Lecture Note

SUB: Yarn Manufacture-I

BRANCH:- TEXTILE ENGG.

SEMESTER:3rd

GOVERNMENT POLYTECHNIC, BHADRAK

Prepared By: Shreepati Sundar Upadhyay(Lect.Textile Tech.)

Simply to define ginning we can say that the process is used to get the cleaned cotton by separating or removing the seeds, dust or any other foreign particles.

Objects of Ginning:

- Make the fiber-free from seeds without gin-cut fiber.
- Ensure the best quality of cotton and get the fair price of cotton in the market.
- To be confident that fiber does not contain excess and unexpected seeds or any other particles.
- To make the spinning process easier and effective

THE GINNING PROCESS

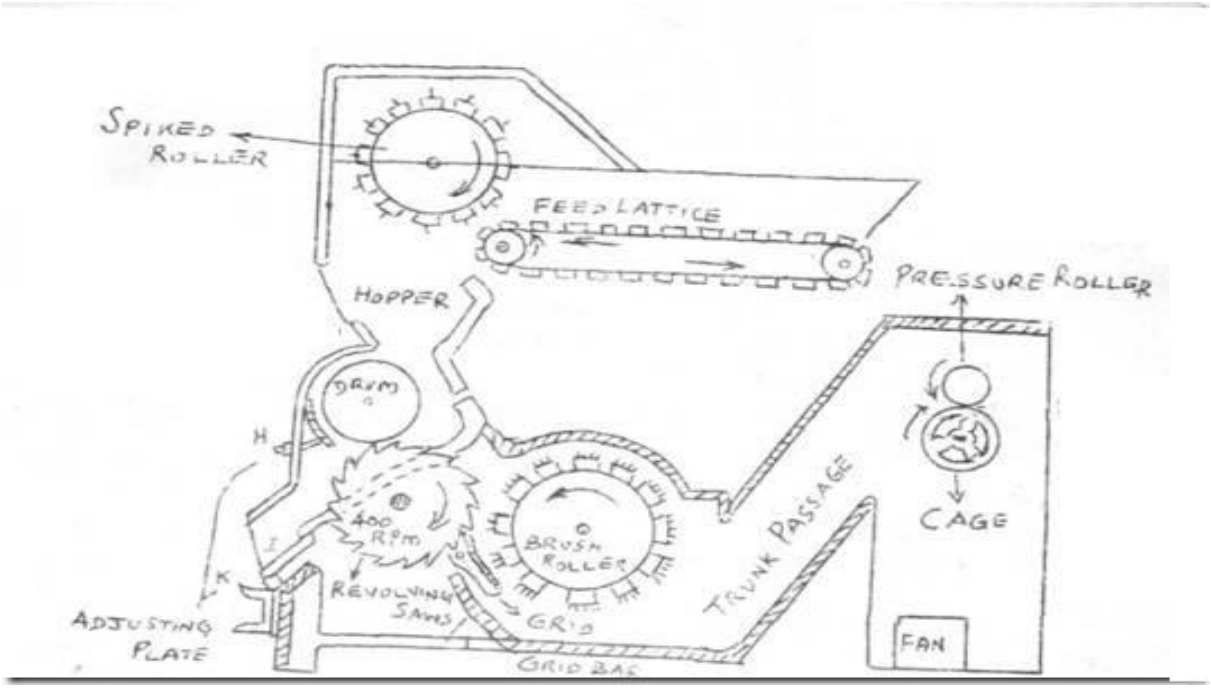
The seed cotton arrives at the gin in round bales or modules.

- The first step in the ginning process is where the cotton is vacuumed into tubes that carry it to a dryer. Cotton must be ginned with a moisture level of 5%. The cotton is dried out if it is too wet or water is added if it is too dry to ensure the correct moisture level.
- Next, the cotton goes through several stages of cleaning equipment to remove leaf trash, sticks, dirt and other foreign matter.
- After cleaning, the cotton is then ready for separation in the gin stand. The gin stand removes the seed from the lint. Most cotton is ginned with saw gins where fast moving circular saws grip the fibers and pull them through narrow slots.
- The raw fiber, now called lint, has any remaining trash removed and makes its way through another series of pipes to a press where it is squashed into bales under very high pressure. Each bale weighs 227kg.
- Samples are taken from each bale for classing and the bales are wrapped in stretchy white cotton fabric to protect the lint.
- They are now ready for transport to one of the ports for shipping into overseas markets.

Saw Gin-

Object:To separate the cotton fibres from the seed.

Diagram:



WORKING:

The seed cotton is fed upon the lattice and carried forward to the spiked roller, which loosens the cotton and throw; it into the hopper.

In hopper, the seed cotton comes into contact with rapidly revolving saw roller. App.70 saws are threaded on a shaft.

As the saws revolve, the teeth carry the fibres forward, but it is impossible for the seeds to follow and also, due to the heavier beating of the rapidly revolving saws on the seed cotton, the fibres are separated from seed and taken round until the brush strips the fibre from the teeth.

Empty seeds husks and other broken seeds are thrown into grid, through which they pass into suitable receptacle. An air current from the cage draw the fibres along the trunk passage, and on reaching the revolving cage are brought under the pressure roller and delivered as a sheet, from which it is taken to the baling press.

Advantage of Cotton Saw Ginning

1. Saw ginned cotton is more uniform
2. Cotton is more clean than usual.

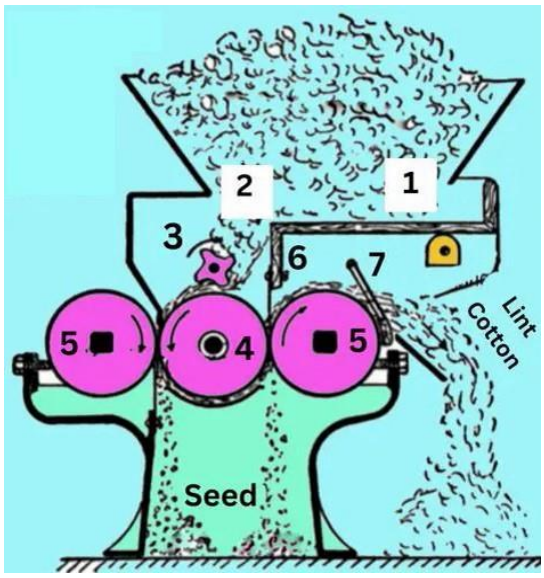
The Disadvantage of Cotton Saw Ginning:

1. Possibility of fiber breakage due to draw up the fiber from the surface of the seed.
2. Increase neps
3. Increase short fiber content

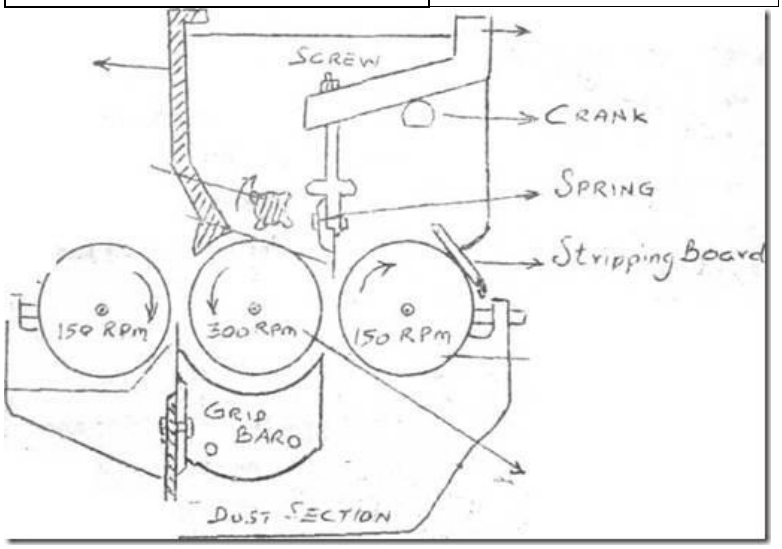
Knife Roller Gin-

Object: To separate the fibres from seed

Diagram:



1= Feed Table	5= Leather Roller
2= Hopper	6= Doctor's Knife
3= Compressing Roller	7= Stripping Brush
4= Knife Roller	



Working:

Seed cotton slides down through the hopper and enters into the of ginning section. Compressing Roller breaks the large cluster of seed cotton and maintains a constant supply of cotton to knife roller.Knife portion being arranged in such a manner that anything coming into contact with it is given a reciprocal as well as striking action due to its revolution. The seed cotton is carried forward in the direction of knife roller's motion. After this the cotton fibres brought into contact with the leather roller. It is impossible for the seeds to follow. So, seeds will remain at the point of contact of the doctor knife and leather roller, with the fibres still connected with it. The combined action soon causes the seeds to separate from the fibres and to fall down through the grid to floor. The freed fibro passing forward is stripped from the roller by the stripping board.

Difference between Knife roller and saw ginning:

Saw ginning	**Knife roller ginning**
1. Saw ginning is used for short staple fiber.	1. Knife roller ginning is used for medium and long staple fiber.
2. Saw ginning is a fast process.	2. Knife roller ginning is comparatively slow process.
3. Fiber breakage percentage is high.	3. Fiber breakage percentage is less than saw ginning.
4. Here, used saw cutting disc.	4. Here, used spiked roller.
5. Lint fiber Capacity of saw ginning is up to 2000 kg/hour.	5. Lint fiber Capacity of knife roller ginning is up to 250kg/ hour.

