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# Part-1

# Basics

## 1.1 Basic Textile Terms of Spinning:

**Fiber:** The fundamental component used in making textile yarns and fabrics. Fibers are fine substances with a high ratio of length to thickness. They can be either natural (e.g. cotton, wool, silk etc.) or synthetic (e.g. polyester, nylon, acrylic etc.).

**Blow room Lap:** The Loose strand, roughly parallel, untwisted fiber sheet produced in blow room.

**Chute feed system:** It is a system of feeding small tufts of fibers directly from blow room to a series of cards, arranged in a circuit through pneumatic pipe.

**Sliver:** The strand of loose, roughly parallel, untwisted fibers produced in Carding.

**Roving:** The soft strand of carded/combed fibres that has been twisted, attenuated, and freed of foreign matter, which is a feed material to spinning.

**Yarn:** A continuous strand of textile fibers that may be composed of endless filaments or shorter fibers twisted or otherwise held together.

**Spinning:** The process of making yarns from the textile fiber is called spinning. Spinning is the twisting together of drawn out strands of fibers to form yarn.

### Yarn Count/Sliver Hank

Yarn count is the numerical expression of yarn, which defines its fineness or coarseness. (Linear density).

Yarn count system:

Indirect system: English count (Ne), Worsted Count etc.

i.e. Higher the yarn number, finer the yarn.

Direct System: Tex, Denier

i.e. Higher the yarn number, Coarser the yarn.

Similarly numerical expression of fineness or coarseness of Lap, sliver & roving are called Hank.

Note: English (Ne) count system is commonly followed in India.

English Count: No. of Hanks of length 840 yds weighing in 1 pound

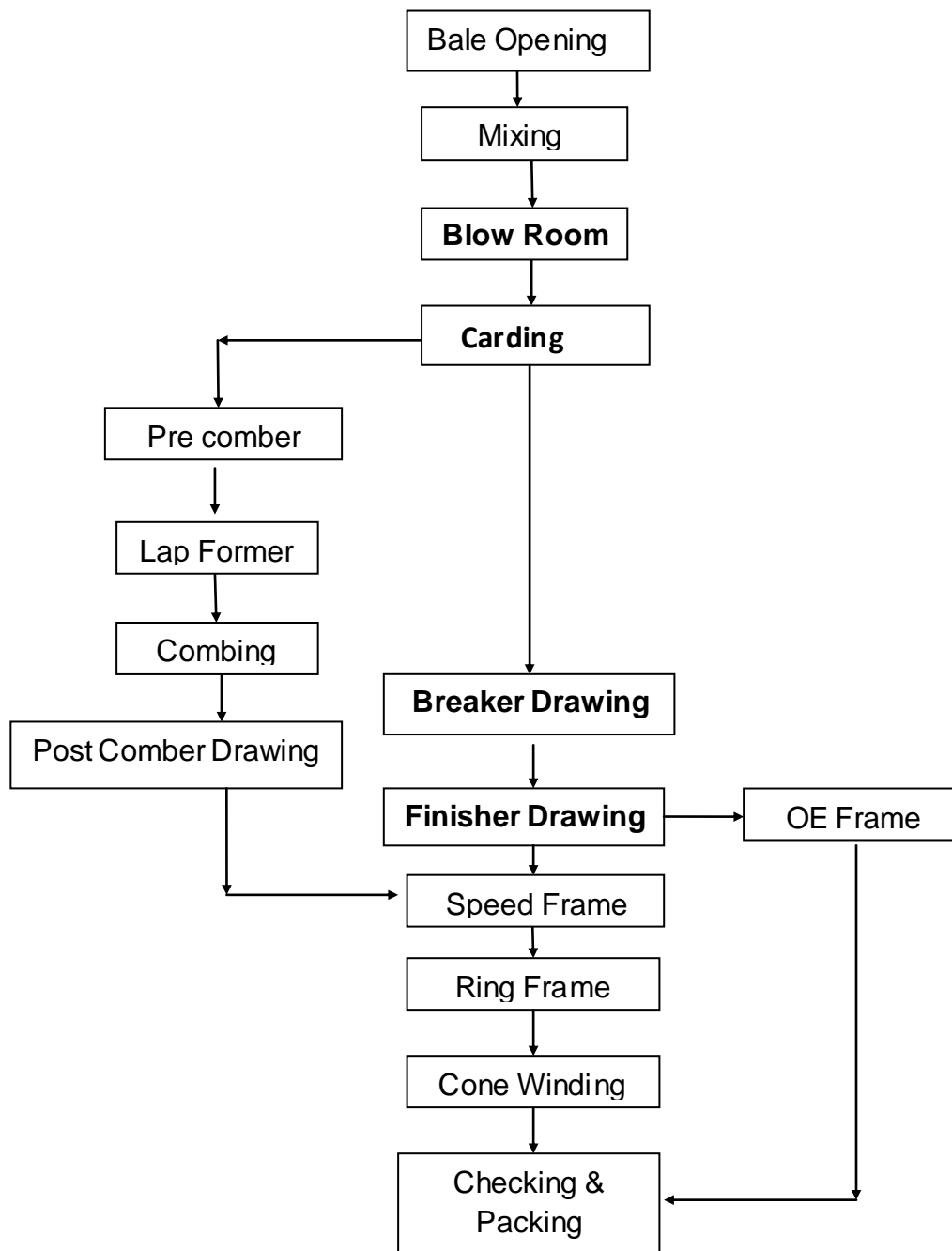
1yds: 0.9144mtrs

1lbs: 0.453 Kgs.

e.g. 40<sup>s</sup> Ne = 40 hanks of 840 yds weighs 1 lbs.

20<sup>s</sup> Ne = 20 hanks of 840 yds weighs 1 lbs.

