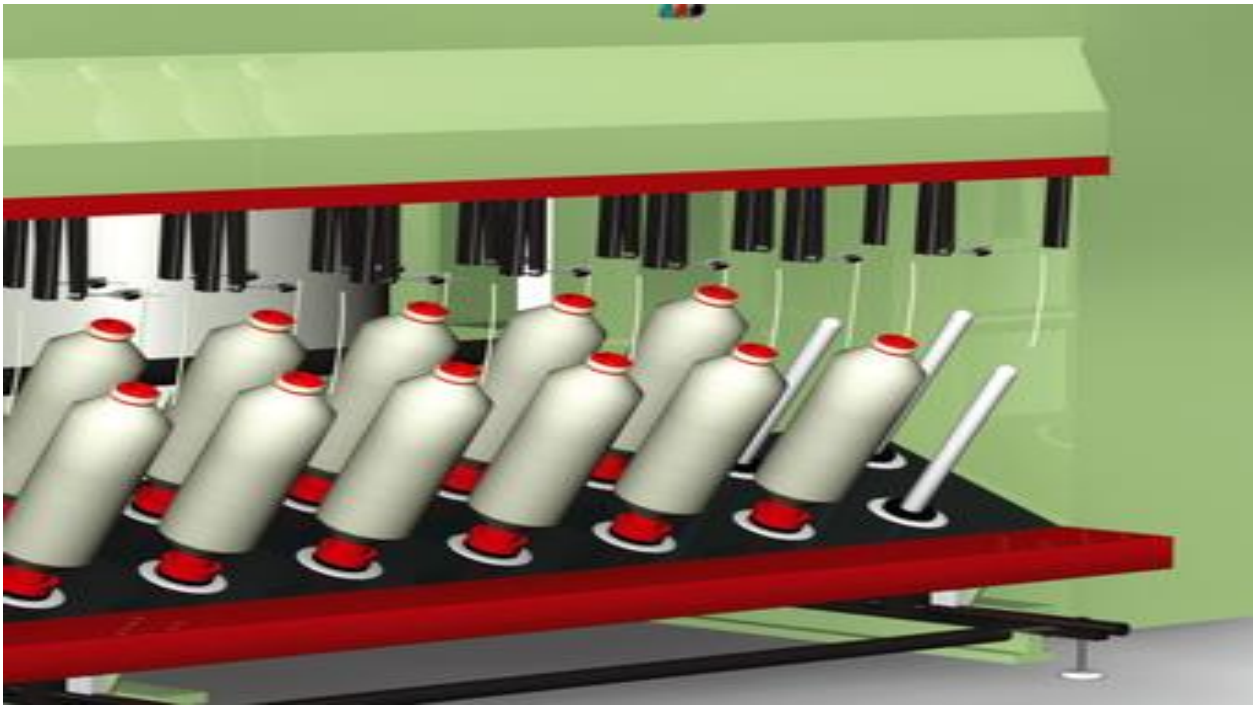
Bottom bunch is also used for automated roving frames with an automatic transport system, but in addition it simplifies the piecing procedure of the roving in the ring spinning machine.



Positions of the roving end

MANUAL DOFFING

To facilitate the doffing procedure, the bobbin rail with the full bobbins is lowered and tilted. This enables the bobbins be removed easily.



TECHNICAL DATA (NORMAL VALUES)

Spindles per machine	**48 - 160**
Flyer rotation speed, rpm	up to 1 500

Production rate, g/sp.h	250 - 2 000
Sliver hank, ktex	3.8 - 5.5
Roving hank, tex	170 - 1 500
Draft	5 - 22
Bobbin weight, kg	up to 3

Calculating output

Production of roving frame should be known to feed to ring frame as desired.

Linear production/machine (meter/hour) = $\frac{\text{spindle speed*total spindle*60}}{\text{TPM}}$

Mass Production (gram/hr) = $\frac{\text{Linear prodn*0.59}}{\text{Roving count (Ne)}}$

An example of calculating machine output:

Count delivered Ne 1, twist 47.24 T/m, spindle speed 1200 rpm, No. of spindles 96.

* Theoretical linear production = 1200/47.24 x 96 x 60 = 146,316.68 m/h.
* Pondered theoretical production = 146,316.68 x 0.59/1 = 86,326.84 g/h
* Real production with performance equal to 92%: 86,326.84 x 0.92 = 79,420.69 g/h.