2. Mixing &Blending

Syllabus-2.1 Objects of Mixing. 2.2 General consideration for preparation of cotton mixing & scientific bale management. 2.3 Methods of mixing and blending.

2.0 Introduction

Definition of Mixing:
When same kind but different grades of fibres are mixed together then it is termed as mixing.
Mixing is combining of fibres together in somewhat haphazard proportion. Properties of the resultant mix can not be reproducible.

Definition of Blending:
When different types of fibers (it may be equal or nearly equal graded) are mixed together are within a particular ratio then the mixture is known as blending.
Properties of the resultant blend can be predicted and reproducible.

Lint-
The seed free cotton which is got after ginning is called lint.

Linters-
After ginning some short fibres are remained with the surface of the cotton seed which is called linters

2.1Objects of Mixing and Blending in Spinning:

I. To achieve uniform quality of yarn throughout its length.
II. To reduce the cost of production.
III. To achieve functional and end use requirements.
IV. To improve process performance.
V. To facilitate the cotton for regain its moisture content lost during baling.

Comparison Between Mixing and Blending in Blow Room:-

SL No.	Mixing	Blending
01	Same kind but different grades of fibres are mixed together.	Equal or nearly equal graded of fibre are combined together within a definite ratio.
02	There is no particular ratio of fibers to mix with each other.	There must be a particular ratio of fibers to mix with each other.
03	So properties can not be reproduced..	So properties can be reproduced.
04	Example:Low graded cotton + high graded cotton= Mixing	Example: 35% polyester + 65% cotton = Blending

2.2 General consideration for preparation of cotton mixing & scientific bale management.

What is Bale Management-

The choice of cotton bales according to the fibre characteristics in order to achieve acceptable and economical processing condition and a constant yarn quality is called bale management.
Bale management deals with storage and retrieval of cotton bales.

Bale management is a process to mix fiber homogeneously to get consistent production, quality of yarn, inventory control and selection of fibers according to its properties.

Bale management refers to the process of inventory control and selection of fiber according to its properties and also to mix fiber homogeneously to get acceptable spinning performance, consistent production and quality of yarn.

Objectives of Bale Management:

1. An evening out of the quality characteristics of a yarn.
2. A means of avoiding quality jumps.
3. A possibility of reducing costs as a result of an improved knowledge of the fiber characteristics.

Specification of a Cotton Bales(Values are approximate):

Origin: CIS (Uzbekistan) raw cotton

- Crop year: 2008-2009
- Bale weight: 215-220 kgs (approximately).
- Staple length: 1 inches
- Micronaire: 4.0 – 4.8
- Strength: 24-29 gram/tex
- Grade: SMW (Strict middling white)
- Price: 65.5 usc/lb

Managing Bales:

To manage the bales we need four modules of fibers and the relation exist between fibers and yarn. They are:

- Strength
- Length
- Color grade and
- Micronaire value

Procedure of Bale Management in Spinning Mill:

Raw material selection (fiber lot number)

↓

Total bales

↓

Sample collection

↓

HVI (High Volume Instrument) testing

↓

Number of mixing

↓

Category defines (micronaire value and color grade) for different mixing

↓

Discard the lower micronaire value and color grade bales

↓

Define daily requirements

↓

Receiving and ware house punning

↓

Evaluation by QA personnel

↓

Preparation of bale layout as per mixing

↓

Delete the consumed bale from the current bale

2.3 Methods of mixing and blending-

Methods of Mixing:

1. Weight mixing
2. Volume mixing
3. Bin mixing
4. Hand stock mixing
5. Hopper mixing
6. Card mixing
7. Lap mixing
8. Sliver mixing
9. Automatic mixing

Weight Mixing: In this process different qualities of cotton fibers are weighed and put together.
Volume Mixing: In this process different qualities of cotton of known volumes are put together.
Bin Mixing: In this process cotton flocks are transferred from bale opener to a pipeline which is of 10" dia. and passed it to bins, these fiber flocks are transferred into the bins from the delivery boxes.
Hand Stock Mixing:
In this process cotton flocks from different bales are manually collected and put together. This is generally used in high count yarn production.
Hopper Mixing: In this process different qualities of cotton fibers are weighed and put together. In this method, mixing is done in hopper bale opener machine. Hopper bale opener picks the cotton from different bales and deposits on a lattice where mixing action takes place.
Card Mixing:
In this method mixing action is carried out in high production carding machine. Two different cotton laps are fed to carding machine to achieve mixing.
Lap Mixing:
In this method to obtain mixing double scutcher is used. Which consist of one breaker scutcher and one finisher scutcher. Different grade and different qualities of laps are produced in breaker scutcher. Four lap stands are placed before the finisher scutcher. Hence, mixing can be achieved in different ratios.
Sliver Mixing:
In this method different carded slivers are fed to draw frame to carryout doubling action and obtain mixing.

Methods of blending operation-

Sr. no.	Blending type	Process stage
1	Bale mixing	Before the blow room
2	Flock mixing	Within the blow room
3	Lap mixing	Using doubling scutchers
4	Web mixing	At the ribbon lap m/c, or the blending draw frame
5	Sliver mixing	At the draw frame & sliver, Lap or the comber
6	Fibre mixing	At the card or Rotor spinning m/c
7	Roving mixing	At the ring spinning m/c

Bale Mixing: This process is carried out before Blow-room. Bale mixing is done for both natural and man-made fibers. For this process 6 to 60 bales are placed one after the other .

Flock blending:

This process is carried out within the blow-room process. This process takes place in an uncontrolled manner.

Lap blending:

To carry out this process a double scutcher is required. 4-6 laps are fed through conveyer lattice. The blend obtained through this process will have high longitudinal and traverse blends.

Web blending:

To carry out this process ribbon lap machine is used. This process gives a good longitudinal blend as well as transverse blend which is obtained with sliver blend.

Sliver blending:

Carried out on drawframe and it provides best blend in longitudinal direction.

Fiber blending:

This process is carried out at the card or the OE spinning machine.

Roving blending:

This process not majorly used in short-staple spinning mills. Two different rovings are fed to ring spinning machine, here fibers do not blend with drafting, but the yarn is twisted with one or another component.

Fiber Blending Systems:

1.Stack blending;
2.Batch blending;
3.Sliver blending

1. Stack Blending:

In this method the blend components from the bale or bale breakers (pre opened) are weighed and laid down in alternate layers. This stack which is laid horizontally is then withdrawn vertically for feeding.

2. Batch Blending:

Fiber batch blending of up to three lots is allowed as long as there is traceability of each fiber batch and the lots are randomly distributed.

3. Sliver Blending:

For the most part, blending of natural and man-made fibers is still carried out in sliver form on the **drawframe**. This provides the best blend in the longitudinal direction. Up to the **draw frame**, each raw material can be processed separately on the machines best suited to it.

Uses of blended fabric:

1. **Polyester/Cotton** – The tough crease-resistance of polyester combines with the cool comfort of cotton. It is easily laundered, dries quickly and is ironed with lower temperature than pure cotton.
2. **Nylon/Wool** – The blending of nylon with wool makes the fabric more absorbent and softer. It becomes more strong and durable.
3. **Nylon/Acetate** – This combination makes the fabric more absorbent than nylon alone.
4. **Ramie/Polyester or Ramie/Acrylic** – These two blends help the fabric to be easily taken care of and it is less stiff than pure ramie fabrics.

5. **Wool/Cotton** – These two fabrics benefit from the inherent qualities of each other after blending. It gives better comfort, better aesthetics and better performance.
6. **Linen/Silk or Linen/Rayon** – This blend helps the fabric to retain the characteristics of linen and makes the fabric drape better and wrinkleless.
7. **Silk/Wool** – The blending of silk with wool provides subtle texture to the fabric. It is generally used for ties.
8. **Rayon/Cotton** – This fabric of rayon and cotton blend wears well and is washable. It is soft and has fuzzy surface. Dresses, suits, sportswear, men's shirts, etc. are made out of this fabric.
9. **Wool/Synthetics or Rayon/Synthetics** – This blend has a very clear finish and i t d rapes better and tailors easily. I t h as exceptional wearing qualities. The fabric is used for men's and women's suits and coats. Ski slacks are also made out of these blends.
10. **Cotton/Polyester** – The quality of polyester helps cotton to give a permanent press property. It is extremely soft, resists wrinkling and is easy t o c are f or. This fabric is widely used a s men's dress shirts and christening apparel.

Most popular fiber blending percentages:

- 60% wool / 40% polyester
- 55% polyester / 45% wool
- 75% polyester / 25% wool
- 60% polyester / 20% wool / 20% linen

General consideration for preparation of cotton mixing

1. Economy:

Blending and mixing influences the reduction of the final product through blend composition, availability of fiber quality and inherent fiber properly variations.