## 1.2 Sequence of Spinning Process:



### 1.3 Material Flow in Spinning:

#### Carded Yarn Manufacturing:

TABLE-1

STAGE	MACHINE	INPUT MATERIAL	OUT PUT MATERIAL	PACKAGE FORM
Opening & cleaning	Blow Room machines	Raw cotton	Lap or chute feed	-
Carding	Card	Lap or chute feed	Card sliver	Slivers in Can
1 <sup>st</sup> drawing	Breaker Draw frame	Card sliver	Drawn sliver	Sliver can
2 <sup>nd</sup> drawing	Finisher Draw frame	Drawn sliver	Drawn sliver	Sliver in can for Roving
Roving	Speed Frame	Drawn sliver	Roving	Roving bobbin
Spinning	Ring spinning frame	Roving	Ring-spun yarn	Spinning Cops
Post-Spinning processes	Winding & Reeling	Yarn in spinning cops	Yarn	Cone, Cheese & Hank

#### Combed Yarn Manufacturing

TABLE-2

STAGE	MACHINE	INPUT MATERIAL	OUT PUT MATERIAL	PACKAGE FORM
Opening & cleaning	Blow Room machines	Raw cotton	Lap or chute feed	-
Carding	Carding machine	Lap or chute feed	Card sliver	Carded Slivers in Cans
Pre comber Drawing	Breaker Draw Frame	Carded Sliver	Drawn Sliver	Drawn slivers in cans
Lap Formation	Super Lap or Lap Former	Drawn Slivers	Lap	Laps in spools
Combing	Comber	Lap	Combed Sliver	Combed sliver in Cans
Post comber Drawing	Finisher Draw Frame	Combed sliver	Drawn sliver	Post comber Draw frame slivers in cans
Roving	Speed Frame	Post comber Draw frame sliver	Roving	Roving bobbin
Spinning	Ring spinning frame	Roving	Ring-spun yarn	Spinning Cops
Post-Spinning processes	Winding & Reeling	Yarn in spinning cops	Yarn	Cone, Cheese & Hank

**Open End Yarn Manufacturing:**

**TABLE-3**

STAGE	MACHINE	INPUT MATERIAL	OUT PUT MATERIAL	PACKAGE FORM
Opening & cleaning	Blow Room machines	Raw cotton	Lap or chute feed	-
Carding	Card	Lap or chute feed	Card sliver	Slivers in Can
Drawing	Draw frame	Card sliver	Drawn sliver	Sliver can
OE Spinning	OE Frame	Drawn sliver	OE yarn	Cheese

**Various Package Form:**





**Roving Bobbin**



**Ring Bobbins**



**Cone Packages**



**Cheese Package**

# Part-2

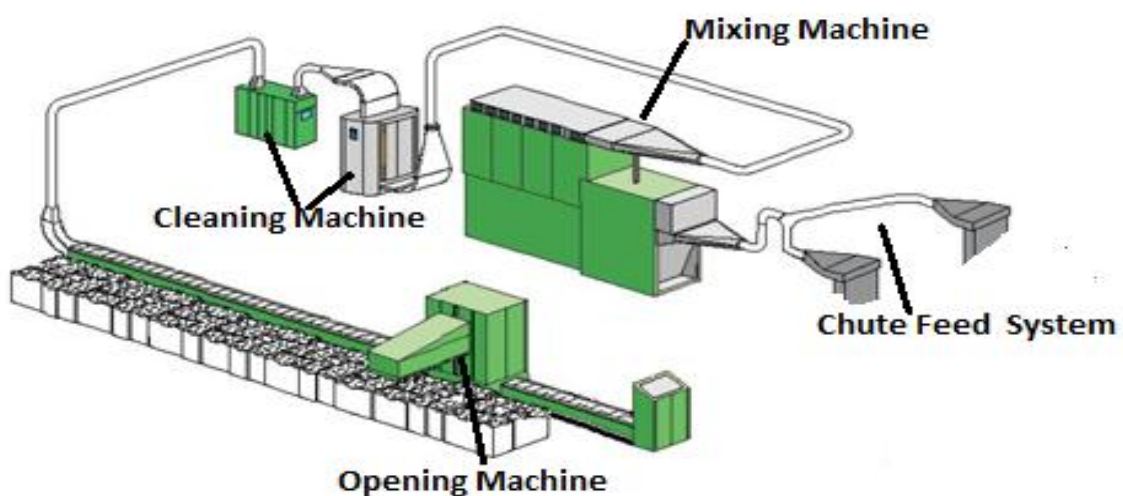
# Blow Room



## 2.1 Functions of Blow Room Machines:

- **Opening:** To open the compressed bales of fibres & to make the cotton tuft as small as possible.
- **Cleaning:** To remove dirt, dust, broken seeds, broken leaves, and other foreign materials from the fibers.
- **Mixing & Blending:** Uniform mixing/blending of fibers of different varieties.
- **Lap or flocks formation:** To transfer opened and cleaned fibre into sheet form of definite width and length which is called lap or in modern system directly feed the material to the carding machine in flock form.

## 2.2. Details of Blow Room Machines:



## Operations of Blow Room Machines:

### Cotton Bale:

A commercial package consisting of cotton lint tightly compressed, covered with bagging and bound with metallic or polymer straps. Normally cotton bale weighs around 170 Kgs.



### Opening Operation:

It is the first operation in the blow room line where the bales are arranged in a predetermined order and the bale plucker machine plucks the fibre tufts from the bales laid uniformly and feeds to blow room line by the action of air.



### Cleaning Operation:

To eliminate dust, dirt, broken leaf, seed particles, grass and other foreign matters from the fibres.



### Blending/mixing Operation:

Fibers of different varieties are uniformly mixed and blended in these machines of blow room.