Self-Check 1.5	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

2. What are the tasks of the roving frame? (2 point)
3. What are the two principal reasons roving frame needs for spinning? (2 point)
4. What is the function of flyer? (2 point)
5. What it mean unsupported roving? (2 point)

Choose the best answer from the given alternative. (1 point each)

1. Which is not the function of twisting on roving?
   a. More turns per unit of length
   b. Good strength
   c. no breakage of roving
   d. drafting
2. Which of the following is not task of roving frame?
   a. Attenuation of sliver
   b. Coherence& protective package
   c. blending
   d. winding the roving onto the
3. Twisting on roving takes place b/n…… &……..
   a. Bobbin rail & spindle
   b. Drafting arrangement & flyer
   c. bobbin & bobbin rail
   d. can & flyer
4. Flyer has two legs, the function of the one is to give twist what about the other?
   a. strength
   b. balancing
   c. Winding
   d. drafting
5. Up & down movement of the package on roving performed by……..
   a. bobbin
   b. lever
   c. flyer
   d. can
6. Winding on roving performed by……
   a. flyer
   b. presser arm
   c. spindle
   d. can

Note: **Satisfactory rating – 14 points** **Unsatisfactory - below 14 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1. _____

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2. _____

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3. _____

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4. _____

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Information Sheet-2	Monitoring machine operations

2.1.1 Opening

The degree of opening is affected by degree of stripping roller rpm and stripping roller setting and other factors also.

2.1.2 Mixing and Blending

Mixing and blending are the two words that are unknowingly used interchangeably. But they have different meaning. Fiber mixing is defined as combining fibers having the same class or origin.

Example- Mixing cotton fibers grown in different area to optimize price and sustain quality.

On other hand fiber Blending is combing fibers of different class or origin.

Example- combining cotton fibers and Man-made fiber (polyester fiber) to optimize price and to get strong yarn.

2.1.3 Cleaning

It shining the workplace before, during and after work is completed.

2.1.4 Parallelizing

It is the process of individualizing the tuft fibers by two rollers rotating in opposite direction. This is achieved by carding machine.

2.1.5 Drafting

It is the process of reducing the thickness of slivers by passing it through different rollers. The top roller will exert force from above and the front roller will stretch the slivers due to their speed difference. So by these two forces the thickness of slivers will be diminished/reduced.

2.1.6 Joining and Piecing Up

It is the process of connecting the head of one sliver with the tail of other slivers to have continuous flow of slivers.

2.1.7 Oiling

It is simply lubricating the working machines by adding oil after checking its standard.

2.1.8 Conditioning

It is the process of preparing the machine for use.

Self-Check 2	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List and explain main operations in pre spinning machine. (5 point)

Note: **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1. _____

_____

_____

_____

Information Sheet-3	Cleaning machines,

Cleaning is shining the machine, during and after work is completed.

- Cleaning of the clearer under the creel rollers.
- Cleaning of the top drafting rollers with wet cloth.
- Take out fan waste at regular intervals.
- Clean top clearers and bottom clearers time to time.
- Clean coiler calendar roller sides time to time.
- Clean drafting rollers sides time to time.
- Cleaning scanning rollers surroundings as per requirement.
- Clean the suction pipes time to time.
- Clean delivery rolls and trumpet regularly.

Self-Check 3	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What are the advantages cleaning of the machine. (5 point)

Note: **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1. _____

_____

_____

Information Sheet-4	Sorting waste

Sorting waste is simply classifying waste generated in workplace either harmful to environment or useful. If they are sorted carefully they are a resource.

4.1 There are 5 types of waste

- **Liquid Waste.** Liquid waste is commonly found both in households as well as in industries.
- **Solid Rubbish.** Solid rubbish can include a variety of items found in your household along with commercial and industrial locations. ..
- **Organic Waste.** Organic waste is another common household. ...
- **Recyclable Rubbish.** ...
- **Hazardous Waste.**

4.2. Methods of Waste Disposal

- **Composting and Vermicomposting:** This method is useful for the disposal of biodegradable waste. ...
- **Landfilling:** A low-lying open area out of the city where garbage is collected and dumped is known as a landfill. ...
- **Incineration:** This method is mainly used to dispose of the medical waste.

4.3. Advantage of Housekeeping and material handling in the department

- Control over excess waste generation
- Work will become more interesting, due to proper work place environment.
- Time and space savings.
- Less chances of material mixture.
- In short if proper care in material handling is taken, shortage of cans for speed frame can be avoided and production will not suffer.

4.4. Simple Ways to Reduce Waste

- ✓ Get to know the rules of recycling.
- ✓ Ditch the plastic bags.
- ✓ Make a meal plan.
- ✓ Start relying on reusable containers.
- ✓ Start composting.
- ✓ Learn to repair rather than discard.
- ✓ Cancel unnecessary mail.
- ✓ Stop using disposable plates.

Self-Check 4	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List types of waste. (5 point)
2. What are the Methods of Waste Disposal? (3 point)
3. List Simple Ways to Reduce Waste. (2 point)

Note: **Satisfactory rating – 10 points** **Unsatisfactory - below 10 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1. _____
   _____
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2. _____
   _____
   _____
3. _____
   _____
   _____

Information Sheet-5	Identifying and correcting product process and machine faults

Some of the product process faults may include uneven Sliver weight, Sliver irregularity and thick and thin place, so after identifying these faults the operator need to fix it.

