SRISAIRAM 6/9/2020

III Semester B.Tech (Textile Tech.) ①

18TX33 - Spinning Technology - I

Module-I

Basics

Classification of Textile Processes

Ginning:- Process of Seperating fibres from Seeds (only for cotton fibre)

Spinning:- Conversion of loose fibres to Yarn.

Weaving: Conversion of Yarn to Fabric

Testing: Yarn and Fabric Properties are tested depending on their end use.

Processing: Dyeing of Yarn and Fabrics (Colouring of Yarn and Fabrics

Knitting: Conversion of Yarn in to Knitted fabrics (Inner garments and T-Shirts)

Garments: Conversion of Two dimensional to 3-dimensional fabrics (Garments ready to wear)

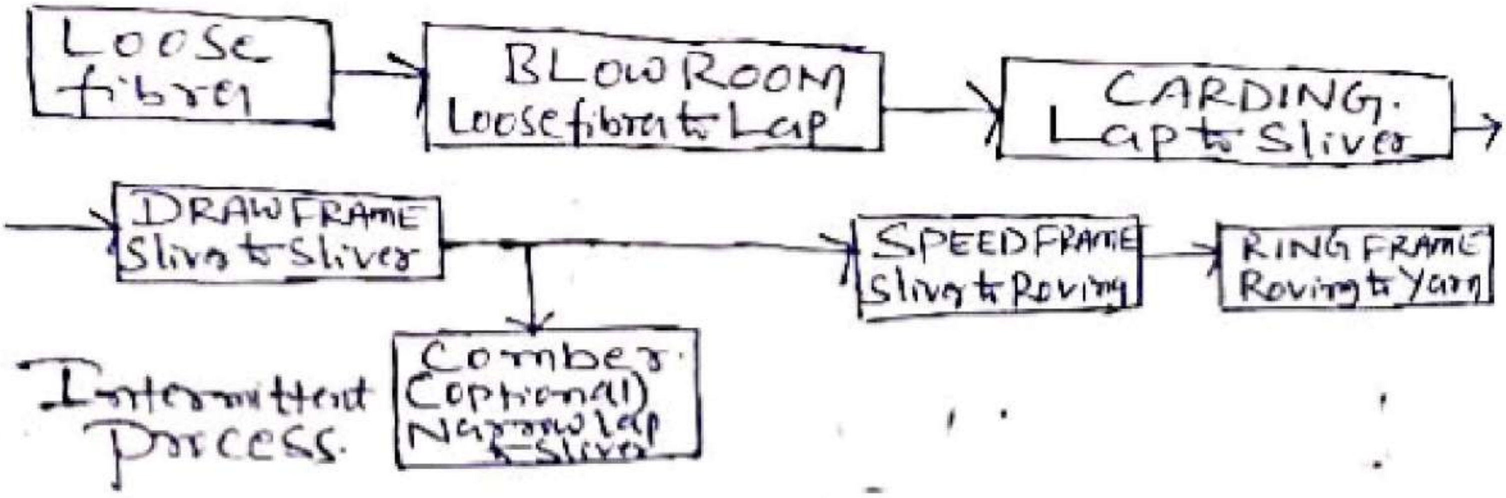
Spinning

Process of Converting Loose fibres to yarn is known as Spinning

Sequence of machinaries used in Spinning during the Conversion of Loose fibre to yarn.

After Ginning

Sequence



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Machine Name	Name of the End produc
BLowRoom	Loose fibres to LAP
Carding.	Lap to Sliver
Draw Frame	Card Sliver to uniform Drawframe Sliver

Comber : - Intermittent process
Converts Narrow lap to Sliver

Speed Frame: Sliver to Roving

Ring Frame: Roving to Yarn

Here end Product of one machine is the feeding material to the next machine.

Ginning Process is Carried out only for Cotton fibres because it has Seed, fibre, and other impurities.

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After the fibres are Seperated from seeds, it is Suited to Process in Blow room.

Cotton is Very good natural fibres and its utility is more because of its inherent Characteristics Such as

- Perspiration – Absorption (Absorb the Sweat and allow air to keep the user Comfertable)
- Dimensional Stability
- Stretch to fit

Cotton fibre is

- an Important Commercial crop
- Foreign exchange Earner
- an Economic Indicator

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Spinning Technology-I

18TX33 Notes

Systems of Numbering.

There are two Systems of Numbering

① Indirect-System

② Direct System.

Indirect System of numbering is used to Communicate locally and to get the work done from local employees.

Direct System of numbering is also named as SI (System International) is used to Communicate the buyers and also to market employees where the product is exported.

We generally use both system in our daily life. We have to understand how this is applied in Textile and Garment Industry

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Indirect System of Numbering

This is local System. In this System

Length is expressed in Yards and Inches

and weight is expressed in Pounds (Lbs) and grains.

With reference to Textiles

Count of Yarn is expressed in

Ne — English Number.

Count is usually defined as number of hanks of 840 Yards weighing 1 lb.

1 Hank = 840 Yards.

1 lea = 120 Yards

Hence 1 Hank = 7 leas

PTO

Example 7/9/20 ②

Let us assume the hank (or) count of Blow room lap is 0.0014 Ne and Card Sliver is 0.14 Ne and Roving is 1.4 Ne and yarn is 14^s Ne

Meaning Lap – 0.0014 Ne means

0.0014 X 840 yards weighs 1 lb.

0.14 X 840 yards weighs 1 lb.

1.4 X 840 yards weighs 1 lb

14 X 840 yards weighs 1 lb.

In all the above cases Length is Variable and weight is Constant

Hence In Indirect System Length is Variable and weight is Constant

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Direct System

This is Global System

Here Length unit is in mm, meter, cm and weight is in gms and Kgs.

Example

Here Hank (or) Count is usually expressed as Linear density. Count is also expressed.

Here the units are Tex and Denier

Let us assume the Count of Roving and Sliver and Yarn is 250Tex, 4K.Tex and 20Tex.

Roving – 250 Tex means –
1000 mts of Roving weighing 250 gms.

Sliver – 4 K.Tex means
1000 mts of Sliver weighing 4 Kgs.

Yarn – ~~14~~ 20Tex means
1000 mts of Yarn weighs 20gms.

Here Length is Constant and weight is Variable

Both systems are required because "Think Globally and Act locally"

Conversion Factors

In order to Solve the Spinning machinary problems (production calculation the units of data should be Same. All data should be in one unit. If it is given in other unit, it has to be Converted to Single unit (System) Hence Conversion Factors are required to Convert from one System to other.

Following are the Conversion Factors used to Convert from direct to Indirect and Indirect to direct Systems.

Conversion Factors

1 mt = 1.1 yards.

1 Yard = 36 inches.

1 ft = 12 inches

∴ 1 Yard = 3 ft.

1 inch = 25.4 mm = 2.54 cm.

1 meter = 100 cm.

1 Km = 1000 mts.

1 Kg = 2.205 lbs.

1 lb = 7000 grains = 453.6 gms = 16 ounces

English Count = $\frac{590.5}{\text{Tex Count or K.Tex Count}}$
(Ne)

English Count = $\frac{5315}{\text{Denier Count}}$
(Ne)

Tex – weight in gms of 1000 mts of Yarn.

Denier – weight in gms of 9000 mts of Yarn.

Using conversion factors, Convert the following

① 0.0012 Ne to K.Tex

② 4 K.Tex to Ne

③ 1.8 Ne to Tex

④ 18 mts/min to yards/min

⑤ 25 yards/min to inches/min

⑥ 400 inches/min to mts/min

⑦ 140 mm/min to inches/min

⑧ 42 pounds to kgs

⑨ 18 kgs to ounces

⑩ 60 grains to grams (gms)

⑪ 5 inches/min to mm/min

⑫ 250 Tex to Ne

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Conversion Factors

Convert the following using Conversion Factors

① 140 mm/min to inches/min ("/min)

② 6 inches/min to ft/min

③ 500"/min to yds/min

④ 18 yds/min to mts/min

⑤ 100 gms to pounds

⑥ 3.5 K-Tex to Ne

⑦ 0.16 Ne to K.Tex

⑧ 2.2 Ne to Tex

⑨ 50 mm to inches (") inch is ~~expressed~~ denoted as "
feet is denoted as '

⑩ 16" to mm.

⑪ 400 gms to ounces (ozs) denoted as ozs

⑫ 10 ounces to pounds (lbs) - denoted as lbs.

GINNING

Ginning is the first mechanical process carried out in Industry and this process is carried out only for cotton fibre.

Process of Seperating fibre from seeds is known as GINNING.

Plucked Cotton from the plant is known as "KAPAS"

KAPAS Consists of 66% Seeds, 33% fibre and 1% trash.

ie For every 100 gms of KAPAS
66 gms - Seed, 33 gms fibre
and 1gm trash. (66+33+01 = 100)

During ginning Seeds are Seperated from fibre. These Seperated fibre are packed in Bales. This packed Cotton contain fibre and trash

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Thease fibra are pacted in Bale. Each bale Contains 180-200kgs of Cotton. This cotton is fed to Blow room and then follows in the Sequence of machinaria to form LAP

12 States in India have been Identified as Cotton growing States. Punjab, Haryana, Rajastan, Tamil Nadu, Karnataka, Andrapradesh, Madhyapradesh, Orissa, Maharastra, Gujaraj, Assam and meghalaya.

About 95 lakh hectares of land are engaged in the Cultivation of Cotton and Provide employment to many people

Impurities present in the cotton

(After Ginning)

Impurities (Trash) present in the Cotton Vary from one Variety to other.

There are many Varieties of Cotton fibres namely Desi Cotton, Jaydar cotton, J-34, Varalakshmi Cotton, Suvin, DCH 32, Shankar-6 etc.

Other Varieties

Indian papular cotton DCH 32

GHIZA cotton - Egypt

T-Swiss cotton - China

PIMA cotton - USA

Impurities present in the cotton are

- Strings of Jute
- Leaves, and feather pieces
- pieces of plastic
- Cut notes
- Stone
- Sand etc

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These impurities Should be extracted in Blow room and Card.

Contaminated Controlled cotton Should be grown.

Trash present in the Cotton Can be determined using Trash Analyser

100 gms of Ginned Cotton Should be fed to the trash analyser. The weight of the delivered material Should be noted.

Difference between these two is Trash percentage

If delivered weight is 92 gms Then Trash is 8% (100 - 92 = 8)

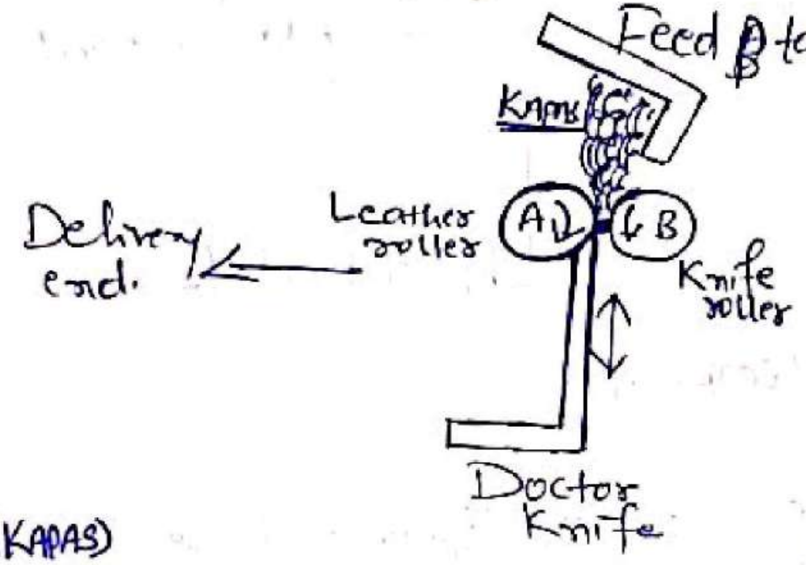
If it is 96 gms Then Trash is 4% (100 - 96 = 4)

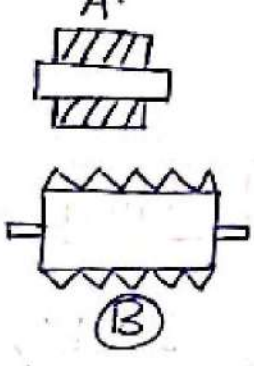
Similary, Varies from Cotton to Cotton.

Types of Ginning Machines

① Knife roller Gin
② Macarthy Gin
③ Saw Gin.

① Knife Roller Gin.





(KAPAS)

Prodn – 50-60 kgs/hr

KAPS – Fibra + Seeds + Trash

Knife roller Speed – 250 – 300 rpm.
Leather roller Speed – 120 – 150 rpm.

KAPAS is feed to machine through feed table. Knife portion of knife roller Cut the fibra from the seed surface. Doctor Knife which is having up and down movement will seprate the fibres from the seed and press them against the Leather roller which will take the fibra towards delivery end. These opened fibra are made in to bales and transported to textile Industry for further processes.

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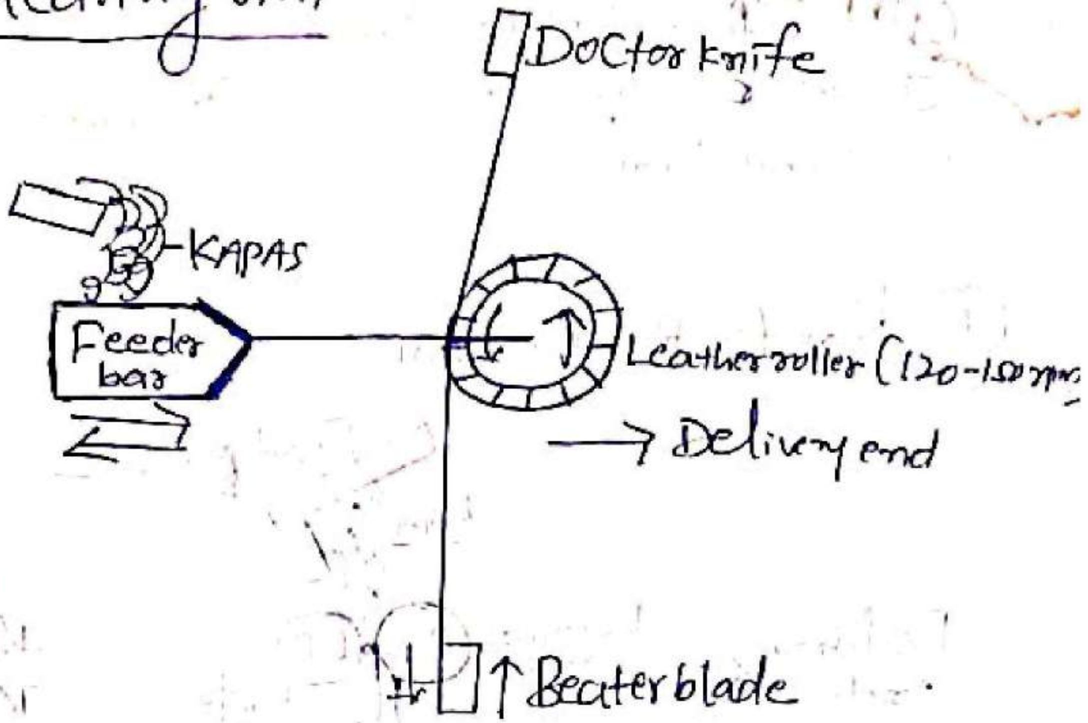
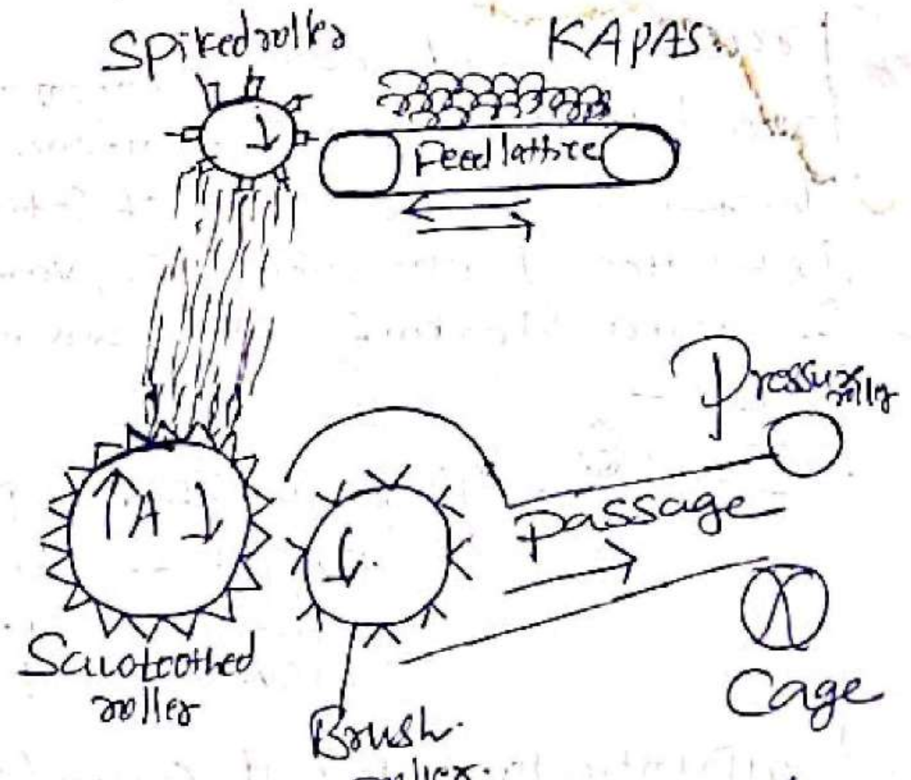
Macarthy Gin



Principle of working

- KAPAS fed to the machine through feeder bar.
- Leather roller due its rough surface loosen the fibre from seed surface
- Beater blade cut the loosened fibre
- Doctor knife press them against the leather roller
- Finally the seperated fibre fall down at the delivery end.