### Lap Forming:

To convert the opened and cleaned fibres into a sheet of particular width with uniform weight/unit length is called lap. The Lap so formed is wound on the lap spindle to make it suitable for the next process of carding.



### Chute Feed System:

In case of chute feed system instead of forming blow room lap, the opened, cleaned, mixed/blended material is fed to the carding machines through pipe line in tuft (sheet form) by the action of air.



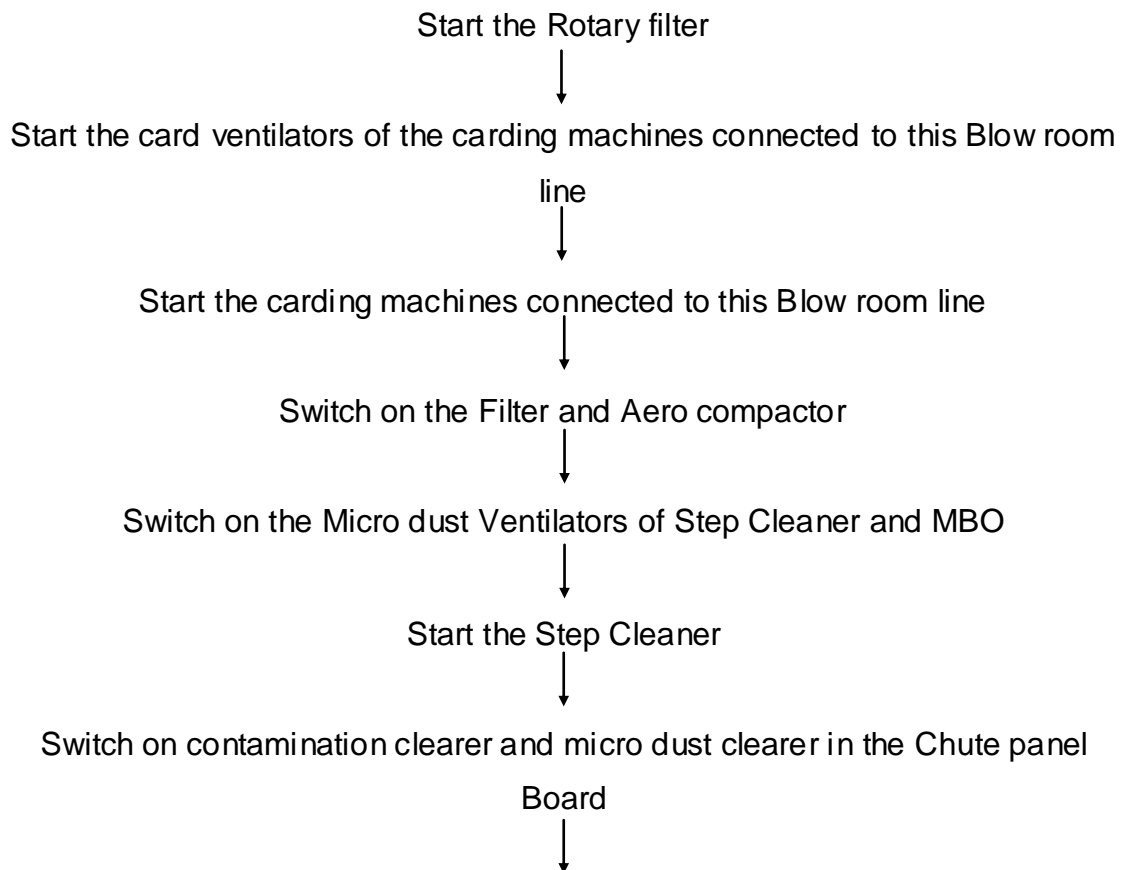
## 2.3 Operating Blow room machines:

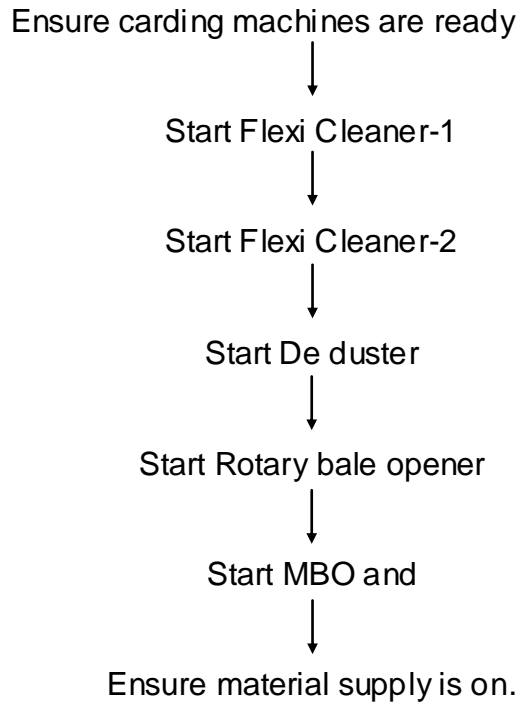
### Laying the bales

- Ensure receipt of correct bales as per supervisor's instruction from bale godown.
- Lay the bales as per the plan given in bale plucker.
- Open the bale hoops, remove covering cloth and clean the sides of bales.
- Ensure proper identification of the bales & remove the bale straps properly.
- Use proper material handling tools for transporting and opening the bales.
- Keep the bale straps properly at specified place.
- In case of manual feeding ensure the correct colour coded mixing is available near the feeding point and feed the mixing as specified.