5.1. Faults at pre spinning & effect on subsequent process

Causes of neps formation in blow room

Due to following points neps formation takes place. And these nep formations strongly affect the yarn quality

- Because of too high or low moisture of cotton.
- Neps formation takes place when there is extremely fine cotton with high trash content.
- Reprocessing of laps and mixing of soft waste cotton, if the reprocessing, this will create bad effect of yarn quality. During reprocessing maximum neps are create which are difficult to remove in the next stage. So it is needed to avoid reprocessing of laps and soft waste cotton.

Causes of curly cotton

Due to following points of curly cotton it should be set the parts of machine in a proper way so that following causes does not happen

- Grid bar is the part of blow room machine which is used for cleaning purpose. Grid bar settings are very close to the beater.
- Causes of curly cotton are due to hooked or bent pins in beaters.

Causes of Lap Licking

Due to the following points lap clicking occurs. Lap is the output of blow room which is used for next step such as carding machine. To avoid the lap of licking we use roving ends within the lap to act as a layer separation.

- Soft waste cotton should not use in mixing because it will create problem in the next stage.
- Sticky nature of cotton, so avoid sticky cotton.

Cut in the sliver:

To check cuts in the sliver, 2-3 meters of sliver is twisted and checked. If cuts are detected then

- ✓ Check roller pressure
- ✓ Check eccentricity of rollers
- ✓ Check calendar roller grooves.
- ✓

Effect:-Cut sliver will affect the quality of the roving and yarn.

- It will also adversely affect the working of the speed frames and ring frames and increase in the breakage rate.

Good fibers in suction waste:-normally suction waste should not be more than 0.25%.

If it is more than the limit, check suction pressure at the drafting zone and correct it.

Effect: Good fibers going in the suction waste will affect production and irregularity in the sliver.

Self-Check -5	**Written Test**

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List and explain product process and machine faults in pre spinning. (5 point)

Note: **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1. _____
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Information Sheet-6	Reporting major machine faults

Major machine faults are those faults that affect fiber tufts, sliver, roving and etc. Example-

- Insufficient stripping
- Dirty under casing (grid bar)
- Uneven flats setting
- Under casing chocked with fly (waste)
- High roller speed
- Poor flat stripping
- Hooked or damaged wires on flats
- Damaged cylinder
- Cluster of cotton embedded on cylinder wires
- Top roller overlapping.
- Improper working of auto leveller.

Self-Check -6	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List pre spinning machine faults. (5 point)

Note: **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1. _____
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Operation Sheet 1	Sorting waste

Method of housekeeping and material handling in the department

Step 1- Keep waste at instructed place.
Step 2- Keep usable waste count wise in waste boxes/bags.
Step 3- Keep fan waste separately in bags & do not allow sliver waste to mix-up with fan waste.
Step 4- Keep full cans and empty cans only at instructed place.
Step 5- Clean empty cans to be used time to time.
Step 6- Keep cleaning tools separately at proper place.
Step 7- Keep the floor of the department. Neat & clean.
Step 8- Surplus material in stock should be kept covered with plastic sheet.
Step 9- Do not touch material with dirty hands.
Step 10- Does not transfer sliver from one can to other
Step 11- Carry full cans carefully so that slivers does not fall on the floor

Operation Sheet 2	Operate and monitor pre spinning process

Procedure of blow room process

Step 1- prepare the bales on the blow room section

Step 2- open the bale into smaller tufts

Step 3- clean the fiber

Step 4- blend/mix the fiber

Operation Sheet 3	Operate and monitor pre spinning process

Procedure of carding process

Step 1- to individualize the fiber
Step 2- Remove very short fibers, neps and foreign materials
Step 3- removes majority of the trash
Step 4- To some extent apply parallelization of fiber
Step 5- formation of sliver

Operation Sheet 4	Operate and monitor pre spinning process

Procedure of draw frame process

Step 1- prepare the carding can close to the draw frame machine
Step 2- load the sliver on the draw frame creel zone
Step 3- Carry out doubling and drafting
Step 4- carry out Straightening and parallelization of fibers.
Step 5 carry out blending of slivers Removal of short fibers

Operation Sheet 5	Operate and monitor pre spinning process

Procedure of roving process

Step 1- prepare the draw frame can close to the roving machine

Step 2- load the sliver on the roving creel zone

Step 3- carry out drafting

Step 4- carry out twisting

Step 5- carry out winding

LAP Test	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within --- hour.

Task 1. Carry out housekeeping and material handling in the department

Task 2. Perform blow room process

Task 3. Perform carding process

Task 4. Perform draw frame process

Task 5. Perform roving process

List of Reference Materials

1- Analysis on the Defects in Yarn Manufacturing Process & its Prevention in Textile Industry by Neha Gupta
2- Training Programme 2004– Spinning by P.N.R. Jeevananthan
3- Klein, W. Short-staple Spinning Series, The Textile Institute, Manual of Textile Technology, Volumes 1, 3, 4, & 5,1994.
4- Wynne, A. The Motivate Series, Textiles, 1997.
5- Bukayev, P.T. General Technology of Cotton Manufacturing, 1984, Mir Publishers.
6- Cotton: Science and technology Edited by S. Gordon and Y-L. Hsieh