③ Saw Gin



Saw Gin – Most effective ginning machine. KAPAS fed through feed lattice Spiked roller loosen the fibre from seed surface with the help of Spikes. Loosened fibre will fall on to Sawtoothed roller where saws are fixed on its surface Sawtoothed roller will seperate the loosened fibre from seed surface. The seperated fibre will be plucked by Brush roller and drawn through passage and finally delivered as sheet material. Later it will be made in to bales. Sawtoothed roller rotates at 400 rpm: prodn is around 200kg/hr.

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Impurities present in the Cotton - (Trash)

Trash present in the Cotton fibre vary from type to type of Cotton fibre.

There are many Varieties of Cotton fibres, namely Desi cotton, Jaydar Cotton, J-34, Varalakshmi, MCU5, Shankara, Shankar6, DCH32, Suvin, Ghiza, T-Swiss, PIMA etc

Indian Popular Cotton - DCH32
Egypt - Ghiza.
China - T-Swiss
USA - PIMA

Impurities present in the Cotton (Contamination)

- Strings of Jute
- leaves and feather pieces
- pieces of plastic
- human hair
- Cut notes
- Stones etc

Contaminated Controlled Cottons Can be grown by educating the farmers and ginners.

Trash present in the Cotton Can be determined using Trash Analyzer

If 100gms of ginned Cotton fibres are fed to Trash analyser and the wt of delivered Cotton is 92gms Then the trash is 8% (100-92 = 08%)

Usually Desi Cotton and Jaydar cotton are the Coarsest varieties having trash upto 8%.
MCU5, Shankara, J-36 - medium varieties with trash upto 6%
DCH32, ~~Suvin~~ Suvin Cotton - finer varieties with trash upto 4%.

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Baling Process and Baleweights

15/9/20

(Baling)

After Ginning process, the seperated fibre from seeds are packed in a bag known as "Bale"

Bale making process is as follows

- Gunny Bags are kept on the floor
- Below the Gunny Bags Iron ~~Stron~~ Strings are placed
- Seperated fibre are spread the Gunny bags Uniformly across its length and width
- Superimpose the layers (one above the other)
- Finally press the layers using hydraulic press.
- Tie them firmly with Strings

One Bale will have 180 - 200 kgs of Cotton fibre.

Now this ready to process through Blow Room in Spinning Section

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Impurities Present in Cotton

- Strings of Jute
- leaf bits and feather pieces
- Plastic pieces
- human hair
- Cut Notes
- Sands, Stones
- ~~Iron~~ pieces (Iron pieces)

Remedies to minimize trash

- Magnets should be kept to seperate Iron pieces
- Farmers should be instructed to ~~use~~ cover their head with cloth during plucking. This will prevent the fall of hair into fibres
- They should be instructed to pluck properly with minimum mixture of sand and stones

Contaminated Controlled cotton should be grown.

Trash (or) Impurities present in cotton can be determined using Trash Analyser. This is named as Shirley Trash analyser.
If 100 gms of ~~A~~ Ginned fibres are fed to analyser, the delivered weight is 96 gms. Then trash present is 4%.

Important types of cotton and Trash present in those cottons

Sl. No.	Name of Cotton	Trash present in percentage
①	DCH32	>3% and <4%
②	Suvin cotton	3%
③	J-34 Cotton	5%
④	Shankar-6-Cotton	6%
⑤	Varalakshmi-Cotton	6%
⑥	MCU5 Cotton	5%
⑦	CIS Raw Cotton	>6%
⑧	Jaydar Cotton	8%
⑨	Desi Cotton	>8%

In addition to the above, many other varieties of cottons are also grown. Important is listed above

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Papular cotton in different Countries

Name of the papular cotton	Country Name.
DCH32-cotton	India
GHIZA-cotton	Egypt
T-Swiss-cotton	CHINA.
PIMA-cotton	USA.

In the Cotton world Market, the names mentioned above will Indicate the Country name. DCH32-cotton means India Identification mark

⑬ ④ ③

Grading of Cotton

Cotton grading is usually carried by Considering the following factors.

- Colour of Cotton
- Length of Cotton fibre
- Trash present in Cotton

All the above Parameters Can be determined using HVI and AFIS

HVI – High Volume Instruments.
AFIS – Advanced Fibre information System
All parameters Can be determined in 45 seconds

$$\text{Colour} \propto \text{length} \propto \frac{1}{\text{Trash}}$$

As the Colour is white, length is more and Trash is less. (As length increases, Colour become white and Trash is less)

ie As the ~~Count of~~ length of fibre increases, the Colour become white and finer yarn Can be Spun. If the Colour is dull, then the length is less and Trash is more and hence Coarser Count Can be Spun.

ie Colour and length $\propto$ Count of Yarn

$$\text{Trash} \propto \frac{1}{\text{Count of Yarn}}$$

[illegible]

Grading of cotton in different Countries are as follows

Grading of Cotton

India.	EGypt.	USA.
Superfine count (100s Ne and above)	Fully Good	Good Middling
Fine (60s, 80s Ne)	Good	Strict Middling.
Medium (40s 50s Ne)	Fully good fair	Middling
Coarse (20s 30s Ne)	good fair	Strict low Middling
Coarsest (10s Ne and below)	Fully fair	Low middling

Count of yarn Should be Specified in Ne and also Tex and to be described in the words used in different Countries.

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Blending and Mixing

Blending

Defn: Blending is referred to the Combination of Competible properties Such as Length, fineness, maturity and strength in order to produce the required Quality products.

Objects of Blending

① To produce Consistant Quality products for longer duration of time

② To Improve Processing Performance

③ To meet the functional properties of the end product

④ To reduce the cost of raw material

Common blends which are used are

Polyester | Cotton – P|C – 67 : 33
Polyester | Viscose – P|V – 50 : 50
Cotton | Viscose – C|V – 58 : 42
Silk | Modal S|M – 65 : 35

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Types of Blending

① Sandwich blending (or) Blowroom Blending

② Drawframe blending.

Sandwich (or) B/R Blending – Ex: P/C blend 67/33.

- Out of 1000 kgs, 670 kgs polyester and 330 kgs of cotton to be blended.
- 670 kgs to be made in to 10 Sections
  330 kgs to be made in to 10 Sections
- Each Section 67 and 33 kgs
- Cotton should be processed upto Comber to Combed sliver should be blended with polyester fiber
- First layer Polyester – 67 kgs. Spread this fibre uniformly across the length and width
- Spread – 33 kgs of Cotton over this layer uniformly
- Continue Superimposing of layers till the reqd. Quantity is achieved
- This process is carried out in a seperate room known as Mixing room.
- Total Quantity in this room is 1000 kgs

Sandwich blending gives homogeneity ie uniform distribution of fibres across length and width of lap and also cross section of yarn.

Similary Blending is carried Pout for other bends such as 58/42, 50/50, 65/35

② Draw Frame blending

Let us consider p/c blend 67/33

In this type of blending, Cotton should be seperately processed through Blowroom, card and comber. The end product of comber is sliver. This process is carried out to extract trash and also to remove short fibre. only longer fibre are left in sliver. This sliver is taken and kept seperately.

polyester fibre are processed seperately till carding machine

Carded sliver and combed sliver are blended at Draw frame.

5 polyester sliver and 3 cotton slivers are blended at D/F:

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Influence of Fibre Parameters on SPINNING PERFORMANCE

Fibre Parameters have Significant influence on the Processing Performance and also on the quality of yarn.

The quality of yarn, Count of yarn, Yarn realisation, are depending on fibre Parameters only.

Following are the Important fibre Parameters which are essentially Considered on Spinning Performance. Spinning Performance means the Performance of Blowroom, Card, Drawframe, Speedframe and Ringframe

- Fibre length
- Fibre fineness (Mi-value)
- Maturity Coefficient
- Fibre Strength

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Fibre length - usually expressed in mm

Fibre length is $\propto$ Count of yarn.

Fibre length is directly proportional to the Count of yarn.

Short length fibre — Coarser Count of yarn
Medium length — Medium Count of yarn
Longer length — Finer Count of yarn

Fibre length may be classified as
Mean length
Effective length
Span length.

Mean length refer to average length of Short, medium and long fibres.

Mean length — $\overline{x}$
Short length - x_1
medium length - x_2
Longer fibre - x_3

$$\overline{x} = \frac{x_1 + x_2 + x_3}{3}$$

Effective length is average of longer fibre and this length is used for setting the machinery parts.

Span length is measured on AUTOSPAN - Instrument @ PTD

Span length measurement is

Objective assessment

(Auto span Instrument is used)

Staple length measured by leading Cotton merchants by hand stapling is

Subjective assessment

Presently Objective assessment is preferred because the result of objective assessment can be substantiated with the help of result sheet.

Span length may be 2·5% span length or 50% span length can be measured.

2·5% span length vary from 3/4th of an Inch to 1·6" ie 18 mm to 40 mm for cotton fibre

Viscose and polyester fibres have length of 40 mm, 50 mm and up to 61 mm because it is Staple Cutting

(Required length can be cut)

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② Fibre fineness

Fineness is usually expressed in micrograms/inc and this is named as Micronaire value (Mi-value). Fibre fineness determines the number of fibres in the cross section of yarn.

Normally there should be minimum 40 fibres in the cross section of yarn. According to the latest information, number of fibres in the c/s of yarn is >100.

Fibre fineness is usually expressed in Mi value and these values are given below depending on the type of fibre.

Fineness of fibres	Mi-value
Very fine fibres	3.00
Fine fibres	3.1 to 4.0
Medium fibres	4.1 to 4.9
Coarse fibres	5 to 5.5

Hence Count of yarn is $\propto \frac{1}{\text{Fineness value}}$

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③ Fibre Maturity

This refer to the number of fibres which are matured in a lot. Matured fibra are denoted by maturity Coefficient

Maturity Coefficient has direct impact on Yarn Strength and dyeability

If Maturity Coefficient is 0·90 means 90 fibres are matured out of 100 fibres and 10 fibres are immatured.

Maturity Coefficient Varies depending on the Count of Yarn to be Spun.

Maturity Coefficient	Count of Yarn that can be Spun
0·80	20^S Ne
0·85	40^S Ne
0·90	60^S Ne
0·95	80^S Ne and above

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Maturity Coefficient (Mc) is directly proportional to Count of yarn

$M_c \propto$ Count of yarn

20^s Ne – Coarser
40^s Ne – medium
60^s Ne – Fine
80^s Ne – Very fine Counts.
and above

Ne – Count of yarn

Ne – English Number

If matured fibre are more on the cross Section of yarn, it will contribute to the Strength of yarn and dye uptake will be uniform. Uniform Shade appear across the length and width of fabric.

④ Fibre Strength

Fibre Strength is a dominating Character and fibre Strength is directly Connected to the durability of fabrics. Fibre Strength is expressed in CN/tex (Centinewton/tex) and Single yarn Strength is expressed in gms/tex

Hence all the above mentioned fibre Parameters have direct influence on yarn and fabric Quality and durability.

In order to Simplify, all the above Parameters are put together and an Index has been derived which is Known as FQI - Fibre Quality Index

PTO

Please Note: Coefficient, Index, Constant have no units. These are expressed in figures and decimals.

FQI - Fibre Quality Index

$$FQI = \frac{LSm}{f}$$

L = 50% Span length in mm.
S = Fibre Strength in CN/tex.
m = maturity Coefficient
f = Mi-value

FQI value Vary from 40-140 from Coarsest to Finest Yarn

Based on FQI value of fibre, Count of Yarn that Can be Spun Can be Predicted. FQI α Count of Yarn

As FQI value Increases, Count of Yarn become

18TX33 - Spinning Technology-I

Module-II

BLow RooM

Blow Room is the first machine after ginning. Bales are supplied to spinning section. Here Bales are manually opened and mixing is carriedout in mixing room. Around 1000 to 1500 kgs of mixing will be done in each Bin. This will be allowed for Conditioning for 24 hours. After Conditioning, these fibres are fed to Blow Room.

Before feeding to Blowroom, all fibre parameters should be determined, such as Length, Strength, maturity and fineness. Fibre Quality Index is determined

$$\boxed{FQI = \frac{LSm}{f}}$$

Based on FQI value, number of machines required in Blow room is determined

PTO

In addition, the trash present in the mixing should also be determined using Shirley Trash analyzer.

The fed weigut and the delivered weight from Trash analyzer is noted. Difference between these two is known as <u>Trash Percentage</u>

Blow Room is the most important machine in Spinning to extract the major portion of the trash present in the material fed and to improve the performance of Subsequent machinery which are placed in sequence to convert loose fibre to Yarn.

Hence Blow room is named as <u>Key for Quality and Economy</u>

Objects of BLow Room

① TO open the Compressed layer of fibra in to Small tufts by Beating action.

② Opening and Beating of fibra with minimum damage and minimum loss of Spinnable fibra in the waste

③ TO achieve homogeneous mixing

④ TO produce Uniform Sheet of fibra both ~~t~~ longitudinally and Transversly Known as "LAP"

Conversion of Loose fibra in to Uniform Lap

PTO

Types of Blow Room

① Toyoda Blow Room – Conventional (Cold)

② Hergath Blow Room – Conventional (Cold)

③ NSE (New Standard Engineering) Blow Room – Conventional (Cold)

④ L.R. Blow Room line – Modern Blow Room

⑤ Trumac (Trutzschler Company) – Latest Blow Room

⑥ Crosrol Blow Room – present day

Development in the all the regions of Blow room have taken place from Conventional to present day Blow Room

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Identification of Components of Blow Room

- Disc beater
- Evener roller
- Stripper
- Pin cylinder
- Star rollers.
- Inclined Spiked lattice
- Bladed Beater
- Kirschner beater
- Cages
- Calender rollers
- Shell rollers
- Lap Spindle
- Lap rod.

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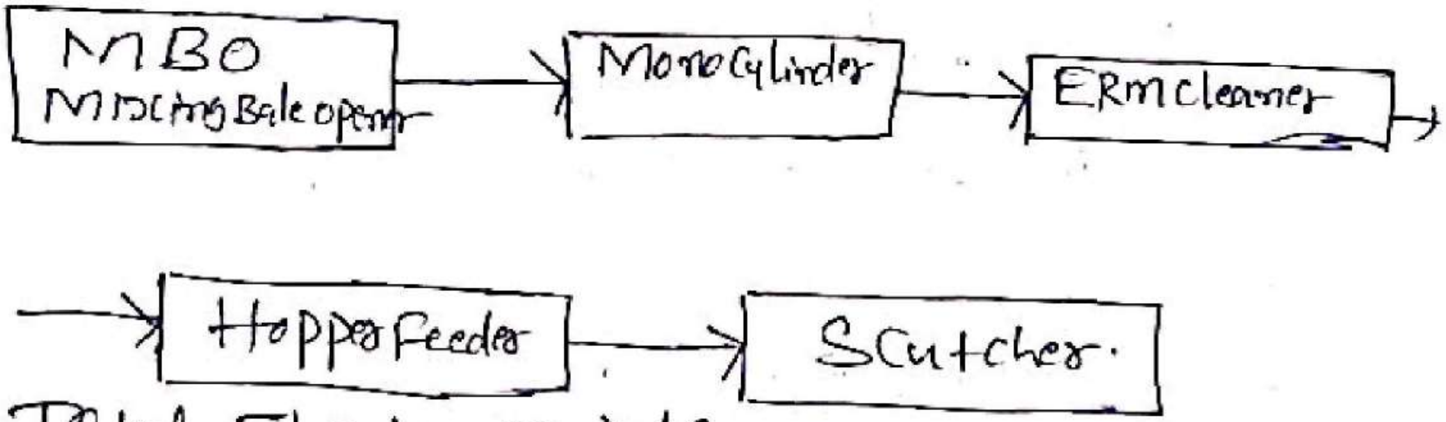
The above components are fixed in different machinery in the Blow Room line.

Sequence of machinaries in Blow Room line

L.R Blow Room line



Total 5 beating points.

MBO Consists of Feed lattice Disc Beater + Grid bars, Stripper, Evener roller, and ISL - Inclined Spiked lattice and Feed rollers.

Mono Cylinder — Pin cylinder and Grid bars

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ERM Cleaner

- Feed roller 1 and 2
- Plaindrum and Cage
- Feed rollers
- Disc Beater.