2. Processing performances:

It helps in processing of the below processes:

- **Carding:**Mixing and blending influences the process performances of carding through control of nep level variation, waste level variation, fly, roving twist variation, machine adjustment and static electricity formation.
- **Spinning:**
  Mixing and blending influences the processing performances of spinning through control of yarn twist variation, machine adjustment and end breakage etc.
- **Warping and weaving:** Mixing and blending influences the processing performance of warping and weaving through control of end breakage and machine adjustment etc.
- **Dyeing and finishing:**It influences the behaviors of dyeing and finishing through control of shrinkage variation and dye effects etc.
- **Functional properties:**It influences the below properties:
  a. Physical properties:

- It influences to increase textile and tear strength, abrasion resistance, elasticity and strength etc.

b. Aesthetic properties:

- It influences to increase lusture, cover, appearance and color etc.

c. Subjective properties:

- It increases comfort and the characteristics like abrasion resistance, handling and stretch etc.

Q.Mention the object of Blowroom.

Ans:

1. To open the fibres.
2. To clean the fibres.
3. To produce sheet of lap for facilating the feed to the next process.

Q. Discuss the operations are operated in Blow room.

Ans :

1. Opening :

a. To open the compressed bales of fibres &

b. To make the cotton tuft a small size as far as possible.

2. Cleaning : To remove the dirt, dust, broken seeds, broken leafs, stalks & other foreign materials from the fibres.

3. Blending or Mixing : To make good value of yarn & to decrease the production cost by mixing different grade of fibres.

4. Lap forming :

a. To transfer the opened and cleaned fibres into a sheet form of definite width & uniform unit length which is called lap.

b. To roll the lap of predetermined length in a cylindrical shape around a lap pin.

c. To transfer the lap from the lap pin to a rod to suitable handle & feed it to subsequence processing carding m/c.

Q. Discuss about the Action in Blow room.

Ans :

The actions of the m/c in any blow room range fall into one or more of four main groups namely :

1. Action of opposite spike : (Opening)

The action of opposite spikes is opening the cotton fibre. By this action, the large pieces of cottons have been reduced in size.

2. Action of Air current : (Transfer + cleaning)

During processing, the movement of cotton from m/cs to m/c is done by air current. It is also helps the separation of lint & trash.

3. Action of Beaters : (Cleaning & opening)

Beaters are responsible for removing almost all of the impurity extracted in the blow room. Beater also helps in opening of cotton fibre.

4. Action of regulation motion : (Uniform output)

The action of regulation motion gives the uniform output of cotton fibre by the help of swing door & swing paddle.

- Electrical photocell.
- Air pressure system.

Q.What are the function of Blow room?

Ans :
(a) Feeding,
(b) Beating/opening
(c) Transporting/transferring,
(d) Lap sheet formation.

Q. Mention the m/cs are used for opening in Blow room.

Ans :
Conventional bale opener –
(a) Multiple Bale opener
(b) Automatic Bale opener (Blandomat)
(c) Unifloc

Q.What are beating or cleaning points in Blow room?

Ans:
(a)Ultracleaner/stepcleaner/supercleaner.
(b)Axiflowcleaner.
(c)Sawtoothedbeater.
(d)Bladedbeater.
(e)Porcupinebeater.
(f)Monocylinder.
(g)Multimixer.
(h)Krischnerbeater.
(i)Twinopener.
(j)Verticalopener.
(k)E.R.M.cleaner

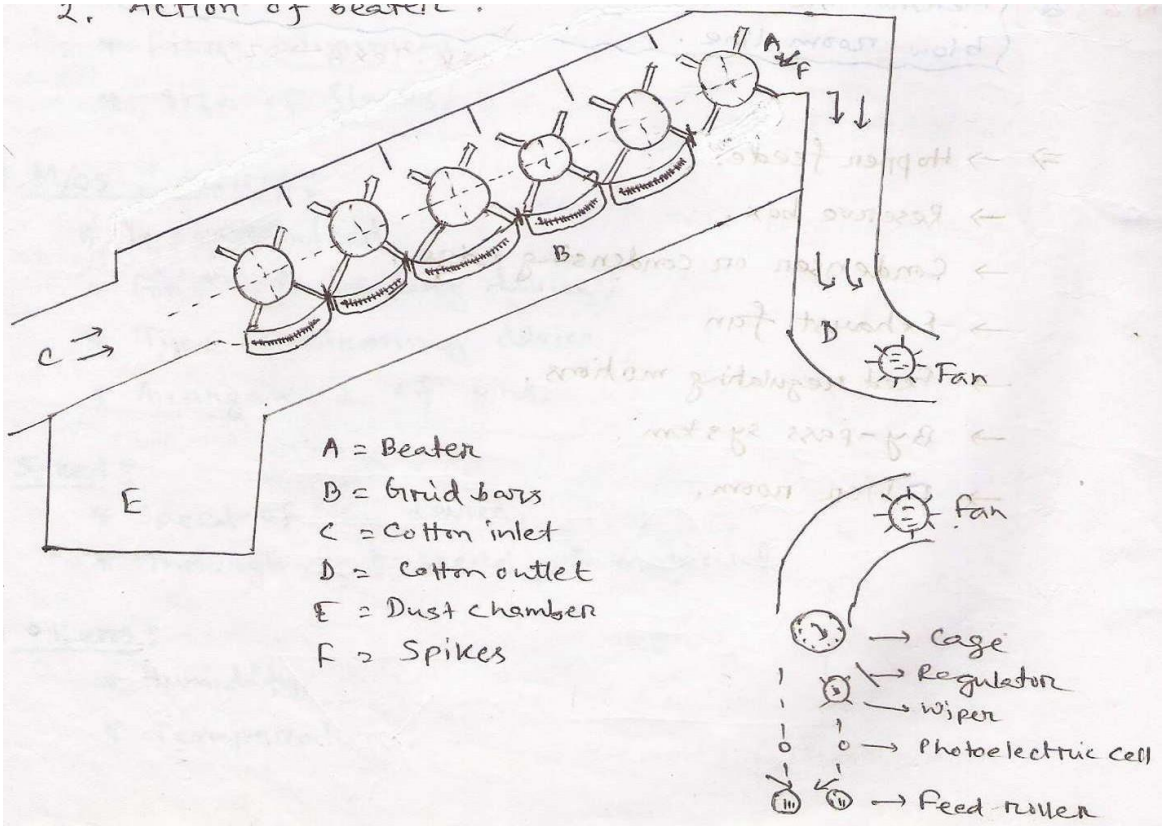
Q. Write down the working principle of Ultra cleaner or step cleaner or super cleaner m/c for a modern blow room with near sketch.

Ans :
Objects :

- To open & clean cotton tuft by opposite spikes & beating action.
- To remove heavy impurities such as leaves, sand without damaging the fibre.
- To make/convert the cotton tuft to small size of cotton fiber.
- To clean the cotton suitable for processing to the next m/c.

Basic function :
Opening and cleaning are lead by the following two actions-

1. Action of opposite spikes.
2. Action of Beater.



Working Principle :

- The cotton or mtls falls into the feed hopper.
- Passes to the first beater.
- Then it is transported upwards by the six beater rollers, each carrying profiled bars & the beaters are arranged on a line inclined upwarf at 45^0.
- The trashes are extracted by the help of opposite spike & bearing function extracts the trashes & falls into the chamber through grid bars hole.
- Cotton tuft open & make small sixe tuft with beating action.
- A buckle is in the middle of per two beaters & it control flow of material.

M/c parameter :

1. Super cleaning.
2. Cleaning efficiency 80%.
3. Mtls transport through air current.
4. No. of beater is 6 (normally).
5. Beater speed 650-500 rpm.
6. Cleaning ability is high.
7. Application for all grades of cotton.

Q. Write a short note on Porcupine Beater.

Ans :

Function :

- Good opening beater.
- Considered most suitable for long staple cotton.
- The striker are arranged at different angles to cover the total width of the m/c in one revolution of the beater.

(h) Q. What do you mean by Major & Minor beating point?

Ans:

When we use a beater to clean fibre then it is called major beating point. e.g. Step cleaner, Porcupine beater, Krischner beater etc.

But when we use a beater to open the fibre, but some cleaning is occurred then it is called minor beating. e.g. Bale plucker, Bale opener, Saw toothed beater, condenser etc.

Q.Statethe Blow room linefor low grade cotton.

Ans:

Balebreaker
↓
Conveyorbelt
↓
Hopperfeeder
↓
Porcupineopener
↓
Double crighton opener
↓
Fan
↓
Hopper feeder
↓
Porcupine beater (2 no.)
↓
Three bladed beater
↓
Mouth piece

↓

Two way distribution

↓

Condenser

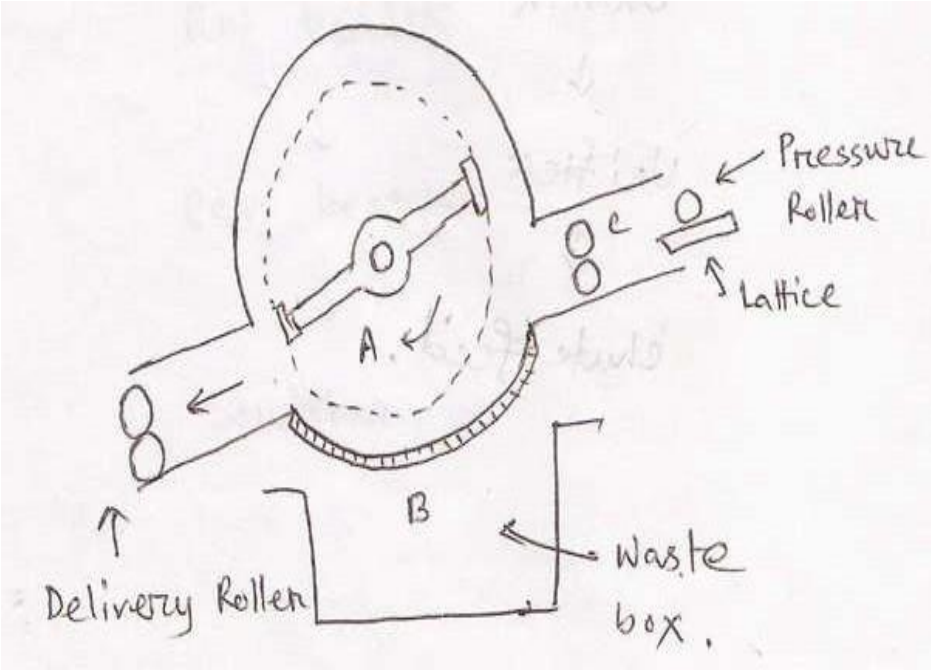
↓

Hopper feeder with reserve box

↓

Scutcher

Q.Write a note on Two bladed beater.