- Control the feed as per the requirement of the next machine.
  - While starting Blow room line the machines in Blow Room are to be started in a sequential order based on the machines and beating points in the blow room line. For explanatory purpose an example for the sequence of machines to be started In chute feed system of Blow room line is illustrated as follows





- Collect & store the Blow room wastes in the appropriate waste collection boxes.
- Follow the different signal lamps used in machines.
- Understand the different control buttons and operate them when the need arises.
- In case of any dangerous situations, stop the machine by using emergency stop button.
- Remove contaminations like metal particles, wooden pieces, jute threads, polypropylene twine, cloth pieces, oily or stained fibre, hair etc. while feeding the material on lattice. Check the respective laid bales and remove the bale or portion of the bale having more contamination and inform supervisor, if ejections of wastes are high.
- Take maximum care when there is a 'mixing' change
- Take out safely the contaminations from the bales laid and store them at designated places.

**Importance of Colour coding:**

- The details related to colour coding and other relevant information are normally displayed in respective machines display board and it is the responsibility of the machine operator to understand them & work accordingly.

## Identifying Defects

- Defects in blow room lap/uneven feed of chute are to be identified and informed to supervisor for necessary action.
- If the mixing used for feeding to Blow room line has more contaminations, shade difference of cotton etc, are to be identified and informed to supervisor for necessary action.

## Waste collection & contamination removed:



- In case of automatic mixing & feeding Bale Plucker does the job of uniform mixing as per requirement
- Attend to respective machines of blow room line whenever the alarm rings or machine stops.
- Clean the filters & dust box periodically.
- Check proper material transport in the ducts of the blow room line.
- Check that the by-pass arrangements are appropriate for the mixing being processed.
- Record the blow room lap weight in case of conventional Blow Room line.

- In case of chute feed system, ensure that the material flows smoothly from blow room to carding.
- During normal course of working if any abnormalities detected inform immediately to supervisor for suitable action.

### **Cleaning of Blow Room Machines & Waste disposal**

- Collect the wastes at regular intervals as instructed by shift in charge
- Clean the machine along with the maintenance person
- Keep the machine surroundings always clean
- Collect the waste from the centralised waste collection systems when it is full
- Sort out the metal pieces from the material collected at metal detector system
- Make sure that the fibre wastes are falling in respective waste collection bags.
- Transport the wastes to the designated place
- Keep the waste category wise and avoid mix-up
- Transfer the wastes to waste godown & Weigh the wastes and record in register.