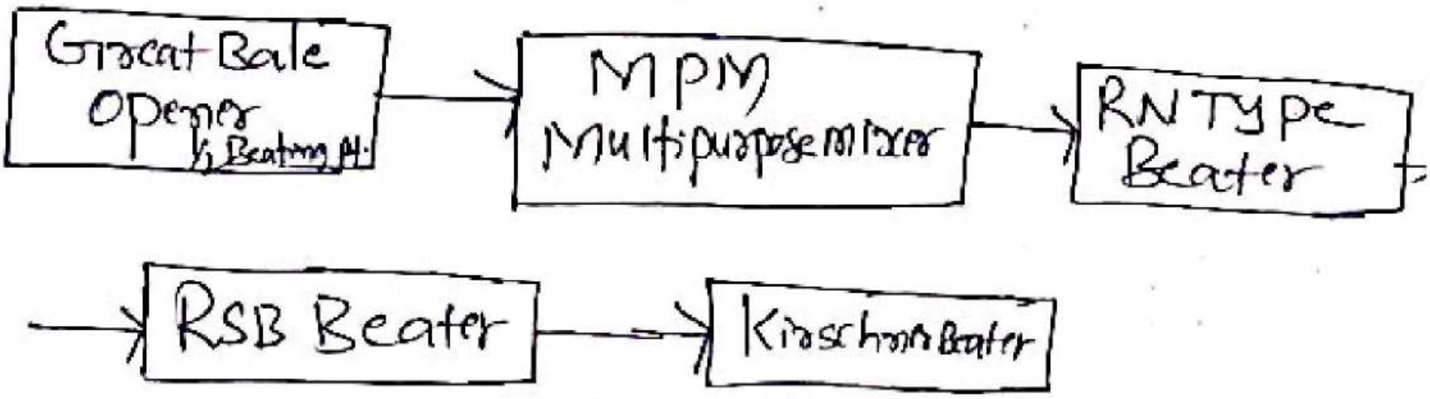
Hopper Feeder

- Star rollers
- Regulating spade
- ISL and Evener roller
- TOP and Bottom Stripper
- wooden lattice

Scutcher

- Two Bladed. Beater
- Cages.
- Kirschner Beater
- Calender rollers
- Shell rollers.

Sequence of Machinaria in Trutzschler Blow Room line



Total – $3\frac{1}{2}$ Beating Points

Here Two laps Can be produced

Twin delivery System in Scutcher line

Note: Depending on the type of material being Processed, trash present, Quality of Yarn and Count of Yarn required, Openers and Beaters are Selected.

7/10/2020

Spinning Technology-I

List of openers and Beaters in Blow Room line

Hopper Bale opener
Crighton opener
Porcupine opener
Step cleaner
Two bladed beater
Kirschner beater

Toyoda Blow Room line

Disc beater
Monocylinder
ERM cleaner
TBB
KB

L.R. Blowroom line

PTO

Study of Design Featura and different types of openers and Beaters on the present day Blow Room line

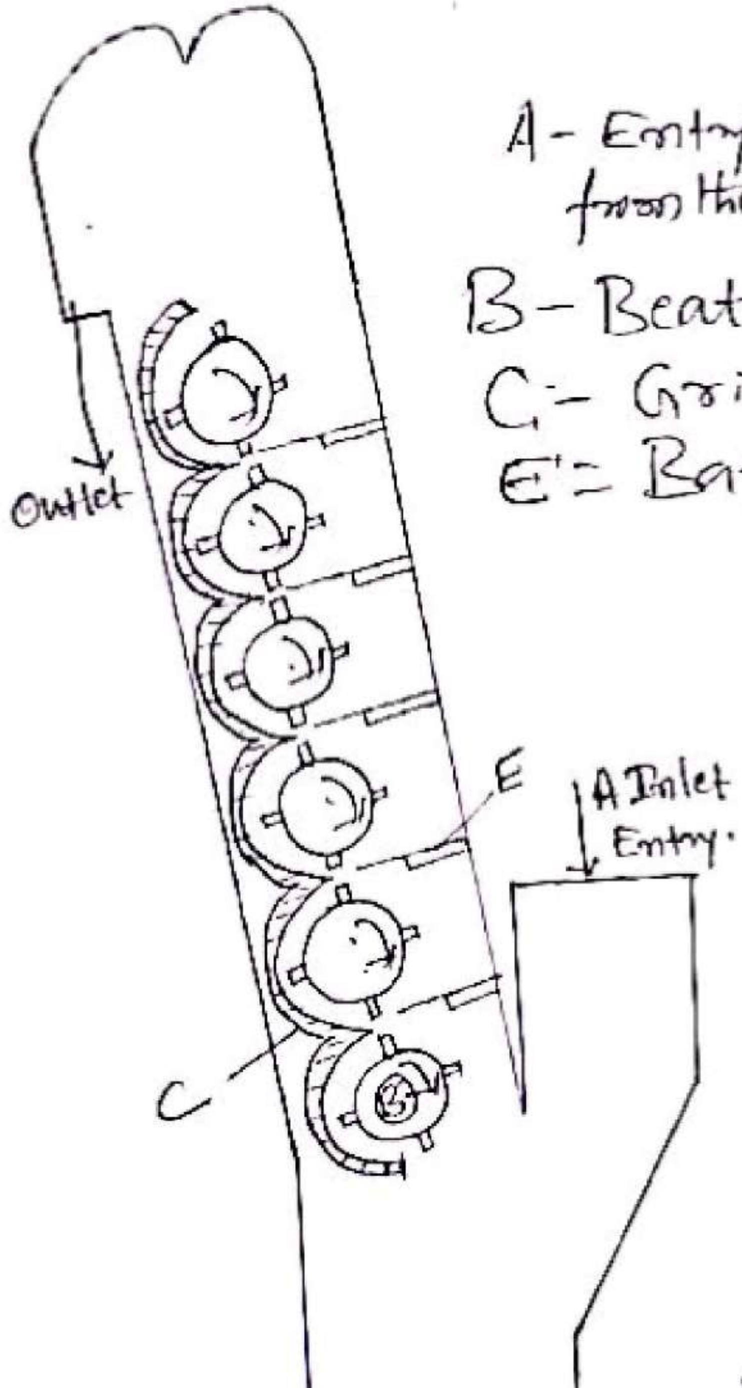
① Step Cleaner ⓞ Ultra Cleaner
② AFC - Axi Flo Cleaner
③ Mono Cylinder
④ RN type beater
⑤ RSB beater
⑥ Fine opener ⓞ Kirschner beater
⑦ Two Bladed beater.

Above mentioned openers are presently used on modern Blow Room line.

Design of the openers and beaters are changed to achieve the following

① To Increase the Quantity of production
② To Improve the Quality of end product
③ To minimize the damage level to fibres
④ To minimize the ~~too~~ loss of Spinnable fibres in the waste
⑤ To extract maximum trash

STEP Cleaner
(or)
ULTRA Cleaner



A - Entry of fibres from the previous machine

B - Beaters (6 beaters)

C :- Grid bars.

E :- Baffle plates.

PTO

Salient Features of Stepcleaner

① 6 beaters are kept at an angle of 45° to achieve effective beating with minimum damage to the fibres

② All beaters are rotating at Same Speed only either 320 rpm or 550 rpm

③ Cleaning efficiency up to 25%

④ Baffle plates will prevent the formation of Circular air Current and allow the fibres to action of beaters on the

Cleaning efficiency calculation

If trash present in the fed material ~~to~~ Step cleaner is 6 gms and trash in the delivered material of Step cleaner is 4.8 gms, ~~Then~~ Then the cleaning efficiency of Step cleaner

① Cleaning Efficiency

$$= \frac{\text{Trash in fed material} - \text{Trash in delivered material}}{\text{Trash in feed material}} \times 100$$

$$= \frac{6 - 4.8}{6} \times 100$$

$$= \frac{1.2}{6} \times 100 = \underline{\underline{20\%}}$$

② If trash in the delivered material of Step cleaner is 6.6 gms and cleaning efficiency of Step cleaner is 25%, find the trash present in the fed material

PTO

$CE = 25\%$

$$25 = \frac{x - 6.6}{x} \times 100.$$

$$25x = 100x - 660$$

$$\therefore 660 = 100x - 25x.$$

$$\therefore 75x = 660$$

$$x = \frac{660}{75} = 8.8\,gms$$

Trash present in the fed material = 8.8 gms

Similarly other calculations can be done.

Please Solve the following

① Trash in fed material is 8gms and dd material is 0.6 gms. find CE%

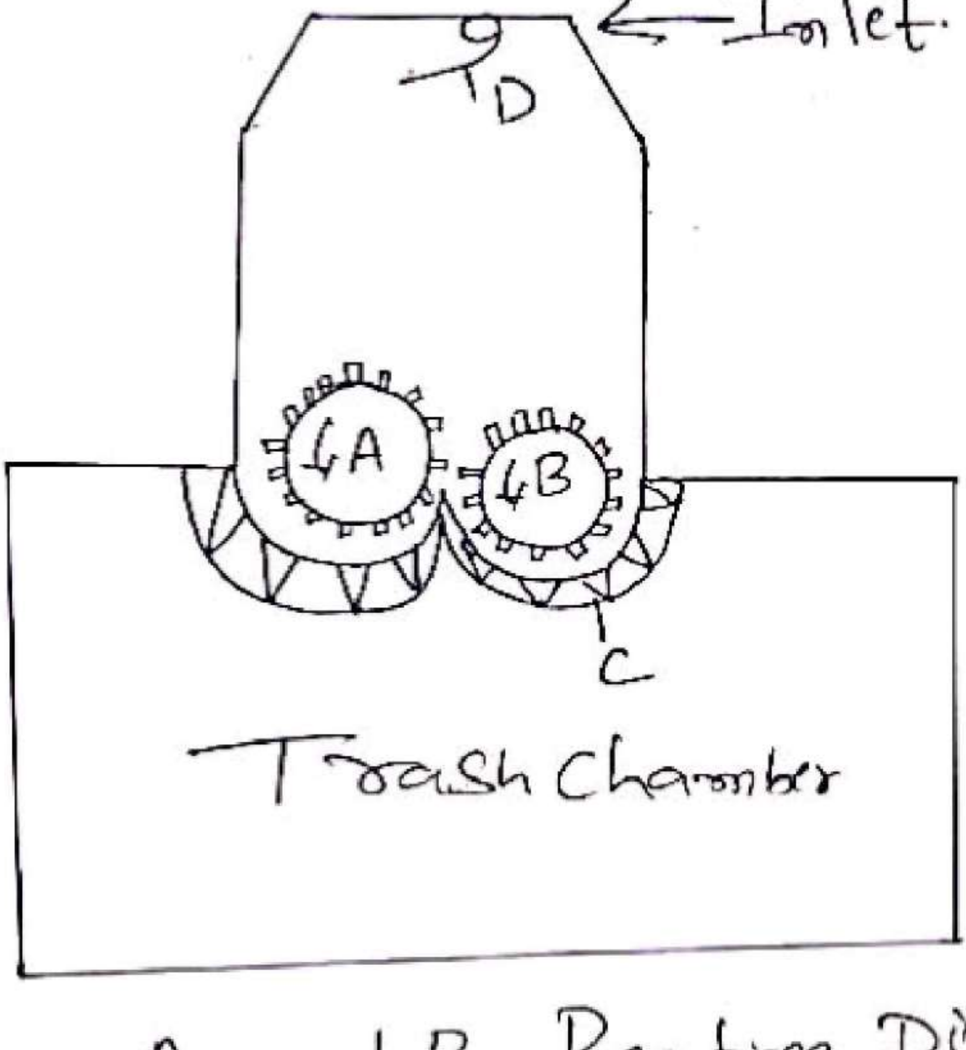
② Trash in delivered material 5.4 gms and Cleaning efficiency is 90%, find Trash in fed material

③ Trash in mixing is 4 gms and ~~Cleanin~~ trash in dd. material is 3.6 gms, find CE%.

② Axi-Flo Cleaner (AFC)

Or

Spiro Cleaner



A and B - Beating pin cylinders.
C = Grid bars
D = Adjestable guide plate

Axi Flo Cleaner in one of the major Cleaning Point in Blow room line

This Cleaner will extract heavy impurities from the material feed.

Damage level is minimum and loss of Spinnable fibres in the waste is also minimum

Material drawn in to the machine by means of Suction through Inlet After the entry, fibres are beaten Simultaneously by two Cylinders A and B. Adjestable plate will Control the approach of fibre tufts to the action of Cylinders

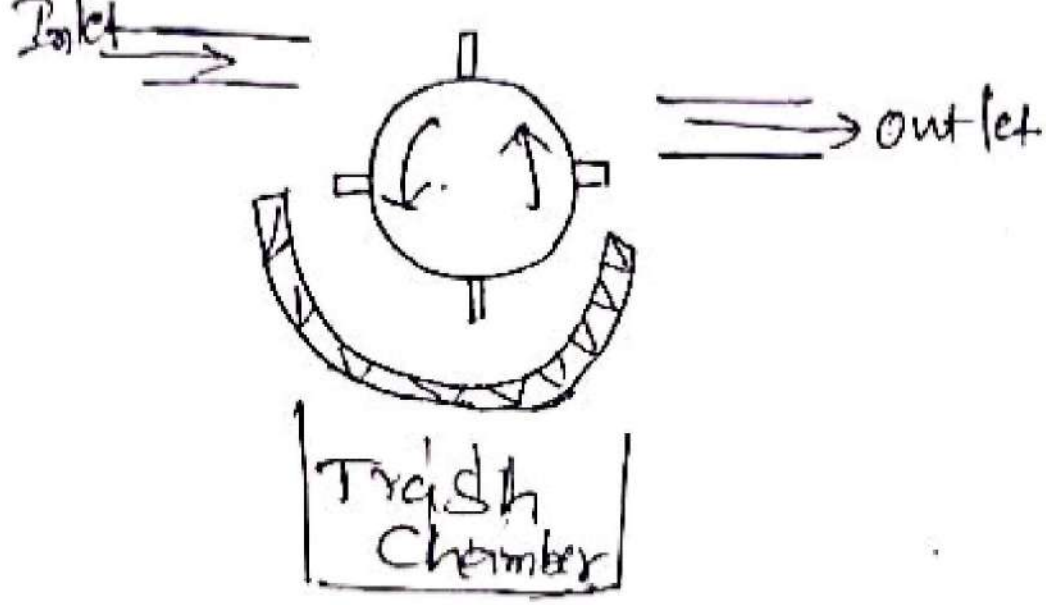
These Cylinders will beat the material against grid bars and release the impurities.

Advantages

① CE up to 25% with minimum damage and minimum loss of good fibres
② Reduced maintenance
③ Less power Consumption
④ Improved Yarn Strength

PN

③ MonoCylinder



Mono Cylinder is one of the Effective beating Point in the Blow Room line

Beater name is PIN CYLINDER

There are 8 Rows of pins and 6 pins in each Row (Total = 48 pins)

Edges of each Pin is made blunt to minimise damage to the fibres while beating.

Monocylinder and AFC are named as Aerodynamic beaters because, beaters will beater the material when flying in air.

Mono cylinder also extracts around 25% of trash present in the material fed

PTO

④ RN type beater in Trutzschler Blow Room line.

This type of beater is having finger type pins on its surface and rotating around 600 rpm. Here maximum trash extraction and very minimum fibre damage

⑤ RSB beater in Trutzschler Blow Room line.

This beater is having saw tooths on its surface. Beating very effective. Heavy impurities like seed bits, leaf bits are extracted. Speed is around 700 rpm.

⑥ Opening rollers in Crosrol Blow room line.

Here all 3 rollers are clothed with saw toothed wires. Speed of these rollers progressively increases. Damage is minimum and loss good fibres in the desired level.

PTO

Design featura

Main objects of changing the design of openers and beater is

- TO Increase the production
- TO Improve the Quality Standard
- TO minimize loss of good fibres
- TO Deliver the end products before the time.

Change has taken place in the following regions

① Type of pins on Beater is made blunt

② Space between the pins is wider for better opening

③ Speed is Variable depending on the type of material and trash present

④ Setting between beater and grid bars is made optimum to drive out the impurities and to retain good fibres.

PTO

Beats |Inch calculation

Two Bladed beater and Kirschner beater are the two effective beating points present in the Scutcher unit of Blow Room. Here Beaters will beat the fibre when it held ~~by~~ between a pedal lever and feed roller. Distance between the nipping point to the beating point is adjestable. This distance is adjested in such a way that the damage level to the fibre is minimum and loss of good fibre is also minimum and maximum trash extraction. Here Bats |Inch is calculated

~~Bat~~ Beats|Inch means, No. of blowsgiven in one inch of fibre.

Beats |Inch can be calculated as

$$\text{Beats}\,|\,\text{Inch} = \frac{\text{Beater Speed} \times \text{Number of Blades}}{\text{Surface Speed of Feed roller in inches}|\text{min } (\pi d n)}$$

PTO

Find beats/Inch of 2 BB rotating at 700 rpm and having feed roller speed of 8 rpm and dia of 2.5"

Here Surface Speed of Feed roller

$= \pi d n$.