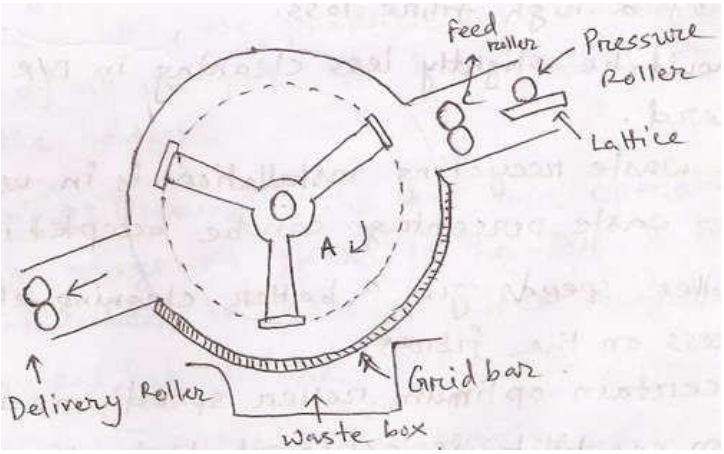


A=Twobladedbeater.B= Gridbar.

C=FeedRoller.

- Two blades are arranged in both sides and equal distance of shaft.
- Cotton tuft are passed through feed roller.
- Then the beater rotate several times until the cotton tufts are not made into small tufts or individual fibre.
- Then it is delivered to the next m/c through delivery roller.
- The seeds or trash are stored in waste box through Grid bar.
- Revolution per minute 800-850.
- To clean broken seeds or heavy impurities of fibre.

Q.Write a note onThree bladed beater.



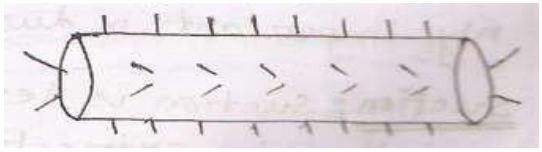
A= Threebladed beater.

- Similar to two bladed beater.
- Three blades are arranged in both sides and equal distance of shaft.
- It is more effective than two bladed beater.
- Cotton fibre are passed through feed roller.
- The beater rotate several times until the cotton fibre are not made into small tufts or individual fibre.
- Then it is delivered to the next m/c through delivery roller.
- The seeds or trash are stored in waste box through Grid bar.
- Revolution per minute is 850-940.

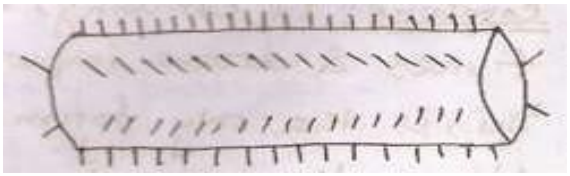
Q. Write down the type, appearance & description of opening devices.

Ans :

1. **Type;** Roller.
   Appearance:
   Description: Small diameter, widely used. e.g. in step cleaner.

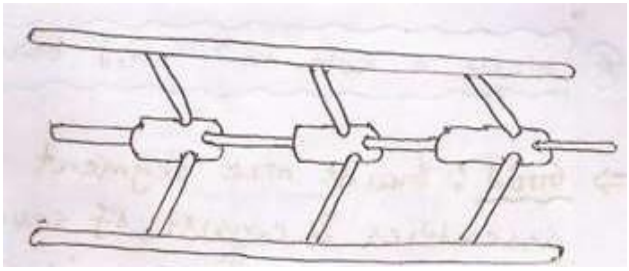


2. **Type;** Drum.
   Appearance:
   Description: Large diameter, little used. e.g. in monocylinder cleaner.



3. **Type;** Quilled shaft.
   Appearance:
   Description: Shaft with many long beater rods hardly used.

4. **Type;** Multiple bladed beater.
   Appearance:
   Description: Two, three or more arms . Now used mostly only in krishner beater.



5. **Type;** Carding bars/plates.
   Appearance:
   Description: This devices associated with the carding drums of the card.

6. **Type;** Spiked lattice.
   Appearance:
   Description: Endless belts with transverse woden or plastic bars in which needles are set, gives very gentle opening.

7. **Type;** Pluckers.
   Appearance:
   Description: In the trutzchler bale plucker & the Inglostradt blending grab.

Q. What is SCI & BIAS?

Ans :

SCI: SCI means spg^{n} consistency index.

BIAS: BIAS means Bale Inventory Analysis system.

Q. State the Major & Minor beating/cleaning points.

Ans :

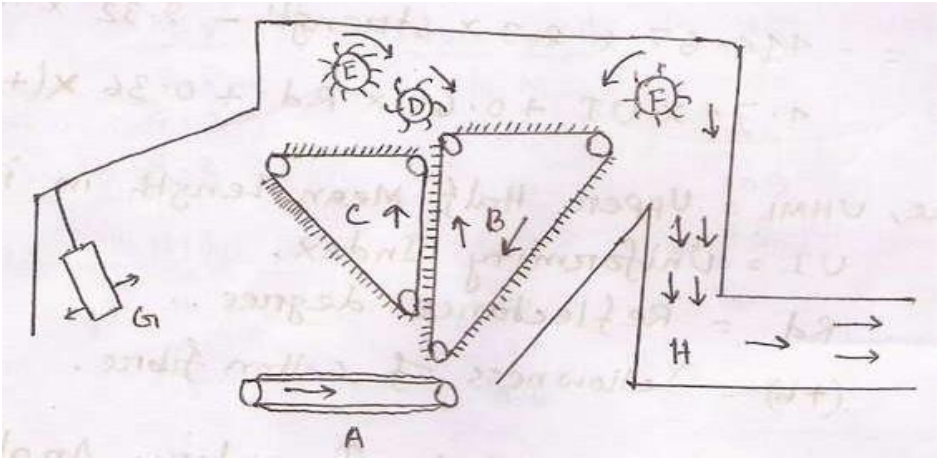
Major cleaning points:

1. Step cleaner.
2. Porcupine beater.
3. Monocylinder.
4. Axi-flow cleaner.
5. Krishner beater.
6. Bladed beater.
7. ERM cleaner etc.

Minor cleaning points:

1. Bale plucker.
2. Bale opener.
3. Saw toothed beater.
4. De-dusting elements.
5. Condenser etc.

Q. Describe a Bale opener/breaker m.c with near sketch.



Here,

A = Feed lattice/Bottom lattice.
B = Vertical/inclined lattice.
C = Evener lattice.
D = Evener roller.
E = Wiper roller.
F = Delivery roller.
G = Swing door/Regulating plate.
H = Air + Mtl flow.

Objects:

1. To open the big jumps of cotton/feed mtls.
2. To faciliate the feeding of mtls to the next m/c.
3. To carry the mtls from one m/c to next m/c.

Actions:

1. Action of spike lattice.
2. Action of air current.

Working Principle: Bale opener/Bale breaker is equipped with bottom lattice, inclined spike lattice, evener roller, wipper roller of suction system. Laying of mtl on the feed table is performed manually or by a bale opening m/c. The bottom lattice pushes the fibre mass towards the inclined lattice. Inclined lattice carry cotton with its spike towards the evener roller for facilitating the feeding. If these cotton lumps are sufficiently opened, they pass between the inclined lattice & the evener roller. However, most lumps are too large to pass through the space between the two units. They are thrown back into the blending hopper by the evener roller & from the hopper they pass once more into the operating region of the two assemblies. Each time they become smaller until finally they can pass through to the next unit. Here evener roller as its name implies it control the amount of passage of cotton by opposite spike action. Wiper roller wipes the cotton to the surface of evener roller. Suction fan to the filter room collect the dust & dirt through pipeling. Blower fans are also activated for transferring the open cotton suitable for next m/c. This operation continue until m/c stoppage. Production rate & degree of opening are determined by the speed of operation of the inclined lattice & its spacing from the evener roller.

Q. Which m/cs are used for coarse & fine cleaning.

Ans :

For coarse cleaning:

1. Step cleaner/Ultra cleaner/Super cleaner.
2. The dual roller cleaner/Axiflow cleaner.
3. The monocylinder cleaner.

For Fine cleaning:

1. RN cleaner.
2. E.R. cleaner.

Q. Describe efficient Raw Mtl (ERM) cleaner for fine cotton.

Here,

A = Fan

B = Mtl filling chute.