# Part-3

# CARDING

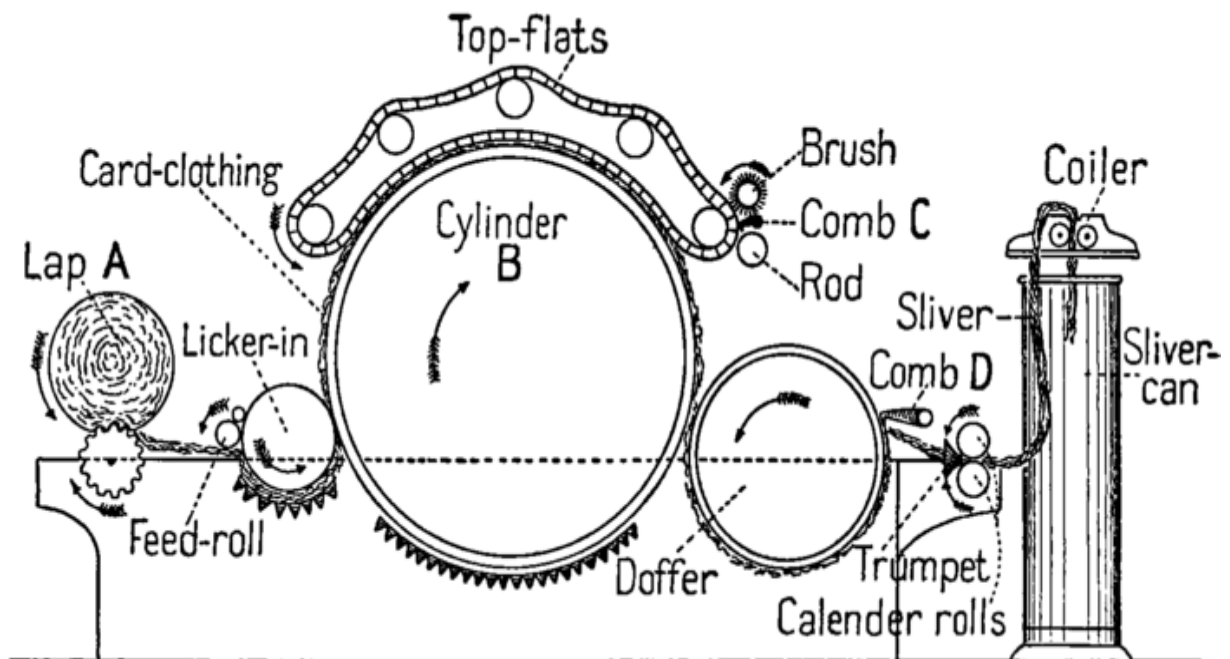


### 3.1 Functions of Carding Machine:

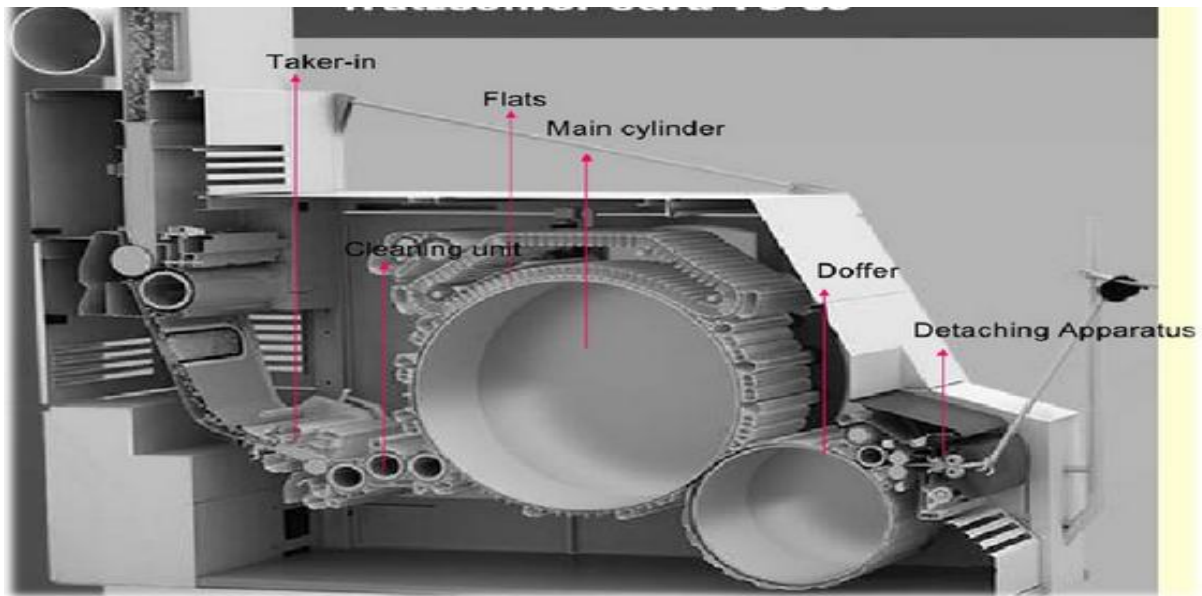
- To individualise the fibres.
- To remove impurities.
- To clean cotton thoroughly off the lighter dirt & trash as well as to remove a certain proportion of neps & short fibers from the opened material.
- To convert Blow Room lap/ Chute feed sheet into the loose, roughly parallel, untwisted strand fibres called 'sliver'.

### 3.2 Details of Carding Machine:

#### With Lap feed:



**With Chute feed system:**



**Different Zones of Carding Machine:**

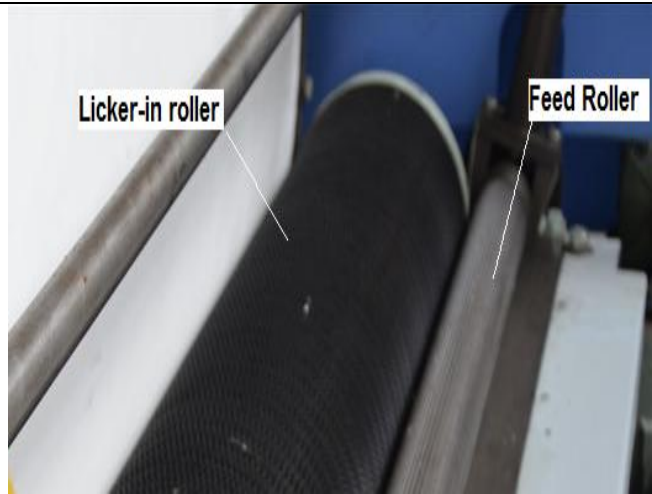
**Chute feed/ Lap :**

The feed material for carding is in the form of Blow Room lap or by direct Chute feed system, In chute feed system the small tufts of fibres (sheet form) fed directly from blow room to a series of cards, arranged in a circuit through pneumatic pipe.



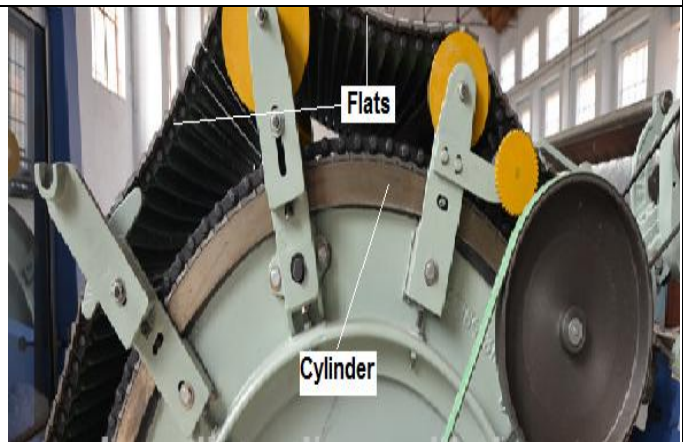
**Feed roller & Licker-in:**

The roller that receives fibres from the feed roll(s) is called the licker-in. Licker- in opens the cotton into very small tufts, extracting the seed bits, sand and other vegetable trash particles from cotton. Licker-in transfers the cotton to the cylinder zone.



**Cylinder & Flats:**

The main work of the card is to individualise fibers which is performed between the main cylinder and the flats. Only by means of this fiber separation it is possible to eliminate the dirt, especially the finer particles and dust.



**Doffer:**

Fibres from cylinder are transferred to doffer. Difference in speed of cylinder and doffer enables fibre to be stripped by stripper roller from doffer to form card web.



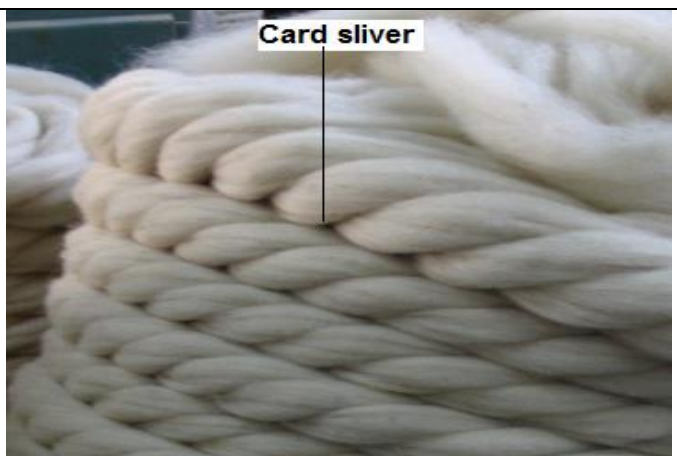
**Condensation of web & Trumpet:**

The fibre web is stripped from the doffer using a stripper roller. It is then passed through a pair of squeeze or crush rolls before it is finally accumulated width wise into a fibre strand form (Card Web). The calendar rolls compress the fibre strand to provide better integrity and stable flow of material. The fibre strand (the card sliver) proceeds upward over guide pulleys to enter the coiler system. This consists of a trumpet, guide and a second pair of calendar rolls that delivers the carded sliver through a revolving tube into the card sliver can.