$= 3.14 \times 2.5 \times 8 = \underline{62.8''/\text{min}}$

$\therefore$ Beats/Inch $= \frac{700 \times 2}{62.8}$

$= 22.29 \simeq \underline{22 \text{ Beats/Inch}}$

If this value to be converted to Beats/Cm

Then

2.54 Cms — 22 beats

1 Cm — $\frac{22}{2.54}$

$= 8.66 \simeq \underline{9 \text{ Beats/Cm}}$

Please Solve the following

① Two Bladed beater rotating at 750 rpm and feed roller Speed is 160 Cms/min. Find Beats/Cm and Beats/inch.

② Find Beats/Inch if 3BB is rotating at 800 rpm and feed roller Speed is 2 mts/min.

③ Find the feed roller Speed in Inches/min and mts/min if Beats/inch is 28 and 2BB Speed is 800 rpm.

④ Find the beats/Inch of 3BB rotating at 750 rpm if the feed roller Speed is 9 rpm and dia is 65 mm.

Spinning Technology-I 13/10/20

18TX33

Modern Developments in BLow Room

Modern Development is a Continuous process where creative ideas are generated.

Modern Development in Blow Room has focussed on the following Points.

① TO Increase the Quantity of Production to meet the requirement of Customers.

② TO Improve the Quality of End products

③ TO Improve the Processing Performance of Subsequent machinery

④ TO reduce the labour cost

⑤ TO minimize the wastage of good fibre

PTO

Following are the Modern Developments in Blow Room.

① Bale Pluckers and Bale grabbers to pluck the required Quantity of fibre from each bale
It is computerized programming

② Magnets are introduced to seperate iron pieces which may damage machinery parts

③ By-Pass arrangement to process different types of mixing Satisfactorily

④ Design of beaters and openers are Changed to minimize damage to fibre and also to reduce the loss of good fibre

Modern Blow Room lines are

① Trutzschler Blow Room line

② Compact Blow Room line

③ Crosrol Blow Room line

In all the above Blow Room lines, there is

- Effective utilisation of available resources (men, machine, material, method and money)
- Damage level to the fibre is very minimum
- Loss of Spinnable fibres in the is Significantly reduced

— Rapid increase in the Quantity of production (80 laps per8hours) ie ~~10 lap~~ 10 laps/hour)

— Significant Improvement in the Quality of lap.

Quality is usually measured in CV % - Coefficient of variation.

CV % between the laps is $< 1\%$

CV % within a lap is $< 1.2\%$

PTO

Sequence of machinary in the modern Blow Room line

① Trutzschler Blow Room line

GBR → AFC → MPM → RN beater
→ RSB beater → KB

GBR - Great bale opener
AFC - Axiflo Clearer
MPM - Multipurpose Mixer
RN — Finger Type beater.
RSB - Saw toothed wires are Clothed
KB - Kirschner beater

Compact B/R is also almost Similar to the above

Crosrol Blow Room

- 3 opening rollers
- Fine opener
- one Blow Room is Connected to Series of Cards (Chute feed System)

Here loose fibres to Sliver directly (No lap formation)

Salient Features of Modern Blow Room line (present day B/R lines)

① Double process (Two laps can be produced)

② Auto doffing

③ Labour Consumption is less.

④ 8 to 10 laps per hour

⑤ Delivery Speed – 8 mts/min

Quality Control Studies in Blow Room

The Success of Textile and Garment Industry is Standing on Quality, Quantity and timely delivery of end products Hence Quality Control Study is Very Important in all the Industries.

Following are the QC Studies of Blow Room

① Cleaning Efficiency
  - Individual
  - overall.

② Coefficient of Variation (CV%)
  - Between the laps
  - Within a lap

③ Lap rejection Percentage

Cleaning efficiency Can be defined as an efficiency of Blow Room to extract the trash present in the material fed.

Cleaning efficiency of Blow room Can be calculated as

$$CE = \frac{\text{Trash in mixing fed} - \text{Trash in Lap delivered}}{\text{Trash in mixing fed}} \times 100$$

$$= \frac{\text{Trash extracted}}{\text{Trash present in fed}} \times 100$$

Ex: If Trash in mixing is 8 gms and trash in Lap delivered is 2 gms, then the Cleaning efficiency is 75%

$$CE = \frac{8-2}{8} \times 100 = \frac{\overset{3}{\cancel{6}}}{\underset{4}{\cancel{8}}} \times \overset{25}{\cancel{100}}$$

$$= \underline{75\%}$$

PTO

Ex:2 If the cleaning efficiency of Blowroom is 80% and Trash in lap is 1.2 gms, find Trash in mixing fed

$$80 = \frac{x - 1.2}{x} \times 100$$

$$80x = 100x - 120.$$

$$\therefore 100x - 80x = 120.$$

$$\therefore 20x = 120$$

$$x = \frac{120}{20} = 6 \text{ gms}$$

Trash in mixing is 6%

② Coefficient of Variation (CV%)

CV% – Between the laps
CV% – Within a lap.

This is one of the Important Quality parameter of Blow Room.

CV% Can be Calculated between the laps and within a lap.

Between the laps

10 laps to be weighed.

Wt. Should be noted.

$\bar{x}$ Should be found out

$$\bar{x} = \frac{\Sigma x}{n}.$$

$\bar{x}$ = Mean.
Σx = Sum of 10 values.
n = number of Trials

PTO

Example

Wt. of 10 laps

Sl. No	Wt. of each lap in kgs (x)	$(x - \bar{x})$ d	$(x - \bar{x})^2$ d^2
1	20.1	0.06	0.0036
2	20.0	−0.04	0.0016
3	20.2	0.16	0.0256
4	20.0	−0.04	0.0016
5	20.1	0.06	0.0036
6	20.0	−0.04	0.0016
7	20.0	−0.04	0.0016
8	19.9	−0.14	0.0196
9	20.1	0.06	0.0036
10.	20.0.	−0.04	0.0016
Σx	200.4		—

$\bar{x} = \frac{200.4}{10} = 20.04$

$\Sigma d^2 =$ ~~0.0640~~ 0.0640

$\bar{x} = 20.04$

n = no. of trials = 10

Sd = Standard deviation

$$Sd = \sqrt{\frac{\Sigma d^2}{n}} = \sqrt{\frac{0.0640}{10}}$$

$$= \sqrt{0.0040}$$

$$= 0.08$$

$$CV\% = \frac{Sd}{\bar{x}} \times 100 = \frac{0.08}{20.04} \times 100 = 0.399 \simeq 0.4\%$$

CV% = 0.04%

Find the cv% between the laps in the following case ⑦

Sl. No.	wt. of laps in kgs	$(x-\bar{x})$	$(x-\bar{x})^2$
1	18.2		
2	17.9		
3	18.3		
4	17.8		
5	18.1		
6	18.0		
7	17.8		
8	18.1		
9	18.0		
10	18.0		

Please do the calculation and find sd, and cv%.

PTO

Lap Rejection

Lap rejection means, number of laps rejected for reprocessing.

Ex: If lap weight is fixed as 20 kgs to produce the required hank of lap.

Then the number of laps produced must weigh between

19.8 to 20.2 kgs

20 ± 200 gms

If the laps are weighing beyond these, those laps should be rejected and reprocessed. Hence all laps should be weighed and noted.

Lap rejection percentage in the present day is < 2%.

For every 100 laps produced in Blow Room, 2 laps may be rejected.

Nowadays the trend of lap rejection is towards "Zero"

Production Calculations of Blow Room

Delivery Speed $= \pi d n$

Delivery Speed is always expressed in Inches/min, mts/min and yds/min.

If Delivery Speed (or) Surface Speed is given in rpm, then it has to be Converted to $\pi d n$

In Blow room, the dia of delivery roller i.e Shell roller is 9" (228mm) (9×25.4 = 228mm)

$$\text{Hank of lap} = \frac{\text{Length in yards}}{\text{weight in grains}} \times 8.33.$$

Production of Blow Room in kgs per shift of 8 hrs at given efficiency =

$$\text{Delivery Speed in yds/min} \times \frac{1}{840 \times \text{Hank of lap}} \times \frac{60 \times 8 \times \text{Efficiency}}{2.205}$$

PTO

Find the production of Blow Room in Kgs / Shift of 8 hrs at 80% efficiency from the following details

Delivery Speed = 9 rpm

Lap delivered – 50 mts and 20 kgs

Delivery Speed must be in $\underline{\pi d n}$

Standard diameter of delivery roller (shell roller) of Blow Room is $\underline{9''}$

Hence $\pi d n = \underline{3.14 \times 9 \times 9''}$ /min.

$= 254''$/min

Lap delivered = 50 mts and weight is $\underline{20 \text{ Kgs}}$

Hank of Lap $= \frac{\text{Length in Yards}}{\text{Weight in grains}} \times 8.33.$

$= \frac{50 \times 1.1 \times 8.33}{20 \times 2.205 \times 7000}$

$= \underline{0.00148 \text{ Ne}}$

PTO

Production in kgs per 8hr shift at 80% efficiency

$$= \frac{254}{36} \times \frac{1}{840 \times 0.00148} \times \frac{60 \times 8 \times 0.80}{2.205}$$

$$\frac{7.05 \times 60 \times 8 \times 0.80}{840 \times 0.00148 \times 2.205}$$

$$= \underline{\underline{988 \text{ kgs}}}$$

$$\text{Number of laps} = \frac{988}{\text{Each lap weight in kgs}}$$

$$= \frac{988}{20} = \underline{\underline{49 \text{ laps/8hrs}}}$$

$$\text{Number of laps in one hour} = \frac{49}{8} = \underline{\underline{6 \text{ laps/hour}}}$$

6 laps will take 60 minutes

$$1 \text{ lap} = \frac{60}{6} = \underline{\underline{10 \text{ minutes}}}$$

Time for each lap is <u>10 minutes</u>

② Find the production of Blow Room (in kgs/day at 90% efficiency from the following details.

Delivery Speed = 8 mts/min

Lap delivered = 350 gms/meter.

Delivery Speed = 8 × 1·1 yards/min

$$\text{Hank of lap} = \frac{\text{Length in yards}}{\text{Weight in grains}} \times 8{\cdot}33$$

$$= \frac{1{\cdot}1 \times 8{\cdot}33}{\dfrac{350 \times 7000}{453{\cdot}6}}$$

$$= \frac{1{\cdot}1 \times 8{\cdot}33 \times 453{\cdot}6}{350 \times 7000}$$

$$= \underline{0{\cdot}0017 \text{ Ne}}$$

PTO

$$\text{Production} = 8 \times 1.1 \times \frac{1}{840 \times 0.0017} \times \frac{60 \times 24 \times 0.90}{2.205}$$

$$\frac{8.8 \times 60 \times 24 \times 0.90}{840 \times 0.0017 \times 2.205}$$

$$\underline{\underline{3622 \text{ kgs}|\text{day}}}$$

$$= \frac{3622}{3} = \underline{1207 \text{ kgs}}|\text{shift of } \underline{8 \text{ hrs}}$$

⑧

③ Find the hank of lap delivered in Blow Room in Ne and K·Tex from the following Particulars.

Production of Blow Room per 8 hrs at 90% efficiency = 70 laps

Each lap weight = 40 lbs.

Delivery speed = 7 mts/min

Production of Blow Room = 70 × 40 = 2800 lbs

$$2800 = 7 \times 1.1 \times \frac{1}{840 \times Ne} \times 60 \times 8 \times 0.90$$

$$Ne \text{ of lap} = \frac{7 \times 1.1 \times 60 \times 8 \times 0.90}{2800 \times 840}$$

0.0014 Ne

$$\text{Hank of lap in K·Tex} = \frac{590.5}{0.0014 \times 1000}$$

422 K·Tex

PTO

④ Find the production of Blow Room and also find the number of laps per shift of 8 hrs at 90% efficiency and also find the number of laps per hour and time taken for each lap in minutes ?

Given:

Delivery Speed = 10 rpm.
Lap delivered = 40 lbs
and length is 50 yards.

Delivery Speed = $\pi d n$

$= \frac{3.14 \times 9'' \times 10}{36}$ (Shell roller $\phi = 9''$)

$= \frac{283''/\text{min}}{36} = 7.86$ yards/min

Production $= 7.86 \times \frac{1}{840 \times \text{Hank of lap}} \times 60 \times 8 \times 0.90$

Hank of lap $= \frac{50 \times 8.33}{40 \times 7000} = 0.00148$ Ne

Production $= \frac{7.86 \times 60 \times 8 \times 0.90}{840 \times 0.00148}$

$= 2731$ lbs

Scanned with CamScanner

$$\text{Number of laps per Shift of 8hrs} = \frac{\text{Total prod}^{n}\text{ in lbs}}{\text{Each lap wt. in lbs}}$$

$$= \frac{2731}{40} = \underline{68\text{ laps}}$$

$$\text{Number of laps per hour} = \frac{68}{8} = \underline{\underline{8.5 \simeq 9}}$$

~~Around~~ 8 Round figure = 9

Time taken for each lap

$$= \frac{60}{9} = \underline{\underline{6.6\text{ minutes}}}$$

6 minutes 6 seconds

Efficiency calculation

④

④ Find the efficiency of Blowroom from the following details

Production of Blowroom = 1200 kgs/8 hrs

Lap delivered = 350 k.Tex

Delivery Speed = 8 mts/min

Hank of lap = $\frac{590.5}{350 \times 1000} = \underline{0.00168\ Ne}$

$$1200 = 8 \times 1.1 \times \frac{1}{840 \times 0.00168} \times \frac{60 \times 8 \times x}{2.205}$$

$$\therefore x = \frac{1200 \times 840 \times 0.00168 \times 2.205}{8 \times 1.1 \times 60 \times 8}$$

$$= \underline{0.88} = \underline{88\%}$$

22/10/2020 Homework

18TX33

Blow Room Prodn, HK. problems

Please Solve the following

① Find the production of Blow Room in kgs/8 hrs at 90% efficiency if the delivery Speed is 230"/min and Lap delivered is 13 ounce/yard

② Find the hank of lap in Ne and K.Tex from the following Particulars -

Production/day at 90% efficiency is 3600 kgs.

Delivery Speed = 8 meters/min

PN

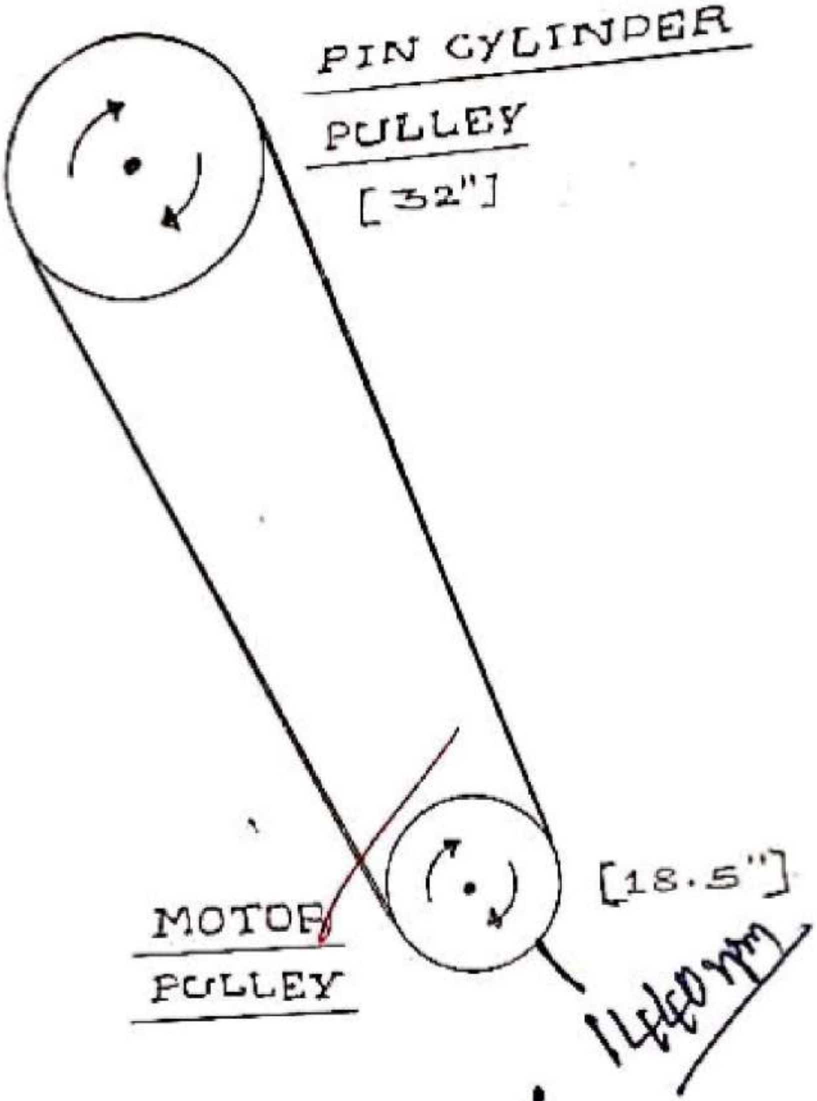
③ Find the efficiency of Blow Room from the following Particulars.

Production of
Blowroom is 8 laps/hour
each lap weight - 20 kgs
Length is 50 mts
Delivery Speed - 9 yards/min.