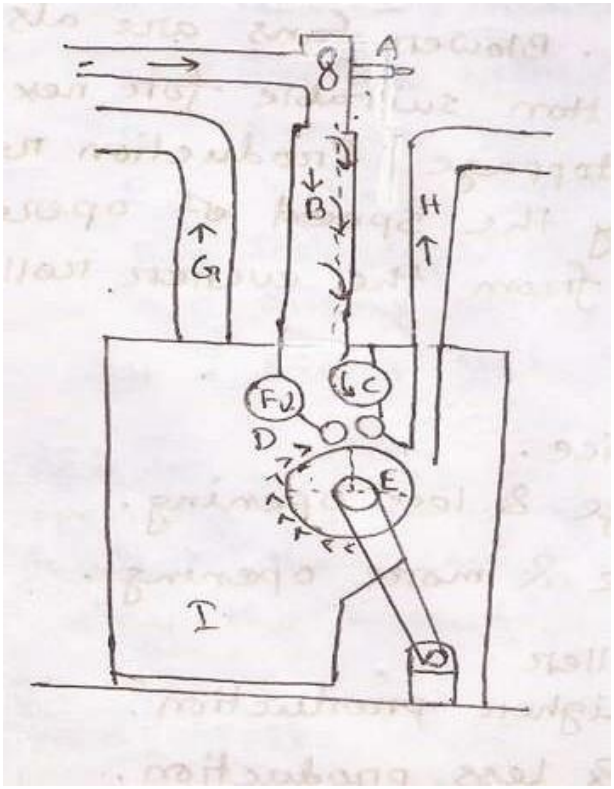
C = Condensing roller/ Perforated roller/ Filterdrum.

D = Feed roller.

E = Cleaning beater/roller.F = Blind drum.

G = Excess air flow/duct.H = Mtl outlet

I = Waste box.



Objects:

1. To open the fibres to a small tuft.
2. To beat the mtls finally.
3. To separate teh mtls from fine dust & trash..

Basic actions:

1. Action of beater/roller.
2. Action of grid bars.

Working principle: A fan (A) draws the flocks by suction from the preceding m/c & ejects them into a filling chute (B). The rear wall of the chute consists of individual aluminium lamellae with slot-openings through which the air escape. The raw mtl remains in the chute, is condensed & is fed to the opening roller by means of perforated roller (C) & blind drum (F) & the feed roller pair (D). The opening roller is exchangeable & can be fitted with bladed discs or a saw toothed clothing. The grid arranged under the roller consists of eight blades. After the grid, the flocks are removed by suction. The transport air of the fan (A) escapes via the slotted chute, filter drums & ducts (G).

M/c parameters:

working width → 100mm.

Beater diameter → 400mm

Speed → 1000r.p.m.

Output → Max^{m} 500kg/hr.

Q. Describe the mono cylinder cleaner of Reiter for low quality cotton with near sketch.

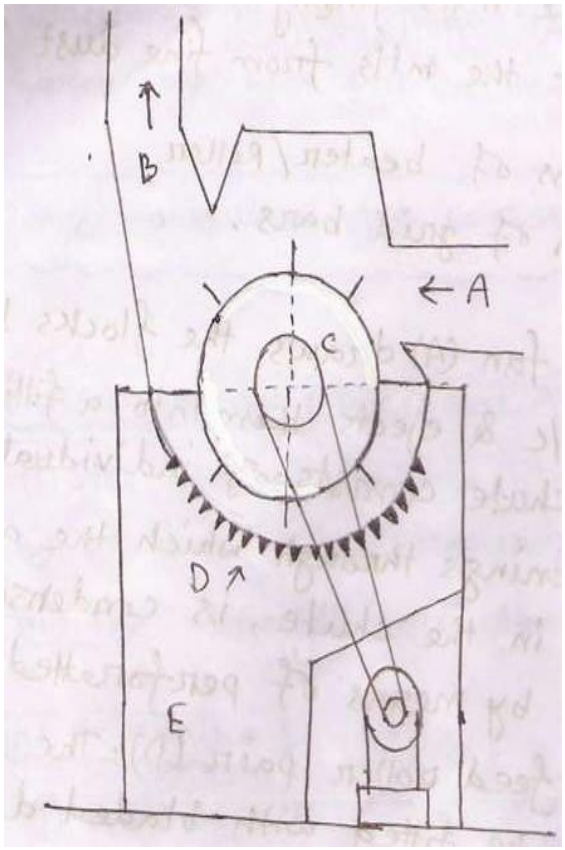
Ans :

This is a loose feeding pin opener. Monocylinder cleaner is employed in the blowing room process between the mixing bale opener & Automixer. The advantage of this opener is that the impurities are separated without being crushed.

Objects:

1. To separate the impurities from cotton flocks without being crushed.
2. To give the cotton flocks a strong cleaning.

Working principle: The cotton tuft is well opened by the bale openers & enter the m/c at right angle to the cylinder axis. The m/c operates in a similar manner to the dual roller cleaner but has only one drum/cylinder/roller. The mtl enters m/c at one side & streams through to the other side. In order to prevent flocks being drawn straight through the m/c, the large hood is divided into three chambers by guide plates. This causes the flocks to fall back into the region of the beater drum after being hurled out by the roller. In this way, i.e. is to pass three times over the grid, this gives a strong cleaning effect. The grid is in two parts & these are separately adjusted.



Here,

A = Entry pipe
B = Exit pipeC
= spike roller

C = spike roller

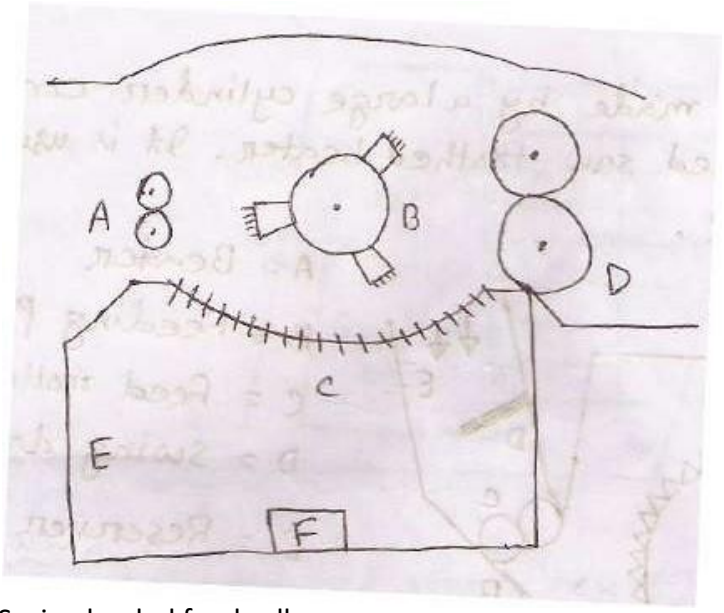
D = Adjustable grid
E = Waste chamber.

M/c parameters:

a) No. of beater drum → One.
b) Diameter of drum with spikes → 700mm.
c) Production → 500-800 kg/hr.
d) Speed → 700r.p.m.

Width of the m/c → 1500mm

Q. Describe the working principle of Krishner beater.



A = Spring loaded feed roller.

B = Beater.

C = Grid bar.

D = Condensing cage.E = Trash chamber.

F = Flap.

Object:

1. To open the fibres lumps to individual state as much as possible.
2. To clean the cotton/fibres with fine action.

Basic Action:

1. Action of bear (High speed beating).
2. Action of fan.

Working Principle:

Raw mtls are feed to the Krischner beater through shed feed system & flutted feed rollers. Beaters high speed causing the lumps of mtls to little and separate the trash finally. With the action of suction fan, mtls are carried to next m/c and separated trash, dusts falls to the dust chamber through grid bars. It is the m/c applicable

equally for processing all sorts of raw mtls irrespevtive of natural artificial fibres. Setting between beater to grid bars & speed of the beater govern the trash removal percent.

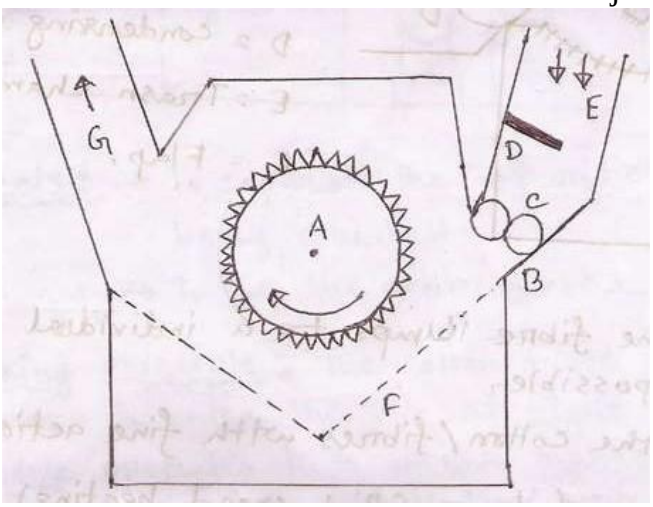
M/c parameters:

1. Working width: 1200mm.
2. Beater diameter: 406 mm.
3. Speed of beater: 820rpm.

Q. Describe Saw-toothed beater with near sketch.

Ans :

The beater which is made by a large cylinder contains tooth like saw tooth is called saw-toothed beater. It is used as a major cleaning point in B/R.