**Sliver & Carding can:**

The rotary movements are required for cycloidal coiling of the sliver. On one hand, the rotatable plate must be rotated above the can, while the can itself must rotate, at a considerably slower rate, below the plate. A sliver tube is provided on the plate as a fixed part to guide the sliver from the calendar rollers into the can.



**Stop signals:**

Signal lamps are provided on the machine to indicate the reason for stoppage of machine. Understand each signal lamp and their purpose in the machine.



### Display Panel:

It displays various operating machine parameters like speed, production etc. Understand the details in the display panel and work accordingly



### 3.3 Operating Carding Machine:

- A carding operator should be able to operate the carding machine, ensure proper feeding of material in chute/lap feed system, piece the sliver on breakage, doff the cans and transport to the storage area.
- Start the machine as per instructions given by shift supervisor.
- Check that the card web is properly condensed and sliver is delivered.
- Follow the different signal lamps used in machines & understand the stop motions.
- Check the proper functioning of card by verifying the control panel.
- Check whether the material is properly fed in the carding machine via chute/lap feed system
- Identify sliver breakages and piece the sliver during breakage. While piecing the sliver do not do too soft or too hard piecing.
- Segregate the sliver waste & card drop waste as per supervisor instructions.
- Check that all the cards have correct colour coded laps/chute feed.
- Check the availability of empty sliver cans.
- During normal course of working if any abnormalities detected inform immediately to supervisor for suitable action.

#### Importance of Colour coding:

The details related to colour coding like Lap Rod colour & Sliver Can colour, and other relevant information like Hank of sliver etc, are normally displayed in respective machine's display board. It is the responsibility of the machine operator to understand them & work accordingly.

### Identifying Defects:

- Defects in blow room lap/uneven feed of chute are to be identified and informed to supervisor for necessary action.
- If the carding sliver being produced are defective like, uneven sliver, neps in slivers, slivers with high variation etc., are to be identified and informed to supervisor for necessary action.

### Carrying out Doffing:

- Clean the can castors before feeding.
- Keep the required number of specified colour coded empty cans near doff zone for automatic can change.
- Keep the empty sliver can near the doffing machine in manual doffing .
- Doff the full sliver can in case of manual doffing.



### Cleaning the Carding machine & Waste disposal

- Keep monitoring that the card sliver produced is free from surface damages and if any damaged sliver is produced, clear them as soft waste.
- Periodically clean the web condensing zone.
- Clean the wastes in the carding department as per schedule instructed.
- Segregate the wastes collected and deposit at the waste bins
- use proper tools for cleaning
- Always safely carrying out cleaning
- Maintain Carding Department clean.