④ Find the production in kgs/8hrs at 85% efficiency and also find number of Laps/8 hrs at time taken for each lap in minutes from the following details.

Delivery Speed - 240"/min.
Each lap weight - 18 kgs/50 yards.

DRIVING ARRANGEMENT



Mono Cylinder

23/10/2020 ①

Mono cylinder.

Refer to driving arrangement

Pin cylinder Speed

$$= 1440 \times \frac{18.5}{32} = \underline{833\ rpm}$$

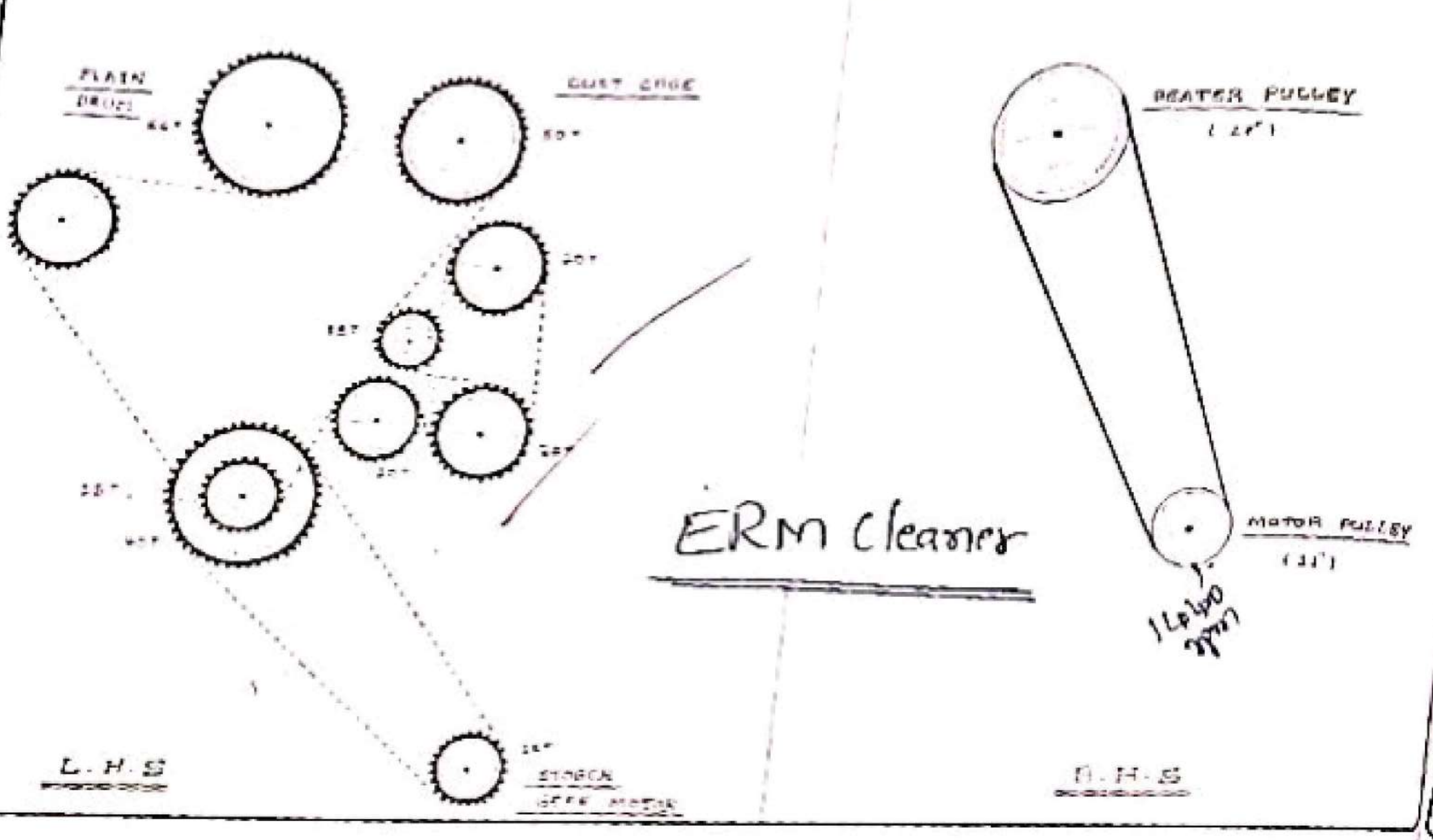
Pin cylinder of monocylinder is 833 rpm

Monocylinder is a major cleaning point where 25% of trash present in the material fed is extracted.

Ex: If trash present in the material fed to Monocylinder is 6 gms and cleaning efficiency is 25%, Then we can say 1.5 gms extracted in monocylinder and 4.5 gms left over in the delivered material of monocylinder PTO

Department of Textile

GEARING AND DRIVING ARRANGEMENT INCORPORATED IN E.R.M CLEANER



ERM Cleaner

Refer to Driving and Gearing arrangement of ERM Cleaner.

$$\text{Beater Speed} = 1460 \times \frac{11}{27} = \underline{\underline{587 \text{ rp}}}$$

In order Calculate the Speeds of Feed roll 1 and 2 and also Plaitdown and Cage a Seperate motor is fixed which is known as STOBER VARIABLE MOTOR

The speed of this motor has two range

9 rpm and 25 rpm

$$\text{Speed of FR-I} = 9 \times \frac{18}{40} \times \frac{\cancel{18}}{\cancel{20}} \times \frac{\cancel{20}}{\cancel{15}}$$

= ~~[illegible] rpm~~ 4.05 rpm

$$\text{Speed of FR-II} = 9 \times \frac{18}{40} \times \frac{15}{20} \times \frac{\cancel{20}}{\cancel{20}}$$

3.03 rpm

Speed of Cage

$= 4{\cdot}05 \times \frac{15}{50} = 1{\cdot}22$ rpm.

Speed of Plain drum

$= 1{\cdot}22 \times \frac{50}{66} = \underline{0{\cdot}92}$ rpm

<u>Similarly you can do for 25 rpm</u>

<u>Result Table</u>

Name of the parts.	Speed at 9 rpm	Speed at 25 rpm.
Feed roller-I	4·05	Please do calculation
Feed roller-II	3·03	
Plain drum	0·92	
Cage	1·22	

ERM cleaner is an Efficient beating Point where 25 to 30% trash is extracted. If trash present in the fed material to ERM Cleaner is 4% (4 gms) and Cleaning efficiency is 30%, then we can say 1.2 gms extracted and 2.8 gms left over in the delivered material of ERM Cleaner.

18TX33 24/10/2020 ①

Spinning Technology-I

Module-2

Process modifications required to process P/c and P/v blends in Blow Room.

Blow Room machinaries for different blends

Presently the Spinning machinary are designed to process all type of cottons and also blends.

Process modifications on spinning machinaries are required because the initial investment is more to p investon machinaries seperately.

Hence the technology has been updated on the latest machines to process all type of materials.

PTO

Processing of Cotton

Cottons are available as Coarse, medium and fine

On one blowroom these three varieties can be processed using by-pass arrangement. Similarly on the same blowroom, polyester/cotton blends can also be processed with modifications

Modifications required on Blowroom to Process P/C blend

— Cotton of finer Variety Should be Selected to blend with Polyester.

— Cotton has to be seperately processed through Blow Room, Card and Comber to extract trash and Short fibre.

— Combed Sliver Should be blended with polyester fibre

- Number of Beating points should be reduced to process p/c blends.. This will minimize damage level
- Speeds of Beaters should be kept at lower level to minimize damage and loss of good fibre
- grid bar setting should be wider to drive out short fibre and trash.
- Lap hank ~~or~~ is finer and also the Count of yarn is on finer side

P/c blend.

Type of Cotton to be selected is.

DCH32 - Finer Cotton

and trash in this cotton is <3%

p/c blend is usually 67/33

67% polyester and 33% Cotton

Span length of Polyester is around 40mm and Cotton is around 36mm

Both will match.

PTO

Blow Room line required to process P/C blend

Trutzschler Blow Room line

Sequence of machinaries required to process P/C blends.

Note: Combed cotton sliver should be blended with polyester staple fibres because only longer fibres are found in Combed Sliver

Sequence of machinaries

(GBR)

GBR opener → RN type beater → Kirschner beater

½ beating pt. 1 beating pt. 1 beating pt.

Total beating Points – $2\frac{1}{2}$

Hank of lap is 0·0015 Ne

Spinning Count at Ring frame is above 60^S Ne

Finer counts

Blow Room line required to Process P/V Blend

During the processing of polyester and Viscose blends, fibre Can be blended at Blow Room level only. In both Polyester and Viscose fibre, the trash percentage is NIL

During the Manufacture of Viscose fibre, Cellulose is the Source and chemicals are used. ~~to manufacture~~ Viscose fibre fall to the Catogory of Regenerated fibre.

During the manufacture of polyester fibre, Chemicals are used. Polyester fibres fall to the Catogory of manmade fibre

Hence polyester and Viscose fibre Can be blended before feeding to Blow Room

PTO

Common Blend ratio of
P|V blend is 50:50

Blow Room line required to
process P|V blend

Trutzschler Blow Room

GBR → RN Type beater → MPM (multipurpose mixer)
→ Kirschner beater

$2\frac{1}{2}$ beating Points

P|V Blend always go
for finer Counts

2.5% Span length is
around 50mm (both)

Required length Can be cut on machine

PTO

Modifications required to process p/v blends in Blow Room.

① Number of beating points should be reduced - It may 2 or 3 maximum

② Beater speed should be reduced to minimize damage to the fibre

③ Grid bar setting should be Narrow to prevent loss of good fibre.

④ P/v blend ratio is usually 50 : 50 and Sometimes 58 : 42

Note: In the present day Blow Room, Both cotton, blends and p/c and p/v blends can be processed using by-pass arrangements and required changes. pto

Present day Blow Rooms to process cotton and Blends are

- Lakshmi Rieter Blow Room line
- Trutzschler Blow Room line
- Crossrol Blow Room line
- Rieter Blow Room line

Technology is getting updated every year in order to

- Increase quantity and to Improve quality
- reduce wastage of Time and labour
- Reduce the Power as far as possible
- To get Identity both Locally and Globally

Spinning Technology-I

18TX33

Module-III

Definition and objects of Revolving Flat card

Carding is one of the Important machine in sequence of machineries during the Conversion of loose fibres to yarn.

Feeding material to carding machine is Blow Room LAP

End product of carding machine is "SLIVER"

"LAP to Sliver"

LAP — Sheet Form
Sliver — Tape Form

Sheet is Condensed to Tape

PTO

Combination of Blow Room and Card will extract major Portion of the impurities present in fibres the Lap fed.

BLow Room is the key for Quality and Economy

Carding is the heart of Spinning

A well Card is half Spun.

Uniformity of yarn depends on the effective Performance of Blow Room and Carding

Carding

Definition

Carding is defined as the process of reduction of entangled mass of fibres into fibrous web by working between two closely spaced parts clothed with wire points.

Closely spaced parts are

Licker-in, Cylinder, Flats
and Doffer.
All these parts are clothed with wire points.

PTO

Objects of Carding

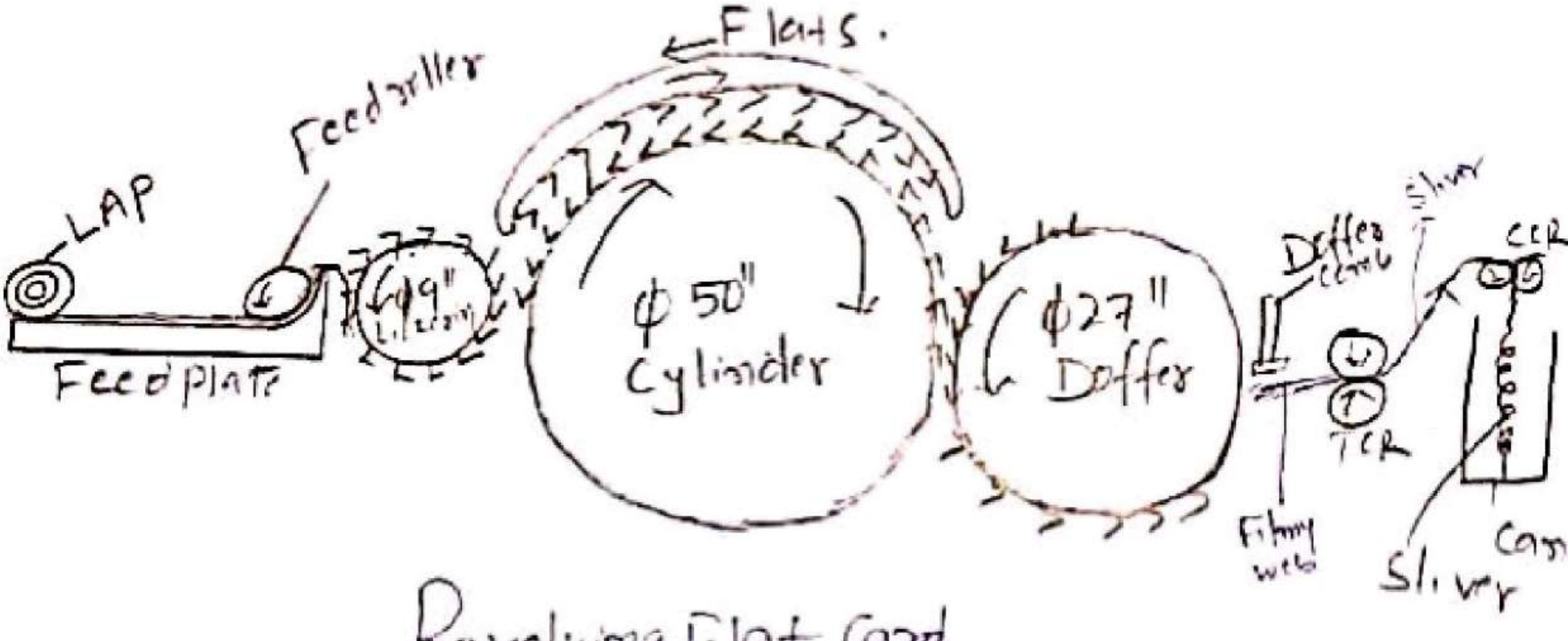
① Removal of Trash present in the lap fed
[Lickerin zone]

② Fibre to Fibre Seperation
(Carding action between Cylinder and Flats)

③ Conversion of Lap to Sliver
(Condensing and Coiler region)

(m)

Passage of material through Revolving Flat Card.



Revolving Flat Card

TCR – Table Calender roller
CCR – Coiler-calender roller

PTO

Passage of material through Revolving Flat Card

Passage of material with reference to the line diagram.

Blow Room Lap is fed between Lap roller and Lap stand. Lap will be unwound and pass through Feed plate Lap will be Subjected to the action of licker-in teeth between Feed roller and Feed plate

Licker-in ⓞⓡ Taker-in is a Cast iron roller Clothed with Sawtoothed wires

Licker-in is of 9" ϕ and rotating at

~~Around~~ [illegible] ~~rpm~~

around 800 rpm ($\pi dn = 3.14 \times 9 \times 800 = 22600''/\text{min}$)

At this Surface Speed licker-in teeth will act on the material and open it and act against undercasing and drive out the trash.

First object is achieved here
(Removal of trash present in the lap fed)

After the material is opened at the Licker-in zone, fibres are transferred onto Cylinder Surface by "Point to back" action of wire points.

Cylinder is having 50" diameter and Clothed with metallic wires. Speed of Cylinder is around 350 rpm.

(πdn = 3.14 × 50 × 350
= 55000"/min)

Licker-in wires will feed fibres from point and Cylinder wires take the fibres from back. Hence the transfer of fibre from Licker-in to Cylinder is Point to back

Later Fibre will be subjected to action of wire Points between Cylinder and Flats

Flats are T-shaped rods and Clothed with wire Points and speed is expressed in Inches/min (or) mm/min

PTO

Action of wire points between Cylinder and Flats will convert the fibres to Individual Stage.

ie Fibre to Fibre Seperation is achieved between Cylinder and Flats by Point to Point action of wire points.

Second object is achieved between Cylinder and Flats

After the fibres are seperated it is transfered on to doffer.

Doffer is of 27" diameter and clothed with metallic wires. and its speed is usually expressed in mts/min because the delivery speed of card is doffer speed.