A = Beater.

B = Feeding plate.
C = Feed roller.

D = Swing door.
E = Reserver

F = Delivery case.
G = Delivery end.

Object:

1. To open the fibres from the cotton tuft.
2. To separate the fibres and
3. To remove the trash from the cotton.

Working Process:

Cotton fibres are collected in the reserve box from the previous m/c which are feeded equally by the feed roller in the m/c. Cotton fibres comes in touch of saw toothed roller, strikes the cotton fibre. Saw toothed beater push the cotton to the case, where it is passing between saw-toothed beater & the case, so the fibres have been extracted & the wastage are fall below the undercase. Cotton fibre cleaned by this m/c are delivered to the next m/c by air flow.

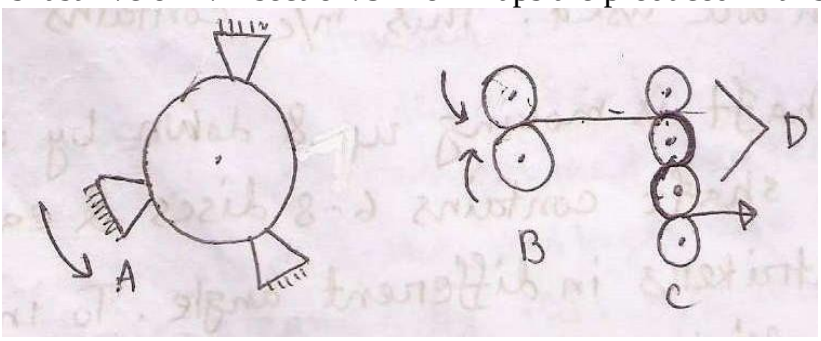
Uses:

1. To process lower graded cotton fibre.
2. To remove the impurities from highly trash cotton.

Q. Describe Scutcher or Lap former m/c.

Ans :

Scutcher: Scutcher is an unit to form lap sheet from the open & clean raw mtls to facilitate the feeding to the next processing i.e. in carding. On the other hand, it is also known as lap former unit. But scutcher does not work individually. It works in conjunction with other beater say, K.B, B.B with condenser etc. Scutcher is designed with some steel polished rollers fabricated one over another. They creates certain pressure to the mtl processed & form a sheet of definite density depending on the raw mtl characteristics. The rollers are known as calender rollers from which bottom can lender roller is responsible for delivery i. e. production. It is last m/c of B/R section.Uniform laps are produced in this m/c.



A = Krischner beater.
B = Condensing cage
C = Bottom calender roller.
D = Calender roller.

Object :

1. To produce even lap of predetermined length & width.
2. Finally individualization of fibre or small tuft.
3. To remove impurities.
4. To wrap the lap on lap pin.

Basic function : Beating action.

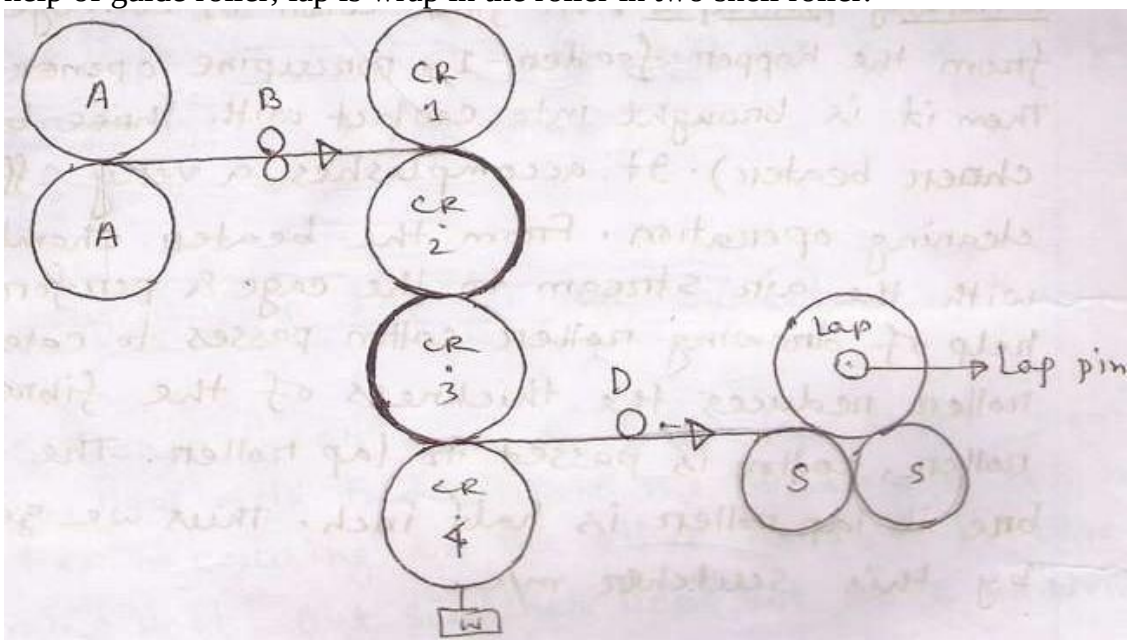
Working Principle : At first cotton is conveyed by a feed lattice from the hopper feeder-1, porcupine opener &hopper feeder-2. Then it is brought into contact with three bladed beater (Krichner beater). It accomplishes a very effective opening & cleaning operation. From the beater chamber cotton passes with the air steam to the cage & perforated cage. By the help of drawing roller cotton passes to calender roller. Calender roller reduces the thickness of the fibre. From the calender roller, cotton is passed to lap roller. The thickness of the fibre in lap roller is half inch. Thus we get cotton in lap form by this scutcher m/c.

Parameters :

Bottom calender roller ida → 9”
Working width → 40” [Exact to the woeking width of carding engine].
RPM of callender roller → 7-12
Lap weight → 35/40/50/60 lbs etc.
Lap length → 40/50 yds etc.

Changeable matter → D.C.P (Draft change pinion)
→ Lap length wheel.

Lap formation : In scutcher m/c, cotton which are coming from beater are collected in case A & collected cottons are likely pressed by a calender rollers. In conventional m/c, Calender rollers are pressed by backet, weight & liver. But in modern m/c they are kept heavily weighted by air or pneumatic action. Cotton passed through the top & 2nd roller, then 3rd & Bottom Calender roller. Then by the help of guide roller, lap is wrap in the roller in two shell roller.



Here, A = cage, D = Dead preasure.
B = flutted delivery roller S =Shell roller
C.R = Calender roller W = weight.

Q. Write down some devices which are used in feed regulation motion.

Ans : The following devices are used in feed regulation motion. these are used for controlling feed mtl –

Swing paddle : Swing paddle is used in Bale process.

Swing door : It is used in Hopper feeder & acts as feed regulating.

Paddle lever : It is used in porcupine beater for feed regulating

Piano feed regulator : It is used in scutcher for feed regulating.

Q. Write down a note on 'Regulating Motion'

Ans:

Regulating motion: Regulating action is responsible for maintaining a constant flow of cotton through each m/c & controlling over the regularity of the mtl

throughout the whole process.
The correct amount of cotton in the reserve box may be maintained by using –

1. Swing door.
2. Photoelectric cell.
3. Measuring pressure.
4. Piano feed regulating system.
5. Reserve box.
6. Micro switch.

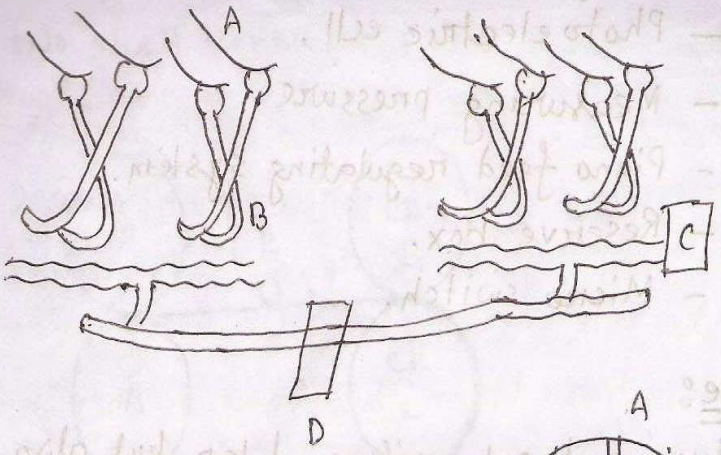
Importance:

1. To produce not only uniformed lap but also uniformed sliver.
2. This motion is important in the B/R in order to maintain a constant flow of cotton.
3. For uniform feeding.
4. To remove dust, dirt & short fibres as req^{d}, this motion needed.
5. To maintain the desired characteristics of lap.
6. To get optimum efficiency of m/c in the B/R.

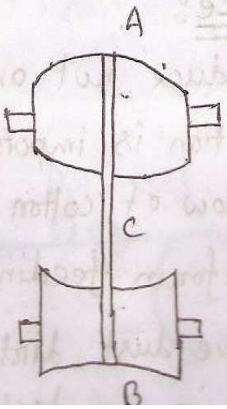
Q. Describe about regulation action present in B/R.