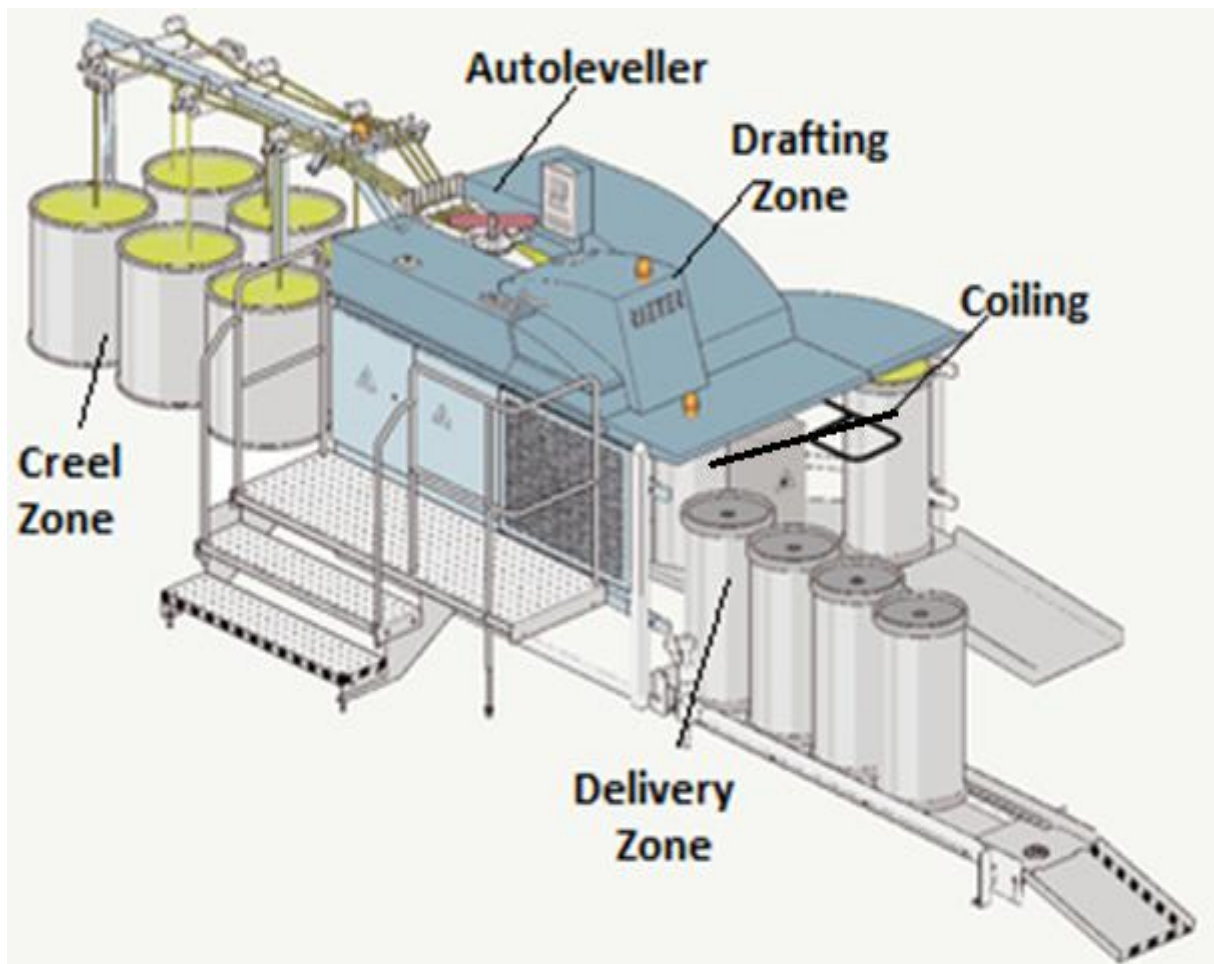
# Part-4

## Draw Frame

#### 4.1 Functions of Draw Frame Machine:

- To straighten the curled and hooked fibres.
- To make the fibres parallel to their neighbouring fibres.
- To improve uniformity of fibres by drafting and doubling.
- To reduce weight per unit length of sliver.
- To remove micro dust from slivers by air suction pipe.
- To blend raw material of same hanks perfectly.

#### 4.2 Details of Draw Frame Machine:





### Type of Draw Frame:

**Breaker Draw frame:** Feed material is card sliver. During this process 6-8 carded slivers are fed to this machine to produce more parallelized breaker sliver.



**Finisher Draw frame:** Feed material is breaker draw frame drawn sliver. During this process 6-8 breaker slivers are fed to this machine to produce more parallelized & uniformed finisher sliver.



## Different Zones of Draw Frame Machine:

### Creeling zone:

It is known as feeding zone. 6-8 feed slivers passing through guide roller, guide bars & feed to drafting zone.



### Guide Roller :

It guides the passage of feed slivers and act as a stop motion when feed sliver breaks



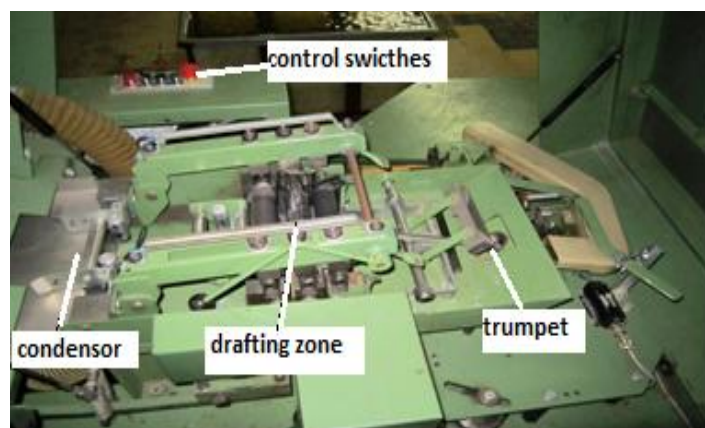
### Auto leveller:

The main task of auto levelling is to eliminate deviations in mass per unit length



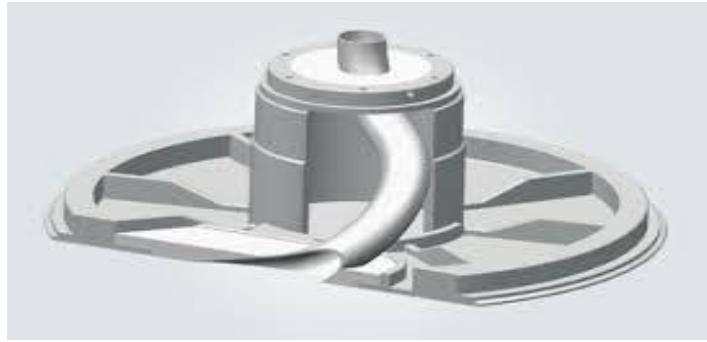
### Drafting zone:

It is the zone for a process of decreasing the weight per unit length of sliver. It is mainly due to differential peripheral speed of the rollers.



### Sliver Coiling:

The rotary movements are required for cycloidal coiling of the sliver. On the one hand, the rotatable plate must be rotated above the can, while the can itself must rotate, at a considerably slower rate, below the plate. A sliver tube is provided on the plate as a fixed part to guide the sliver from the calendar rollers into the can.



### Doffing of cans:

In Single-step changers full cans are replaced by empty ones at full speed, i.e. without stopping the machine.

In Multiple-step changers machine is brought to a stop during the change.



### Signal Lamps:

Signal lamps are provided on the machine to indicate the reason for stoppage of machine

Understand each signal lamp and their purpose in the machine.



## Display Panel:

It displays various operating machine parameters like speed, production etc. Understand the details in the display panel and work accordingly



## 4.3 Operating Draw Frame Machine:

- Creel the required number of cans and draw the slivers forward.
- Take the slivers through all guide rollers and feed to drafting zone.
- Operate the control switches for inching, starting and stopping the draw frame.
- By inching feed the material and start running.
- Follow the different signal lamps & stop motions used in machines.
- Piece the sliver during breakage & Doff the full sliver cans.
- View the display panel and identify the reasons for machine stoppages if any.
- Inform the supervisor and maintenance in charge in case of a jam and in case of any break-downs support to carry out maintenance activities.
- Carryout cleaning activities in creeling, drafting, and delivery zones.
- Remove the suction waste periodically & segregate the wastes collected and put them in the designated bins.
- Always keep Draw frame area clean.