Doffer speed vary from 100 to 220 mts/min from old to the present day cards

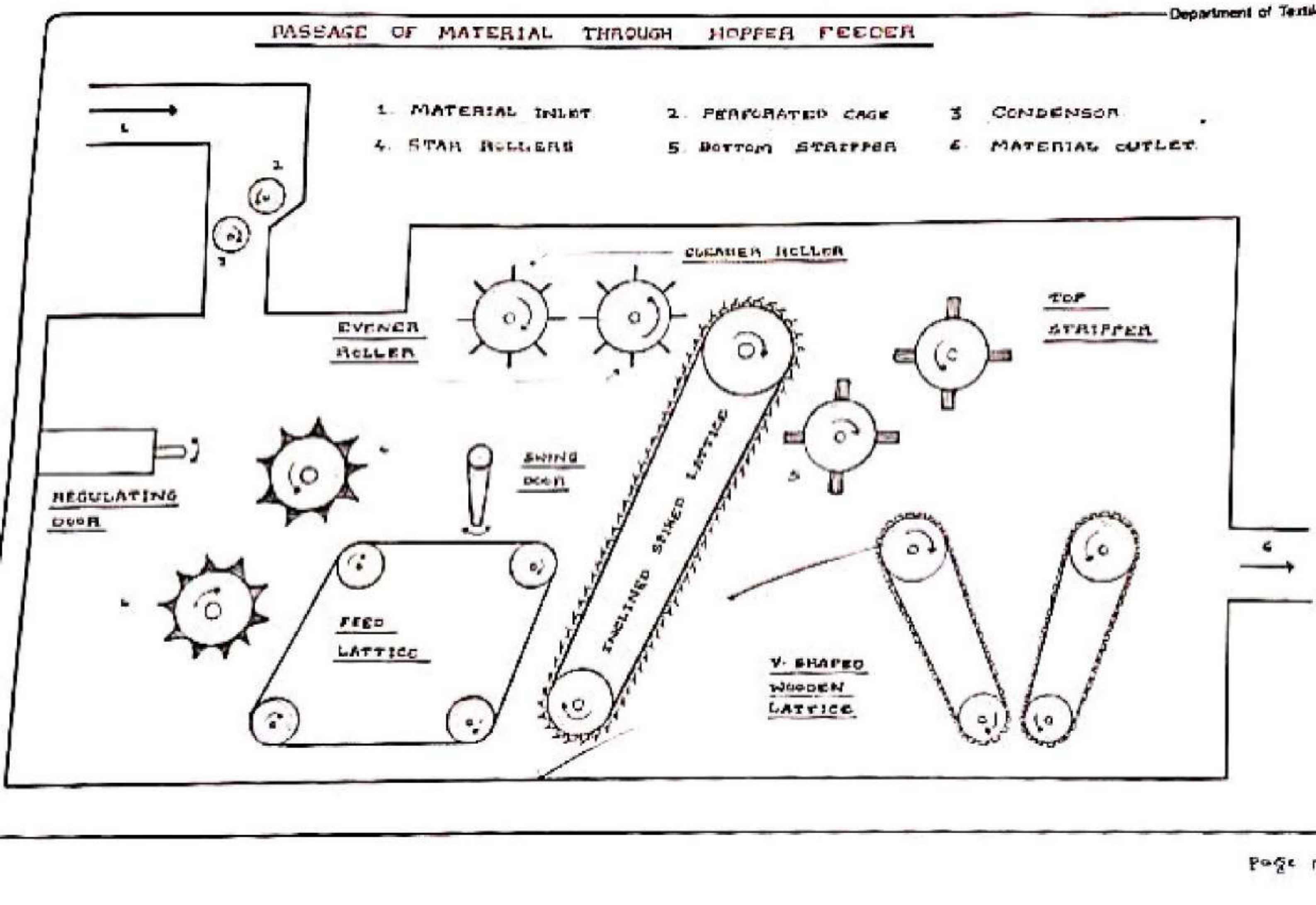
Seperated fibres from cylinder and flats are transferred on to doffer surface by the release of aircurrent at the point of transfer.

Doffer will take the fibres up to half of its circumference where doffer comb will convert the fibres into fibrey web. This web is consolidated into Sliver between TCR and CCR. Finally Sliver will be laid in Can

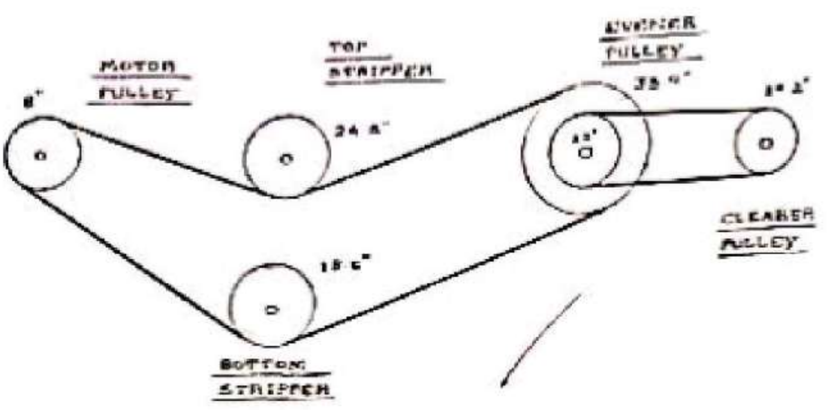
3rd object is achieved here

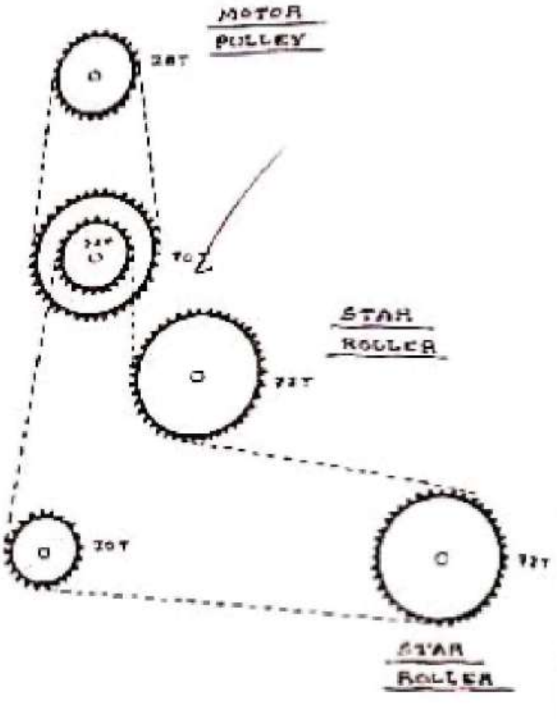
Note: Neat and proportionate figures are Self explanatory. Please draw Neat and Proportionate figures.

PASSAGE OF MATERIAL THROUGH HOPPER FEEDER



GEARING AND DRIVING ARRANGEMENT INCORPORATED IN HOPPER FEEDER





ST lab-I 18TXL36 3/11/2020

①

Hopper Feeder

Passage Explanation - Refer to line diagram uploaded

Hopper Feeder is kept in the Sequence of Blow Room Machineries.

Hopper Feeder is not a beating point.

Main object of Hopper Feeder is to Feed regular quantity of material to Scutcher unit to maintain the weight of lap in the desired level.

Hopper feeder recieves material ~~from~~ either from MBO (or) From ERM Cleaner. If MC and ERM are by passed, it will receive directly from MBO

pto

On entry, material fall in to hopper of hopper feeder between two Star rollers.

Later the fibra are carried by ISL. Fibra are further made in to Smaller tufts by spike action between ISL and Evener roller.

Opened fibra are Stripped by top and bottom Stripper and feed the fibra to the Scutcher unit through wooden Lattice kept in V - Shape.

Calculations

Driving and gearing arrangement uploaded. Please refer to those arrangements and Calculations are below.

Speed of Motor – 18 rpm

Speed of Star roller – I

$$= 18 \times \frac{28}{70} \times \frac{26}{72}$$

$$= 2.6 \text{ rpm.}$$

Speed of Star roller – II

$$= 2.6 \times \frac{\cancel{72}}{\cancel{72}} = 2.6 \text{ rpm.}$$

PTO

1) Speed of Bottom Stripper

Motor Speed = 1440 rpm

$= 1440 \times \frac{8}{19} = 606$ rpm

② Speed of Evener roller

$= 606 \times \frac{19}{34} = 338$ rpm.

③ Speed of Top Stripper

$= 338 \times \frac{34}{26} = \underline{442}$ rpm

④ Speed of Clearer

$= 338 \times \frac{22}{17} = \underline{437}$ rpm

Hopper Feeder

Sequence of Driving

Motor to STAR Rollers

Motor Speed is 18 rpm

Star rollers (both) 2-6 rpm

Motor to other parts

Motor Speed is 1440 rpm

Sequence of driving arrangement

Motor to Bottom Stripper
Bottom Stripper to Evener roller
Evener roller to Top Stripper
Evener roller to Clearer.

Refer to the driving arrangement and draw it on your Observation book and do calculation once again.

ST-I 5|11|2020 ⑥

Design features of Carding

Design features of Carding is as follows.

Lap stand to keep the lap.

① Lap will be unwound with the frictional contact with the lap rollers

② Feed plate - Surface of the feed plate is made highly polished for the smooth flow of material and the edge of the feed plate is Curved for the progressive penetration of licker-in teeth into the fibre fringe

③ Licker-in - Sawtoothed Clothing
diameter - 9"
Speed - 650 to 800 rpm
rpm - Rotations per minute

④ Cylinder - Metallic wire Clothing
Diameter - 50"
Speed - 250 to 350 rpm.

⑤ Flats - T-shaped plates Metallic wire
106-110 flats on chain
Speed - 100 - 125 mm/min (4-5"/min).
pto

⑥ Daffer – Delivery roller
Clothed with metallic wire
Standard diameter – 27"
(Rieter has changed the dia to 20")

Speed of daffer is usually expressed in mts/min (Delivery speed)
(DS)

DS Vary from 100 to 220 mts/min
from Conventional to present day Card.

⑦ Doffing unit – Daffer Comb – Conventional Card
Crosrol Varga] Present
(or) Indiarel unit] day Card.

⑧ Coiling unit – Planetary Coiler System
only Coiler head rotates
and Can is stationary.

Typesof Clothing on licker-in, Cylinder, Flats. and Doffer and their Specifications

Licker-in or Taker-in

Type of Clothing – Saw toothed wire

Three types of wire
- Negative rake angle wire
- Neutral wire
- Positive rake angle wire

Negative Rake angle wire means
Angle of wire is < 90° (Acute angle)

Neutral wire 90° (Right angle)

Positive rake angle wire >90° (Abtuse).

Number of wire Points is usually expressed as PI Points/Inch.

PI is usually 3 to 4
3 to 4 wire points in one Inch.

Usually Negative rake angle wire are used PTO

Cylinder

Type of wire – Metallic wire clothing

Thickness of these wires are much lesser than Sawtoothed wire.

Number of wire Points are usually expressed as PPSI

Points per Square Inch.

Usually PPSI on Cylinder is 300 to 400

300 points to 400 points in one Square Inch

Flats – T-shaped plate

Clothed with metallic wire

PPSI – Around 300

PTO

Doffer

Doffer is delivery roller of Carding machine.
This is also clothed with metallic wire,
PPSI - 400 to 600

PPSI is more on Doffer to increase retentive power to hold the fibre after it is transfered from Cylinder Surface

Note Delivery Speed means
πdn (Surface Speed)
Product of Circumference and rpm

If DS is given in rpm, it has to multiplied with πD

PTO

Beater speed is expressed in rpm.

Delivery speed in yds/min (Or) mts/min.

Flat speed in mm/min.

Production is expressed in kgs/hour.

(Or) kgs/shift of 8hr.

(Or) kgs/day

Please remember

Licker-in, Cylinder and Doffer – 9"ϕ, 50"ϕ and 27"ϕ

Transfer of fibre from licker-in to cylinder is "Point to back".

Carding action between cylinder to flats is Point to point

Here Fibre to Fibre seperation is achieved.

Transfer of opened fibre from cylinder to doffer is by the release of aircurrent at the point of seperation.

7/10/2020 ①

Spinning Technology-I

List of openers and Beaters in Blow Room line

Hopper Bale opener
Crighton opener
Porcupine opener
Step cleaner
Two bladed beater
Kirschner beater

Toyoda Blow Room line

Disc beater
Monocylinder
ERM cleaner
TBB
KB

L.R. Blowroom line

PTO

Opening action by Spikes is known as "Preliminary opening"

This is achieved between Everroller Spikes and Inclined Spiked lattice Spikes in MBO and HF.

MBO - Mixing Bale opener
HF - Hopper Feeder

This type of opening opens the bigger tufts to small tufts.

Here Compressed fibre tufts are loosened and Converted to Smaller tufts.

Opening is effective between Spikes ~~because~~ because the Spikes are Sharp.

PTO

⑥ MPM (multipurpose Mixer) is introduced to achieve effective mixing of fibres

⑦ Auto doffing to prevent manual doffing and also to reduce loss of good fibres and also to replace the empty lap spindle and to take out the full lap out

⑧ Double Process line (Double scutcher) (2 laps can be produced at the delivery end)

⑨ Blow Room is made in to U-Shape to reduce labour.

⑩ To produce Consistant Quality laps.

Find the production of Blow Room in Kgs / Shift of 8hrs at 80% efficiency from the following details

Delivery Speed = 9 rpm

Lap delivered - 50 mts and 20 kgs

Delivery Speed must be in $\overline{\pi dn}$

Standard diameter of delivery roller (shell roller) of Blow Room is 9"

Hence $\pi dn = \underline{3.14 \times 9 \times 9"}$ /min.

$= 254"$/min

Lap delivered = 50 mts and weight is 20 Kgs

$$\text{Hank of Lap} = \frac{\text{Length in yards}}{\text{Weight in grains}} \times 8.33.$$

$$= \frac{50 \times 1.1 \times 8.33}{20 \times 2.205 \times 7000}$$

$= \underline{0.00148\ Ne}$

PTO

Production in kgs per 8hr shift at 80% efficiency

$$= \frac{254}{36} \times \frac{1}{840 \times 0.00148} \times \frac{60 \times 8 \times 0.80}{2.205}$$

$$\frac{7.05 \times 60 \times 8 \times 0.80}{840 \times 0.00148 \times 2.205}$$

$$= \underline{\underline{988 \text{ kgs}}}$$

$$\text{Number of laps} = \frac{988}{\text{Each lap weight in kgs}}$$

$$= \frac{988}{20} = \underline{\underline{49 \text{ laps/8hrs}}}$$

$$\text{Number of laps in one hour} = \frac{49}{8} = \underline{\underline{6 \text{ laps/hour}}}$$

6 laps will take 60 minutes

$$1 \text{ lap} = \frac{60}{6} = \underline{\underline{10 \text{ minutes}}}$$

Time for each lap is <u>10 minutes</u>

CARDING

Assisting Factors for the Complete transfer of fibre from Licker-in to Cylinder and Cylinder to doffer.

Licker-in to Cylinder

Following are the assisting factors for the Complete transfer of fibre from Licker-in to cylinder

① Point to back action of Wire

Points between Licker-in to cylinder.
(Lickerin is feeding fibre from Point and cylinder is taking from its back)

② Close Setting between Licker-in to Cylinder of 7 Thou [1 Thou = $\frac{1"}{1000}$

7 Thou = $\frac{7}{1000}$ = 0.007"
= 0.175 mm)

③ Cylinder Surface speed is higher than Licker-in Surface Speed
Releasing

④ ↑ Air Current between Licker-in and Cylinder

PTO

Cylinder to Flats

Fibre to fibre seperation by Point to point action of wire points.

* Cylinder to Doffer

Assisting Factors

① Release of Aircurrent between Cylinder and doffer

② Close Setting of 4 Thou
(4 Thou = $\frac{4}{1000}$" = 0.004" = 0.1 mm)
between cylinder and doffer

③ Higher Surface Speed of Cylinder.

④ More retentive Power of doffer wire points.

⑨

Autoleveller on Card and Its Importance

Autoleveller is an online monitoring device on Card and drawframe.

Online monitoring means, Quality of ~~Str~~ material is checked and corrected when the machine is running.

Nowadays Autoleveller has become an integral Part of Carding machine and Draw Frame machine.

Autoleveller will Correct Short term, medium term and Long term Variations.

Short term Variation < 2.5 mts.

Medium term Variation 2.5 to 25 mts

Long term Variation is 25 to 250 mts

Very long term Variation > 250 mts

PTO

Autoleveller is an Electronic Instrument fixed on both Card and Draw Frame.

Presently we Call it as Autolevelled Card and Autolevelled Draw Frame.

There are two types of Autoleveller

① open loop type
— DRAW FRAM

② Closed Loop type
— CARDING MACHINE

Main object of Autoleveller is to measure the Sliver thickness Variations and to Correct them when the machine is running

PTO

Open loop Autoleveller is used On Draw Frame and Here the Variation is corrected and then Sensed

Correction Before Sensing

This is Suitable to correct Short term Variations

~~In~~ closed loop Autoleveller is used on Carding machine and Here the Variation is Sensed first and then corrected

"Sensing before correction"

This is Suitable to correct medium term and Long term Variations

Autoleveller is fixed between Feedroller & TCR in Carding machine PTO

~~Advantages of Autolevelling~~

Working principle of Closed Loop Autoleveller on Card

Autoleveller is an Electronic device and works on the principle of transfer of Signals.

Instrument is kept between feed roller and TCR (Table Calender roller)

At the feeding end, the Variation of ~~Sliv~~ Lap fed is Sensed and it is Sent through Signals and accordingly the Speed of TCR is Changed to Correct the variations and uniform Sliver is formed.

Sensing and then Correcting

PTO

Advantages of Autolevelling

① All Variations are Corrected

② Count CV% of yarn will be consistant

③ Reduction of end breaks in Ring Spinning

④ Fabric Quality will be good

⑤ machine productivity is more

⑥ yarn U% is low

⑦ Idle Spindles are less

⑧ Labour efficiency is more because of Less end breakes.