Ans:
The following regulating action is present in modern B/R.
1. By photoelectric cell: Here the light source & photocell are filted opposite a window in each side of the m/c so that the light passes through on to the m/c. While filling the cotton if the light is broken between light source & photo-cell, the feed of cotton is stopped until cotton again moves away from the light source.
2. By piano feed regulating system:
Object:

1. To feed the layer/wave of fibre uniformly to switcher.
2. To control feed by decreasing the speed of feed roller in case of thick places of cotton & by increasing the thin place.
3. To produce uniform lap.



A = Paddle lever
B = link
C = Regulating box
D = Weight.



A = Top cone drum
B = Bottom " "
C = Belt

Principle: The pedal movement caused by the thick & thin places of cotton is employed to shift the belt in the cone drums by means of lever to alter the speed of the feed roller in order to keep the feed contains per unit time.

3. By air pressure: When air & cotton are fed, air is sucked by another portion, this air pressure is measured by sensor & is used to determine the amount of cotton present in the hoppers. If pressure is more, it stops feeding & if pressure is less, it allows more cotton to enter.

4.By swing door: The swing door is used forthe uniform feeding of cotton to spiked lattice.

Q. Write the causes of lap wt. variation.

Ans :

1. Unsuitable feeding :

a) Irregular feeding of fibres to the feed lattice by the feeders in the bale opener.

b) Feed of very large piece of baled cotton.

2. Characteristics of fibre in blending :

a) If the blend contains improper mixing of fibre it may be varying fineness.

b) If there are immature fibres in the blend, irregular lap are produced.

c) If there are weak & short fibres, produce irregular lap.

3. Incorrect setting of different m/c parts :

i) **Mechanical swing door or photoelectric cell :** Lap variation will produce due to setting faults in this instrument.

ii) **Setting of evener roller :** If this setting is incorrect, the opening regularity of flow of fibre & rate of production of the m/c is affected with causes lap irregularity.

iii) **Piano or cone drum regulating arrangement :** If this system does not work effectively, causes lap variation.

4. Improper maintenance of the machinery : Due to not well maintained proper opening, beating, cleaning, disposal of dust, control of air current, fan speed etc leads to lap variation.

5. Excessive waste content in lap.

6. Incorrect fan speed : If fan speed is too slow, the fibres move on the cages. on the other hand, if the fan speed/air flow is too strong, the cotton is drawn downwards the centre of the cages & will give a barrel shaped lap.

Q. Discuss the defects & their remedies of lap due to faulty setting of m/cs in B/R.

Ans :

1. Uneven lap : Patchy, sticky, thick & thin places in lap.

Causes : i. Uneven feed of mtl.

ii. Faulty regulating motion.

iii. Improper m/c maintenance.

Remedies : i. To ensure even feed of mtl.

ii. Correct bale opening.

iii. Proper m/x maintenance.

2. Irregular lap : Lap should be definite shape, length & wt/unit length. If the lap is less than the required length them then it is called Irregular lap.

Causes : i. Uneven feed of fibre to feed lattice.

ii) Presence of weak, small & immature fibres in fibres during mixing.

iii) Faulty regulating motion, cage, swing door.

iv) Improper m/c maintainance.

3. Soft lap : If the lap is less compact, it is called soft lap.

Causes : i. Low pressure of calender roller.

ii. Less relative humidity.

iii. More trash content of fibre.

Remedies : i. Presence of calender roller should be controlled.

ii. Relative humidity should be controlled.

iii. Cleaning should be correct.

4. Conical lap : If the width of lap increases or decreases with respect to its initial width, the lap is called conical lap.

Causes : i. Air suction varies due to fan speed variation. So, uneven drawn of mtl at both sides of cage.

ii. Pressure variation at both sides of calender roller.

iii. Dirt drain in one side of cage.

iv. More air inlet at one side.

Remedies : i. To ensure proper air flow.

ii. Calender roller pressure must be controlled.

iii. After a certain time, cage must be cleaned.

5. Barrel shaped lap : If the thickness of lap in middle is more than that of at the border sides it is called Barrel shaped lap.

Causes : i. More air suction in the middle position of the cage due to excessive fan speed & so more fibre is drawn in the middle position of cage.

ii) Due to accumulation of dirt at both sides of the cage.

Remedies : i) Fan speed should be controlled.

ii) After certain time, cage must be cleaned.

6. Licking lap : Not uniform all over the lap area.

Causes : i) Low pressure of calender roller.

ii) Excessive fan speed.

iii) Improper roller motion setting.

iv) Low opening of cotton.

Remedies : i) Proper fan speed

ii) Proper pressure of calender roller.

ii) Proper opening of cotton.

7. Defective selvedge : Both sides of lap are uneven.

Causes : i) Waste accumulation at m/c sides

ii) Waste accumulation at grid bars & cage sides

iii) Broken gear teeth or m/c parts.

iv) Faulty cage & faulty surface of lattice.

Remedies : Proper maintenance of cage & lattice.

8. Split lap ; The cotton splits into sheet like a sandwich when unrolling at the card

Causes : i) Low pressure of calender roller.

ii) Low temp in B/R section.

iii) Variation of surface speed of top & bottom cage.

Remedies : i) Proper pressure of Calender roller.

ii) Proper temp in B/R.

9. Dirty lap :

Causes : i) Insufficient dirt removal.

ii) Dirty m/c due to improper maintenance.

Q. A lap contains 2% trash after processed in B/R having the cleaning efficiency of 80%. Find the trash % in raw cotton.

Ans :

We know,

$$\text{Cleaning efficiency} = \frac{\text{Trash remains after processing}}{\text{Total trash}}$$

$$\Rightarrow 80 = \frac{2\%}{\text{Total Trash}}$$

$$\Rightarrow \text{Total Trash} = \Rightarrow \text{Total Trash} = 2.5\%.\text{(Ans.)}$$

Q. Bottom calender roller dia = 7 inch, rpm = 10 & wt. of every yds lapis 12 oz and cleaning

efficiency 75%. Find out the production of B/R per hour

Ans :

$$\text{Production/hr of B/R} = \frac{3.14 \times 7 \times 10 \times 60 \times 75 \times 12}{36 \times 16 \times 100} \text{lb}$$

$$= 206.06\text{(Ans.)}$$

Q. Find the no. of lap per hour in scutcher m/c of Bottom calender roller dia = 7 inch, rpm = 12, efficiency 80%. Lap length 40 yds.

Ans :

$$\text{Production of m/c} = \frac{\pi \times 7 \times 12 \times 80 \times 60}{36 \times 100} \text{yds}$$

$$= 351.85 \text{ yds.}$$

$$\text{No. of lap} = \frac{351.85}{40} = 8.79 \approx 9 \text{ (Ans.)}$$

Q. Find the no. of lap per hour in scutcher m/c of Bottom calender roller dia = 7 inch, rpm = 12, efficiency 80%, lap wt. 14 oz/yds.

$$\text{Production} = \frac{3.14 \times 7 \times 12 \times 0.80 \times 60 \times 8 \times 14}{36 \times 16} \text{lbs}$$

$$= 2461.76 \text{ lbs}$$

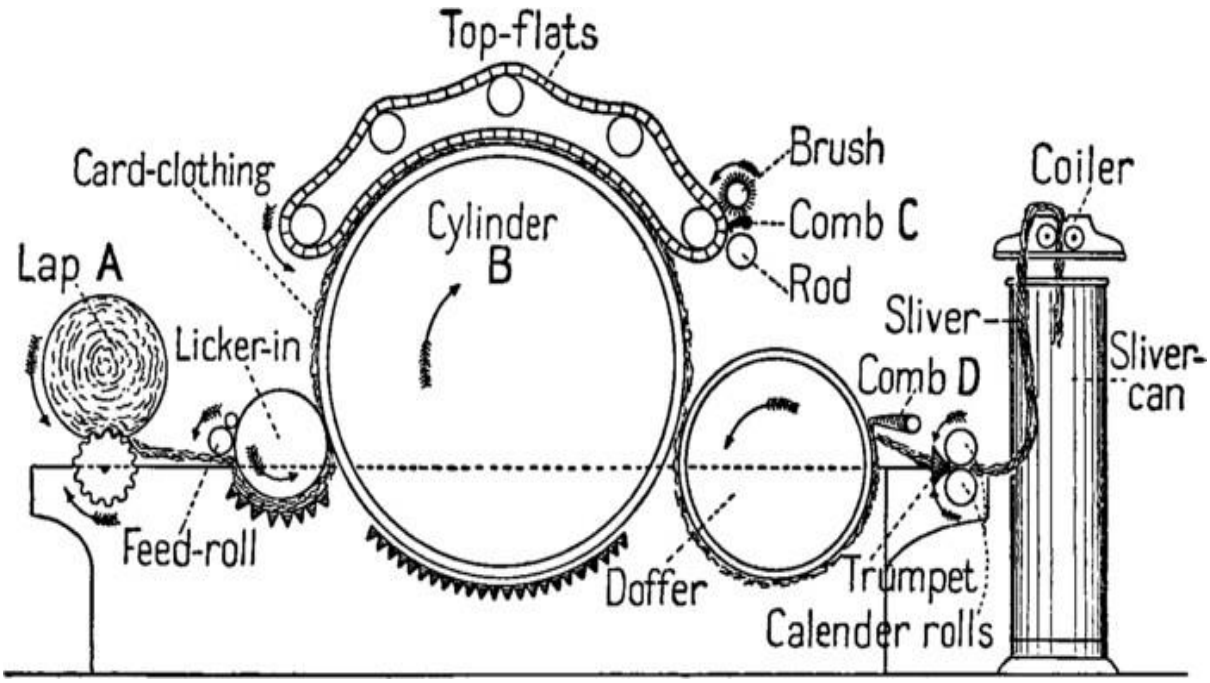
$$= \frac{2461.76}{2204} \text{metric ton}$$

$$= 1.117 \text{ metric ton. (Ans)}$$

Functions of Carding Machine:

- To individualise the fibres.
- To remove impurities.
- To clean cotton thoroughly off the 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'.