### ➤ Importance of Colour coding:

The details related to colour coding like card sliver can, draw frame sliver can and other relevant information like Hank of sliver etc, are normally displayed in respective machine's display board. It is the responsibility of the machine operator to understand them & work accordingly.

## Identifying Defects:

- Defects in sliver like, uneven sliver, neps in slivers, slivers with high variation etc., are to be identified and informed to supervisor for necessary action.

### **Attending the Machine on Sliver Break:**

- Identify the machine stoppage for sliver breaks by viewing the signal lamps and display panel.
- Identify the broken sliver; piece the sliver/s as per standard piecing procedure.
- Open the calendaring zone
- Collect and condense through the calendaring rollers and trumpet for sliver formation.
- Draw the sliver through the conveyor rollers and pass it through the coiler rollers in delivery zone into the sliver can.
- Ensure proper functioning of machine after piecing.
- Collect the wastes generated during piecing and keep it at respective waste box.





**Piecing of sliver to pass through trumpet**

**Activities at Drafting Zone:**

- Interchange top rollers in drafting zone as per the schedule displayed on the machine.
- Attend to roller lapping and chocking of sliver. If lapping occurs remove the roller lapping manually without damaging the cots and ensure minimum waste. If lapping occurs frequently report to the supervisor immediately.
- Release the pressure on top rollers when the machine is to be stopped for longer duration.
- Clean the drafting zone periodically
- Inform the supervisor and maintenance in charge in case of a jam.



### **Carrying out Can Doffing:**

- Clean the can castors before feeding.
- Keep the required number of specified colour coded empty cans near doff zone for automatic can change.
- Keep the empty sliver can near the doffing machine in manual doffing.
- Doff the full sliver can in case of manual doffing.
- After doffing ensure that the can is seated properly and sliver is delivered continuously in the can

### **Cleaning the Draw Frame & Waste disposal**

- Carry out cleaning of Draw frame as follows or as instructed by supervisor
- Always safely carry out cleaning activities
- Carryout cleaning activities in creeling zone, drafting zone, and in Coiler using suitable equipment like brush.
- Periodically remove the dust from creeling area.
- Remove the soft waste piled up if any from creeling, drafting and delivery zone.
- Clean the doors and covers of the machine at periodical intervals and keep them free from fluff accumulation.
- Check the wastes collected from different parts of machine are deposited in the respective bins
- Keep the Draw Frame department clean.

# Part-5

# General Responsibilities



## 5.1 Responsibilities during shift change:

### Take Charge of the Shift

#### General

- Come at least 10 - 15 minutes earlier to the work spot.
- Meet the previous shift operator and discuss regarding the issues faced by them with respect to the quality or production or spare or safety or any other specific instruction etc.
- Check the cleanliness of the machines & other work areas.
- Check whether any spare/raw material/ tool / any other materials are thrown under the machines or in the other work areas.
- Check the wastes collection boxes are empty while taking charge of shift.
- Check and ensure that the work spot is clean.

#### In Blow Room Line

- Ensure to collect the details regarding mixing followed, count produced and colour code followed in the blow room line.
- Check and understand the technical details mentioned in the display board.
- Check the fibre tuft passage and proper transportation of fibre tufts/lap to carding department via chute/lap feed system.
- Check proper functioning of blow room machine parts and variations, if any report it to supervisor.

#### In Carding

- Ensure to collect the details regarding mixing followed, Sliver Hank and colour of sliver cans in the Carding machines allotted.
- Check and understand the technical details mentioned in the display board.
- Ensure that card web is properly formed and sliver is delivered in the cans .
- Check proper functioning of carding machine parts and variations, if any, report it to the superiors.

## **In Draw Frame**

- Understand the count/Hank produced, colour of card slivers cans & colour of Draw frame slivers cans followed in the Draw Frame for the allocated number of machines.
- Check and understand the technical details mentioned in the display board.
- Check for the availability of the feeding sliver cans for creeling.
- Check the sliver passage and proper formation of drawn sliver.
- Check the condition of all the running sliver cans.

## **Handing over the Shift:**

- Properly hand over the shift to the incoming shift operator.
- **In case of Blow Room line:** Provide the details regarding mixing followed, count produced, colour code for Mixing, Lap & Lap Rod and other technical details followed in the department
- **In case of Carding:** Provide the details regarding count/Hank produced, colour of card slivers cans, colour code of Lap & Lap Rod in case of Lap fed Carding machines for the allocated number of machines.
- **In case of Draw Frame:** Provide the details regarding count/Hank produced, colour of feeding slivers cans & colour of Breaker/Finisher Draw frame sliver cans followed in the Draw Frame for the allocated number of machines.
- Collect the wastes from waste collection bags, weigh them and transport to storage area
- Check for the complete entries in the waste register at the end of shift.
- Check for the cleanliness of the work place.
- Get clearance from the incoming counterpart before leaving the work spot, in case if the next shift operators do not come, report to shift supervisor as well as to the incoming shift supervisor.
- Report to the shift supervisor about the quality / production / safety issues/ any other issue faced in the shift and leave the department only after getting concurrence for the same from supervisor.

## 5.2 Importance of Health & Safety

- Follow the safety work instructions or practices like not opening the doors of the machine, not cleaning the interior parts and not taking any choked material when the machine is in running condition.
- Always use head cap and face mask in the work spot.
- Do not carry any metallic parts during machine running as there are chances of fire and damage to machine parts.
- Take action based on instructions in the event of fire, emergencies or accidents, participate in mock drills/ evacuation procedures organized at the workplace as per organization procedures.