CARDING 11/11/2020 ①

Module-3

Setting of different Parts of Card and Gauges used to Set the Carding parts

Setting of all parts in Spinning is Very important to produce good Quality yarn.

Setting of Carding machine depends on following factors

① Type of material and Trash present in it.

② Length of fibre in mm.

③ Hank of Sliver required.

④ Cleaning efficiency of Carding machine

Based on the above factors, All the parts of Card are Set

PTO

Setting of Carding means distance between each part and also Speeds of Various parts in Card.

Setting of different parts in Card

① Feed plate to licker-in

— 9 — 12 Thou $\left(1 \text{ thou} = \frac{1''}{1000}\right)$

0.009" to 0.012"

$1 \text{ Thou} = \frac{1''}{1000}$ Hence 9 Thou $= \frac{9}{1000} = 0.009''$ $= 0.225 \text{ mm}$

Similarly 12 Thou $= \frac{12}{1000} = 0.012'' = 0.30 \text{ mm}$

Object of This Setting is to

① feed the lap to the action of licker-in

② To achieve progressive penetration of licker-in teeth on fibres.

③ To remove the trash present in lap effectively.

PTO

② Licker-in to Cylinder

7 Thou = 0.007"

① Object of this Setting is to

- Transfer all the opened fibres on to Cylinder Surface by Point to back action
- To distribute the fibres uniformly across the width of cylinder
- To minimise loss of good fibres.
- To achieve effective Carding action at Carding zone

③ Cylinder to Flats

10 to 12 Thou   0.010 to 0.012"

Object of this Setting is

- To achieve Fibre to Fibre Seperation effectively between Cylinder and Flats
- To prevent entanglement of fibres between Cylinder and Flats.
- To minimize loss of good fibres

PTO

④ Cylinder to doffer

4 – 5 Thou 0·004" to 0·005"

Object of this Setting

- TO transfer the individualised fibres On to doffer Surface
- TO distribute the fibres uniformly across the width of doffer
- TO form filmy and Sliver.

⑤ Doffer to webpurifying unit

4 Thou

Object

- TO Strip the fibres from doffer Surface at high Speed of doffer
- TO form Quality web and Quality Sliver.

⑥ Flat to FCB (Flat Cleaning Brush) – 32 Thou 0·032"

TO Strip the embedded fibres from the flat Surface

Gauges used for Setting the Carding Parts

① Multiple leaf gauges

② Flat (or) Trawel gauge

③ Pin gauge

① Multiple leaf gauges

gauges are ground to accurate dimensions of 5, 7, 10, 12 Thou

All these gauges are rivetted.
Required leaf gauge Can be used for Setting the Parts. These gauges are used to set the distance between licker-in cylinder, [illegible] and doffer

pto

② Flat (or) Trowel gauge

This is used to set the distance between Cylinder to Flats only

③ Pin gauge — used to set the trumpet at TCR (Table Calender roller) to Produce Quality Sliver.

Please Note

1) Licker-in (or) Taker-in – 9" ϕ 650–800 rpm
Saw-toothed clothing
PI – 3–4

② Cylinder – 50" ϕ metallic Clothing.
250–350 rpm PPSI–300–400

③ Flats – 106–110 Flats – T-Shaped plate.
Metallic Clothing – 300 PPSI
Speed – 110 to 130 mm/min

④ Doffer – 27" ϕ metallic clothing
PPSI – 400 to 600
Speed – 100 to 220 mts/min from old to present day Cards.

Spinning Technology-I ①

18TX33

16/11/2020

Module-III

Draft in Card and Types of draft and Calculations

Draft - Definition

Draft is defined as the degree by which the material is attenuated (or) drawnout.

Attenuation (or) Straightening of fibre
[Straightening)

is Known as Draft.

Draft and Draft Constant has no unit. They are just figure (10, 20, 40, 400, ino like this)

PTO

In carding wider width lap is drafted into Sliver ie Condensation of lap to Sliver

Types of draft in card

① Actual Draft (AD)
② Mechanical (or) machine draft (MD)
③ Main draft, Tension draft
④ Negative draft

Actual draft (AD)

$$= \frac{\text{Hank of Sliver delivered}}{\text{Hank of Lap fed.}}$$

(or)

$$\frac{\text{weight of lap fed}}{\text{Weight of Sliver delivered}}$$

Please Note: Always AD > MD in Carding machine because of waste extraction

16|11|20

Mechanical draft (or) <u>Machine Draft</u>

$$MD = \frac{\text{Surface Speed of delivery roller}}{\text{Surface Speed of Feed roller}}$$

$$\text{Main draft} = \frac{\text{Surface Speed of doffer}}{\text{Surface Speed of Feed roller}}$$

$$\text{Tension draft} = \frac{\text{Surface Speed of TCR}}{\text{Surface speed of Doffer}}$$

$$\text{and} \quad \frac{\text{Surface speed of CCR}}{\text{Surface speed of TCR}}$$

<u>Negative draft</u>

means if the draft value is $\underline{<1}$ (Less than 1)

This exists between Lap roller to → Feed roller: Object of this draft is to Unwind the lap without any uncontrolled Stretching to the action of licker-in.
Draft is very less and hence this figure is ignored for calculations

$$AD = \frac{\text{Hank of Sliver dd}}{\text{Hank of Lap feed.}}$$

This is based on material Parameter.

MD based machinary Parameters

$$MD = \frac{\text{Tdn of dR}}{\text{Tdn of FR}}$$

Relation between AD, MD and waste extraction in Card is

$$AD = \frac{MD}{1 - \text{waste }\%}$$

This can be written as

$$AD = \frac{MD \times 100}{100 - \text{waste}} \quad \left[\because w\% = \frac{w}{100}\right]$$

1) Find A.D of Card if 16|11|2020
Lap fed is 18 kgs|50 meters
and Sliver delivered is 0·14 Ne

$$\text{Hank of lap} = \frac{50\times 1{\cdot}1\times 8{\cdot}33}{18\times 2{\cdot}205\times 7000}$$

$$= 0{\cdot}00164\ \text{Ne}$$

$$\simeq 0{\cdot}0016\ \text{Ne}$$

$$AD = \frac{0{\cdot}14}{0{\cdot}0016} = 87{\cdot}5 \simeq \boxed{88}$$

② Find the mechanical draft of Card if the lap fed is 0·0012 Ne and Sliver delivered is 0·12 Ne and waste extracted is 5%.

$$AD = \frac{0{\cdot}12}{0{\cdot}0012} = 100.$$

$$AD = \frac{MD\times 100}{100 - W} =$$

PTO

$$AD = \frac{MD \times 100}{100 - 5}$$

$$AD = \frac{MD \times 100}{95}$$

$$100 = \frac{MD \times 100}{95}$$

$$MD = \frac{\cancel{100} \times 95}{\cancel{100}} = \boxed{95}$$

$$\underline{\underline{MD = 95}}$$

③ Find the Mechanical draft of Card if lap fed is <u>0·80 lbs / yard</u> and sliver delivered is 4 K·Tex and waste extracted is 5%.

PTO

Lap-fed = 0.80 lbs/yard

Hank of lap = $\frac{1 \times 8.33}{0.80 \times 7000}$

$= 0.00148$ Ne

Hank of Sliver = $\frac{590.5}{4000}$

$= 0.147$

$AD = \frac{0.147}{0.00148} = \boxed{99}$

$AD = \frac{MD \times 100}{95}$

$MD = \frac{99 \times 95}{100} = \boxed{94}$

$MD < AD$

PTO

④ Find the Total draft of card using the following Particulars.

Doffer speed – 4200"/min
Feed roller speed – 1.8 mts/min
Speed of TCR – 170 yards/min
Speed of CCR – 250 mts/min

Please note: During Calculation, Numerator and Denominator units must be same

$$\text{Main draft} = \frac{\text{Surface speed of doffer}}{\text{Surface speed of feed roller}}$$

$$= \frac{4200}{1.8 \times 1.1 \times 36} = 58.9 \simeq \underline{\underline{60}}$$

$$\text{Tension draft} = \frac{\text{Surface speed of TCR}}{\text{Surface speed of doffer}}$$

$$= \frac{170 \times \cancel{4} \times 36}{4200} = \frac{6120}{4200}$$

$$= 1.46$$

$$\text{Tension draft} = \frac{\text{S.S. of CCR}}{\text{S.S. of TCR}} = \frac{250 \times 1.1}{170} = \underline{\underline{1.6}}$$

Total draft is the product of Md and Td.

Always TD is the Product of Intermediate drafts

Product means Multiplication

∴ Total draft (TD)

TD = Main draft (md) × Td × Td

= 60 × 1·46 × 1·62

141·9 ≃ 142

Total draft is 142 [No unit]

PTO

⑤ Find the Hank of Sliver delivered in Card from the following details

Lap fed – 360 K.Tex

[redacted] = [redacted]

MD = 95

Waste extracted – 5%.

Firstlly You have to find AD

$$AD = \frac{MD \times 100}{100-5}$$

$$\therefore AD = \frac{MD \times 100}{95} = \frac{\cancel{95} \times 100}{\cancel{95}} = 100$$

$$AD = \frac{\text{Hk of Sliver delivered}}{\text{Hk of lap fed.}}$$

$$\text{Hank of lap fed} = \frac{590.5}{360 \times 1000}$$

$$= 0.00164\ Ne$$

$$\therefore AD = \frac{\text{Ne of Sliver}}{\text{Ne of lap}}$$

Hank of Sliver = AD × Ne of lap

= 100 × 0.00164 = 0.164 Ne

Hank of Sliver = 0.164 Ne = $\frac{590}{0.164 \times 1000}$ = 3.6 K.TEX

ST-I 18TX33 19/11/2020 ①

Stripping and Grinding

Stripping and grinding are the two important operations carried in carding. These two operations are carried out for Cylinder, Flats and doffer.

STRIPPING

Process of removing the embedded fibres from the Cylinder, Flats and doffer wire Points is known as Stripping.

During Continuous running, Short fibres, impurities will be Collected in the wire Points of Cylinder, Flats and doffer. If these collected fibres [Embedded fibres] are not removed, Fibre to Fibre Seperation will not be achieved effectively. Hence these embedded fibres should be removed by a Process known as Stripping

PTO

Stripping process is carried out seperately for cylinder, doffer and Flats

Seperate brackets are provided to strip ~~d~~ cylinder and doffer

Flats are stripped by FCB
Flat Cleaning brush.

Stripping Principle is
"Point to back"

All embedded fibre from cylinder and doffer are removed by Point to back action.

Stripping Process frequency depends on the type of material processed.

Stripping is usually once in a shift for fine count and once in two days for coarser counts.

Grinding

Due to Continuous running, the wire points of Cylinder, Flats and Doffer bend. This bend wire entangle the fibres and spoil the Quality of Sliver. Hence these bent wires should be straightened.

The Process of straighting the bent wires is known as Grinding

Sharpening of wire Points is also Known as ~~Sh~~ Grinding

Seperate brackets are provided for Grinding.

Frequency – 2–3 years

Types

PTO

Types of Grinding

Long roller Grinder - Cylinder and Flats

Travers wheel grinder - Flats

Note Stripping and grinding Process make the Carding wire more effective and increase their life span and also improve the Quality of Sliver

ST-I 18TX33 22/11/2020 ①

Modern Developments and Salient features of modern Card

Modern developments on carding machine has been focussed on the following points They are to

① Significantly increase the quantity of production

② Improve the Quality of Slives remarkably

③ Improve the Performance of Carding machine

④ Minimize loss of good fibres

⑤ Increase efficiency of labour and Machine

⑥ Fulfil the requirement of Customer's and to meet the market requirement

PTO

<u>Modern Developments in Card</u>

① Feed roller is <u>Sawtoothed</u> and loaded by means of Spring to have thorough grip on lap to prevent uncontrolled Stretching

② Licker-in undercasing is replaced by <u>Fibre retriever</u> to make the all the fibres to follow the path of longer fibres and to drive out only unwanted trash.

③ Cylinder, flats and doffer are clothed with metallic ~~f~~ wires to achieve effective carding action [Fibre to Fibre seperation]

④ Iron flats are replaced by Aluminium flats which are lighter in ~~e~~ weight to handle

⑤ <u>Doffing unit</u> has replaced Doffer Comb by a newly designed webpurifying unit Known as <u>CROSROL VARGA</u> (CRV) and <u>INDIAROLLUNIT</u> [IRU DTI]

This new doffing unit will strip the fibre from doffer surface when doffer in rotating at high speed.

⑥ Doffer speed (Delivery speed) has been increased up to <u>220 mts/min</u> from <u>80 mts/min</u> (Almost 3 times from conventional to present day card)

⑦ Leather tape condenser between <u>Doffer to TCR</u> to prevent the falling down of filmy web and to form the sliver effectively

⑧ Planetary coiler system to ~~dis~~ lay coils of sliver in different positions in can - (Displacement of coils). This will prevent ~~a~~ entanglement during unwinding at next stage.

⑨ <u>1</u> mt can is used — <u>40" dia</u> 42" height

Salient Features of the the present day cards

① DK 780 card from Trutzschler Company.

Salient features

- Feed roller Spring loaded for uniform distribution of load across the width of lap.
- Fibre retriever to minimize loss of good fibres
- ~~Alumn~~ Aluminium flats for easy handling
- Cylinder Speed up to 300 rpm
- CROSROL VARGA UNIT
- 1 mt. can.
- Auto doffing to replace the filled can with empty can Automatically
- Delivery Speed up to 200 mts/min
- Production up to 60 kgs/hour
  ie 480 kgs/Shift of 8 hrs
  = 1440 kgs/day

PTO

② Rieter Card

Rieter Company (Switzerland) has made breakthrough in the Spinning Technology in the year 2000. This is the first company to reduce the doffer diameter to 20"

Salient features

- Licker-in Speed up to 800 rpm
- Cylinder speed — 500 rpm.
- Flat Speed up to 130 mm/min.
- Doffer dia reduced to 20" from 27"
- Delivery speed achieved up to 171 mts/min. (Break-through in the world)
- Production — 50 kgs/hour
- Auto doffing

③ CROSROL CARD — Latest Card

CROSROL Manufacturing Company is located in UK.

- Licker-in Speed - 800 rpm
- Cylinder Speed - 350 rpm
- Aluminium flats and Speed up to 132 mm/min
- New doffing System
- Delivery speed up to 220 mtr/min
- production - 80 kgs/hour
  - 640 kgs/Shift
  - 1920 kgs/day

- Autodoffing to replace the filled cans.

Spinning Technology-I 23/11/2020

①

18TX33

Calculations of Card

Hank, Production and Efficiency Calculation of Carding machine

Hank of Card Sliver Vary from 0.11 to 0.16 Ne from Coarse to fine

Hence maximum draft is given in Card. If lap hank is 0.0011 Ne and draft is 100, then hank of Card Sliver is 100 × 0.0011 = 0.11 Ne

∴ Hank of Sliver = Draft × Hank of lap

(or) Draft = $\frac{\text{Hank of Sliver}}{\text{Hank of lap}}$

Maximum draft is given in Card among Spinning machineries

PTO

and A D of n always > MD

because of waste extraction.

Calculations

① Find the hank of Card Sliver if the length is 6 yards and weight 24 grams.

grams to be converted to grains

453·6 grams = 7000 grains

24 grams → $\dfrac{24 \times 7000}{453 \cdot 6}$

= 370 grains

$$\text{Hank of Sliver} = \frac{\text{Length in yards}}{\text{weight in grains}} \times 8 \cdot 33$$

$$= \frac{6 \times 8 \cdot 33}{370}$$

$$= \underline{0 \cdot 135 \simeq 0.14\,Ne}$$

PTO

② Find the weight of Lap fed to Card in grams/meter. I.f Sliver delivered is 0.15 Ne and draft given is 95

First-find the hank of lap fed in Ne

$$\text{Draft} = \frac{\text{Hank of Sliver}}{\text{Hank of lap fed}}$$

$$\text{Hank of lap fed} = \frac{\text{Hank of Sliver}}{\text{Draft}}$$

$$= \frac{0.15}{95} = 0.00157$$

$$\simeq 0.0016 \text{ Ne}$$

Weight of lap fed in gms/mt

Find wt of lap in grains/meter

$$\text{Hank of lap} = \frac{\text{Length in yds}}{\text{Weight in grains}} \times 8.33$$

PTO

$$0.0016 = \frac{1.1 \times 8.33}{x}$$

$\therefore$ Wt. of lap in grains $= \frac{1.1 \times 8.33}{0.0016}$

$5726.8 \simeq \underline{5727}$ grains

Convert grains to gms

7000 grains — 453.6 gms

5727 grains — $\frac{5727 \times 453.6}{7000}$

$\underline{371 \text{ gms}}$

Wt. of lap fed to the card is 371 gms/meter and this Can be written as 3.71 K.Tex

③ Find the weight of Sliver delivered ③
in grams/yard from the following
Particulars

Lap fed to the card
is 0.0012 Ne.