Sketch of material flow in Carding Machine:



working mechanism of various operations:

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 / OPENING SYSTEM:

Licker-in receives fibres from the feed roll. 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.

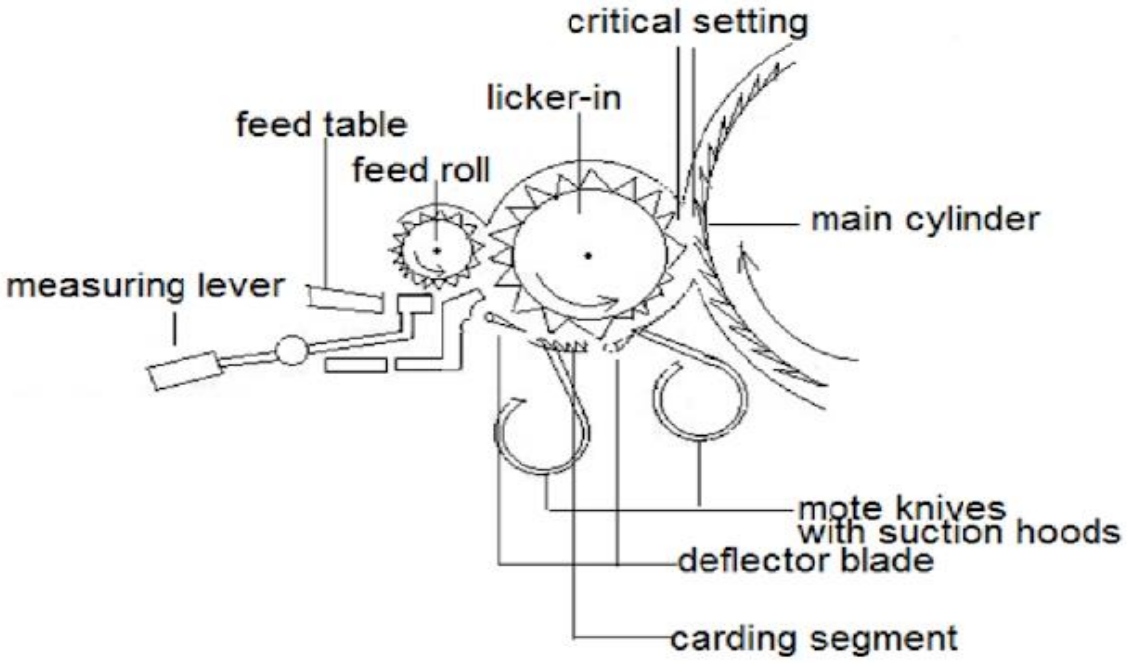
The fed material needs maximum opening and the linear density of the material is reduced up to 3 – 5 grams per metre as per sliver count to be produced. This intense reduction is mainly obtained in the region between the feed roll and the licker-in.

Licker-in has a diameter of 25 centimeters. It rotates at a speed of 700 – 1200 rpm for cotton fibres and 400 – 600 rpm for synthetic fibres.

The licker-in is covered with saw-toothed wire clothing. The draft between licker-in and feed roll is kept around 100. The ratio of surface speed between the licker-in and the feed roll is equal to the draft.

High rotational motion of the licker-in creates centrifugal force. This centrifugal force tries to eject the heavy trash particles, and seed coats fragment out at the mote knives with the assistance of air draft.

The licker-in eliminates about half of all trashes present in the cotton fibres.



Cylinder & Flats/ The carding zone:

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.

The opened and cleaned fibres by licker-in get transferred to the main cylinder using stripping action. The cylinder strips the fibres from licker-in.

Now, these fibres begin to travel between cylinder and flats, this area is called **carding zone**.

The surface speed of the main cylinder is kept higher than the licker-in to perform fibre removal by the main cylinder from the licker-in.

The surface speed of the licker-in varies between 700 – 950 metres per minute. The surface speed of the cylinder ranges from 1000 metres per minute to 2400 metres per minute.The draft varies between1.5 to 2.5.

The carding action with the cotton tufts takes place between the cylinder and flat region. According to carding principle, carding action takes place when two surfaces have wires inclined in opposite directions and rotating in opposite directions one surface passes other points against the point.

The flats are the bars that are covered with wire clothing. These flats rotate at a very slow speed in the opposite direction of a cylinder rotating at high speed. The speed of the flats varies within the range of 8 – 20 centimetres per minute. Both are closely set to each other.

The Doffing system:

The fibres come out of carding region in the form of a very thin web. The formed web is stripped from the main cylinder by another cylinder called a doffer. It has a diameter of 700 mm. and rotates at up to 96 rpm.

Since doffer rotates at a very low surface speed in comparison to the main cylinder. Thus condensation effect results in the 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.

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Card Auto levelling System:

An auto levelling system controls the variation of linear density of sliver and helps to maintain the uniformity consistently. The main objectives of an auto leveller are given below:

1) To measure and maintain sliver thickness variation on a real-time basis.

2) To alter the machine draft so that a high consistent sliver linear density is continuously produced.

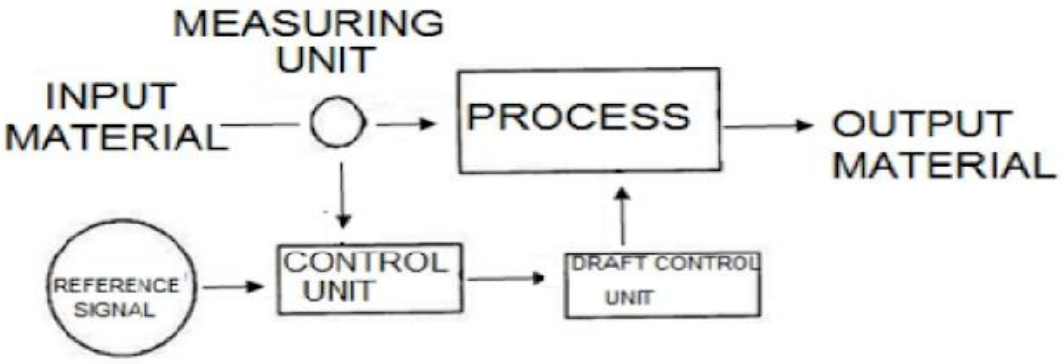
Generally, two types of auto levelling systems are used depending upon the working principle. Which are:

a) Open-loop auto levellers

b) Closed-loop auto levellers.

Open-loop auto levelling system:

The open-loop system is generally used to correct the short-term variations of sliver.

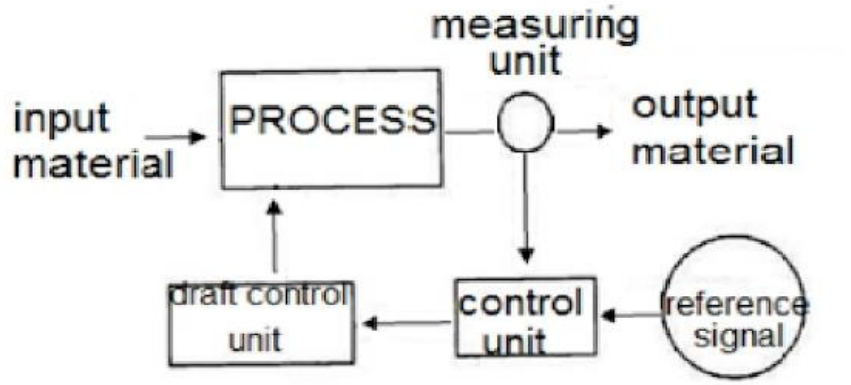


OPEN LOOP AUTO LEVELLING SYSTEM

In the input material the variation of sliver is measured with the help of a measurement unit. A comparison is made by a control unit between the measured signal and the reference signal (normal value). If the control unit finds any difference between them, then it sends a command to the draft control unit. This draft control unit takes necessary action to correct the variation. The open-loop system does not check the delivered sliver. Thus we can say that it makes the correction in the draft when it read a variation in the input material.

Closed loop auto levelling system:

it is generally used to correct long-term variations in linear density of sliver. This system takes the measurements of the delivered sliver. In other words, we can say that the closed-loop auto leveller monitors the results of corrective actions taken by it to maintain the sliver uniformity.



CLOSED LOOP AUTO LEVELLING SYSTEM

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.

Display Panel:

It displays various operating machine parameters like speed, production etc.