Mechanical draft = 90
Waste extracted - 5%.

$$AD = \frac{MD \times 100}{100-5}$$

$$\therefore AD = \frac{MD \times 100}{95}$$

$\therefore$ ~~AD =~~

$$AD = \frac{90 \times 100}{95} = 94.7 \simeq \underline{\underline{95}}$$

$$AD = \frac{Hk\ of\ Sliver}{Hk\ of\ lap}$$

$$95 = \frac{Hk\ of\ Sliver}{0.0012}$$

Hank of Sliver = 95 × 0.0012
= $\underline{\underline{0.114\ Ne}}$

PTO

Wt. of Sliver

= Hank of Sliver = $\frac{\text{Length in yds}}{\text{Wt. in grains}} \times 8.33$

$= \frac{1 \times 8.33}{x}$

$0.114 = \frac{1 \times 8.33}{x}$

~~Ha~~
Wt. of Sliver = $\frac{1 \times 8.33}{0.114}$

73 grains

Hence weight of Sliver delivered = 73 grains / yard

Per yard means 1 yard

Solve the following

① Find the hank of Sliver delivered if lap fed is 350 K-Tex and draft given is 90.

② Find the draft given in card if Sliver delivered is 0.15 Ne and Lap fed is 12 ounce/yard

③ Find the hank of lap fed to the Card if Sliver delivered is 4 gms/mt and draft given is 105

④ Find Draft of card if Lap fed is 0.0013 Ne and Sliver delivered is 0.14 Ne.

Production calculation in Carding machine

Important formula.

① Hank of Sliver = $\frac{\text{Length in Yards}}{\text{Weight in grams}} \times 8.33$

② Draft (AD) = $\frac{\text{Hank of Sliver dd.}}{\text{Hank of lap fed}}$

② Draft (MD) = $\frac{\text{Surface Speed of delivery roller. } (\pi d n)}{\text{Surface Speed of FR } (\pi d n)}$

③ $AD = \frac{MD \times 100}{100 - W}$.

W = Waste extracted at Card.

PTO

[illegible]

$$\text{Hank of Sliver (Ne)} = \frac{590.5}{\text{K.Tex of Slivers}}$$

Production of Card in kgs/Shift at given efficiency =

$$\underset{\text{in yds/min}}{\text{Delivery Speed}} \times \frac{1}{840 \times \text{Hank of Sliver}} \times \frac{60 \times \text{shift} \times \text{Efficiency}}{2.205}$$

Please remember the following

1 mt = 1.1 Yards

1 yd = 36"

1 kg - 2.205 lbs

1 lb = 7000 grains

16 ounce = 453.6 gms = 7000 grains = 1 lb.

⑥

① Find the production of carding machine in kgs/8hrs shift and also kgs/hour at 95% efficiency from the following details.

- Delivery speed = 180 mts/min.
- Draft given = 100.
- Lap fed is 18 kgs/50 meters

Find Hank of lap first

$$\text{Hank of lap} = \frac{\text{Length in Yards}}{\text{Wt. in grains}} \times 8.33$$

$$= \frac{50 \times 1.1 \times 8.33}{18 \times 2.205 \times 7000}$$

$$\underline{\underline{0.0016\ Ne}}$$

$$\text{Draft} = \frac{\text{Hank of Sliver}}{\text{Hank of lap}}$$

$$100 = \frac{\text{Ne of Sliver}}{\text{Ne of lap}}$$

$$100 = \frac{x}{0.0016} \quad \therefore \text{Hank of sliver} = 100 \times 0.0016$$

$$= \underline{0.16\ Ne}$$

PTO

$$\text{Production} = 180 \times 1.1 \times \frac{1}{840 \times 0.16} \times \frac{60 \times 8 \times 0.95}{2.205}$$

$$\left[\text{Efficiency is } \underline{95\%} = \frac{95}{100} = 0.95\right]$$

$$\text{Production} = 304.66 \simeq \underline{\underline{305\ \text{kgs}}} / \underline{\underline{8\ \text{hr}}}$$

$$\text{production per hour} = \frac{305}{8} = \underline{\underline{38\ \text{kgs/hour}}}$$

② Find the production of card in kgs/8hrs shift at 98% efficiency and also the length of sliver laid in each can if the weight of sliver in each can is 25 kgs and also total length for the total production.

Data given

Delivery Speed – 200 mts/min :

Sliver delivered – 4 gms/mt

Find Hank of Sliver

4 gms/mt = 4 K-Tex

$$= \frac{590.5}{4 \times 1000} = \underline{\underline{0.147\ Ne}}$$

Production

$$= 200 \times 1.1 \times \frac{1}{840 \times 0.147} \times \frac{60 \times 8 \times 0.98}{2.205}$$

$$= \underline{\underline{380\ kgs}}$$

0.147 Nc means

0.147 × 840 Yards weighs 1 lb.

$\frac{0.147 \times 840}{1.1}$ mts — 453.6 gm.

= 112 mts — 453.6 gm

453.6 gms — 112 mts

25 × 1000 gm — $\frac{25 \times 1000 \times 112}{453.6}$

6173 mts/can

25 kgs — 6173 mts length

380 kgs — $\frac{380 \times 6173}{25}$

93830 mts

6173 mts — one can

93830 mts — $\frac{93830}{6173}$ = 15 Cans

Efficiency calculation

③ Find the efficiency of carding machine from the following particulars

Delivery Speed = 200 mts/min

Production per Shift of 8 hrs = 400 kgs

Sliver delivered = 0.14 Ne

$$400 = \frac{200 \times 1.1 \times 60 \times 8 \times \eta (\text{Eff.})}{0.14 \times 840 \times 2.205}$$

$$\therefore \text{Efficiency} = \frac{400 \times 0.14 \times 840 \times 2.205}{200 \times 1.1 \times 60 \times 8}$$

$$= \underline{0.98} = \underline{98\%}$$

PTO

④ Find the efficiency of Carding machine from the following details

Production per day = 1158 kgs

Hank of Sliver = 0·12 Ne

Delivery Speed = 171 mts/min.

$$1158 = \frac{171 \times 1{\cdot}1 \times 60 \times 24 \times \eta}{0{\cdot}12 \times 840 \times 2{\cdot}205}$$

$$\text{Efficiency} = \frac{1158 \times 0.12 \times 840 \times 2{\cdot}205}{171 \times 1{\cdot}1 \times 60 \times 24}$$

$$= 0{\cdot}95$$

$$= 95\%$$

⑤ Find Delivery Speed of Carding machine in mts/min, yds/min and rpm from the following details.

Production — 60kgs/hour at 95% η

Sliver dd. = 0.12 Ne

$$70 = \frac{x \times 60 \times 1 \times 0.95}{0.12 \times 840 \times 2.205}$$

$$\therefore x = \frac{60 \times 0.12 \times 840 \times 2.205}{60 \times 1 \times 0.95}$$

$= 240$ yds/min

$= \frac{240}{1.1} = \underline{218 \text{ mts/min}}$

240 yds/min = ~~240×36~~

$= \underline{240 \times 36''/\text{min}}$

PTO

$\pi d n = \underline{\underline{240 \times 36''}}/min$

dia of doffer = $\underline{\underline{27''}}$

Hence.

$$n = \frac{240 \times 36}{3.14 \times 27}$$

$$= \underline{\underline{102 \text{ rpm}}}$$

Solve the Following

① Find the Surface Speed of delivery roller on Card from the following details

Lap fed = 0.0012 Ne
Sliver delivered = 0.12 Ne
Waste – 5%
Surface speed of Feed roller
= 2.2 mts/min

② Find the production of Carding machine in kgs/day and kgs/hour at 98% efficiency from the following particulars.

Delivery Speed – 84 rpm.
Sliver delivered = 370 grains/6 Yards

PTO

③ Find the production of card in kgs/hour at 95% efficiency from the following details

Delivery Speed = 200 mts/min.

Sliver delivered - 3.5 K-Tex

④ Find the hank of Sliver delivered and also hank of lap fed to the card from the following details

Production per 8hrs at 96% efficiency = 340 kgs.

Delivery Speed - 150 mts/min.

Actual draft = 90.

⑤ Find the efficiency of Carding machine from the following details

Production = 48 kgs/hour

Delivery Speed = 5544"/min

Hank dd. = 0.12 Ne

18TX33 3/12/2020 ①

Spinning Technology

Module-4

DRAWFRAME

In Card Sliver, fibres are disorderly arranged and oriented in different directions. Unless these fibra are alligned properly and laid Parallel to each other, the Sliver is not Suitable to process in Speed Frame.

Hence draw-frame is required to allign the fibra Parallel to each other.

Objects and Principle of Drawframe

① Doubling - Combination of Several Card Slivers and Convert them to Single Sliver. During this Process, the uniformity of Sliver will be improved.

PTO

② Drafting - Straightening of fibre and making the fibre to lie Parallel to each other in drawframe Sliver.

Principle is

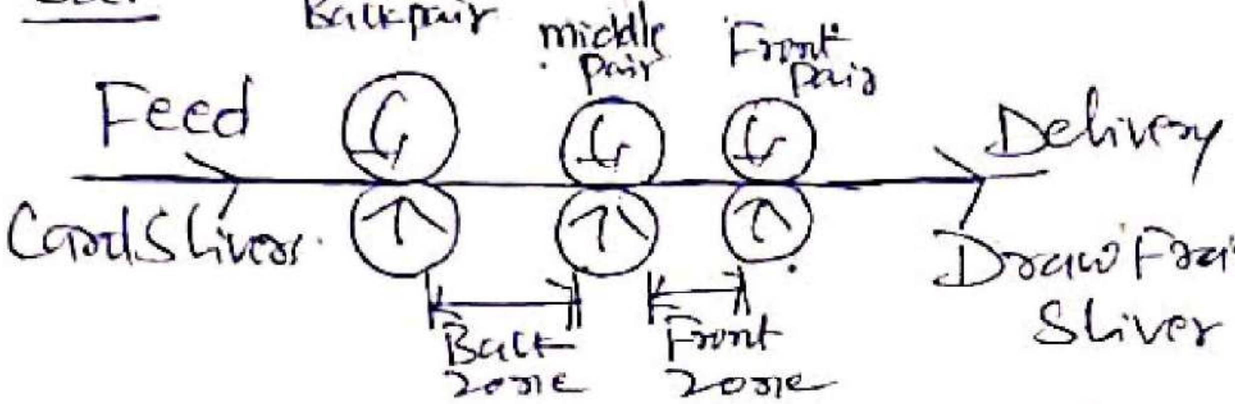
- Combining several Card Slivers (6 or 8) in the Creel Zone to nullify Variations. Resultant drawframe Sliver will be more uniform.

- Drafting is achieved between Pairs of drafting rollers by the Principle of Pullying action. During this action fibre will be Straightened and they are laid Parallel to each other..

Drafting

In drawframe, drafting is achived between Pairs of drafting rollers.

Ex:



Here the Surface speed of Successive Pairs of rollers are rotating faster than the preceeding pair of rollers.

Surface Speed of Front pair is > Surface speed of middle pair

Surface Speed of middle pair > Surface Speed of Back pair of roller

During these type of actions of roller, fibra are Pulled and get straightened and they lie parallel to each other This action is known as Drafting

PTO

Draft between Back-pair to middle pair is known as "Break draft"

Draft between middle pair to Front pair is known as Main draft

$$\text{Break-draft (Bd)} = \frac{\text{Surface speed of middle pair } (\pi d n)}{\text{Surface speed of Back pair } (\pi d n)}$$

$$\text{Main draft (md)} = \frac{\text{Surface speed of Front pair}}{\text{Surface speed of middle pair}}$$

Total draft (TD) is product of two.

$$\boxed{TD = Bd \times Md}$$

Types of drafting System in Draw Frame

① $4/4$ Conventional Graduated drafting System.

② $3/5$ Polar drafting System
— on DO/2S LR draw Frame

③ $4/5$ whitin drafting System
— on MMC draw Frame

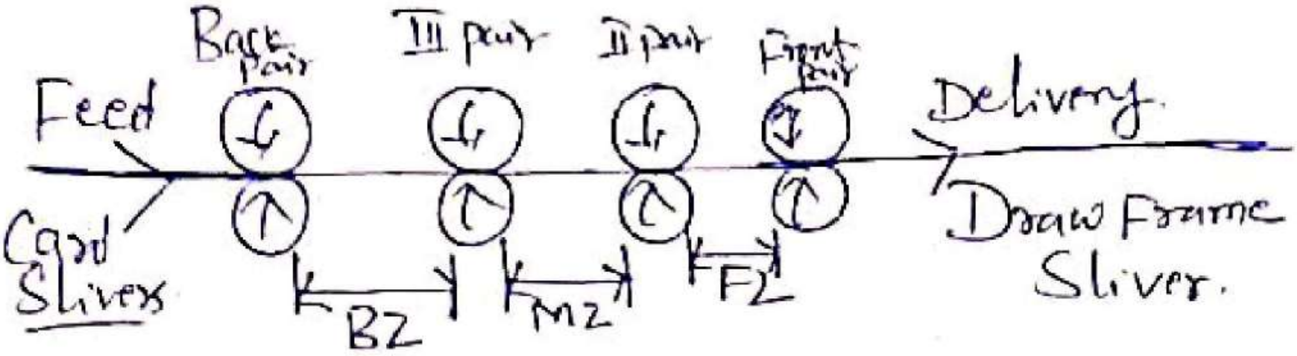
MMC – machinary manufacturing Company

④ $4/3$ drafting System on Twin delivery draw from of LMW Company

LMW – Lakshmi Machine works

PTO

① 4/4 Conventional (or) Graduated drafting System



BZ = Back Zone
MZ = Middle Zone
FZ = Front Zone

BZ = Break draft (Bd)
MZ = Tension draft (Td)
FZ = Main draft (md)

This drafting System is adopted on Conventional drawframe. Presently this System is outdated

PTO

Here 4 top rollers and 4 bottom rollers Bottom rollers are driven from Motor through pully and gear wheels. Top rollers are driven by the frictional Contact with the bottom rollers. and hence top rollers are loaded by some means.

Front pair Speed > II pair ;

II pair Speed > III pair

III pair Speed > Back pair

Draft in B2, m2 and F2 is known as Break draft, Tension draft and main draft respectively

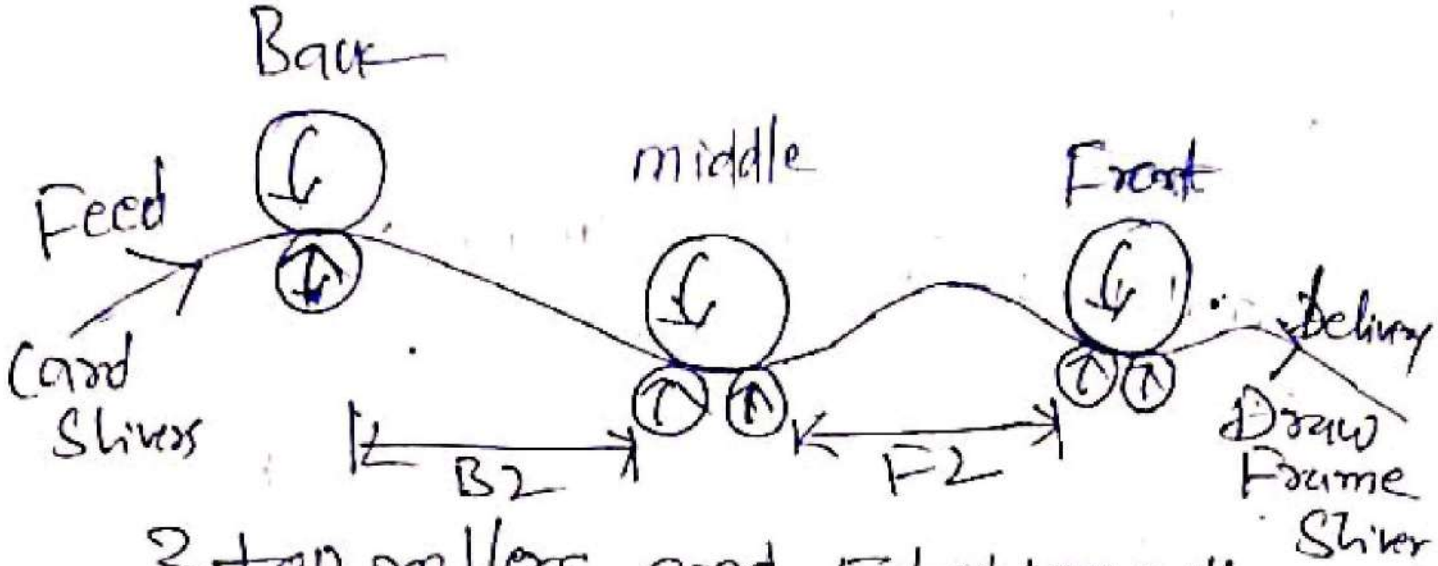
Total draft is the product of three drafts

$$\boxed{TD = Bd \times Td \times md}$$

TD = Total draft

PTO.

② 3/5 Polar drafting System.
This is adopted on LR.DO/2S draw Frame.



3 top rollers and 5 bottom roller Arrangement

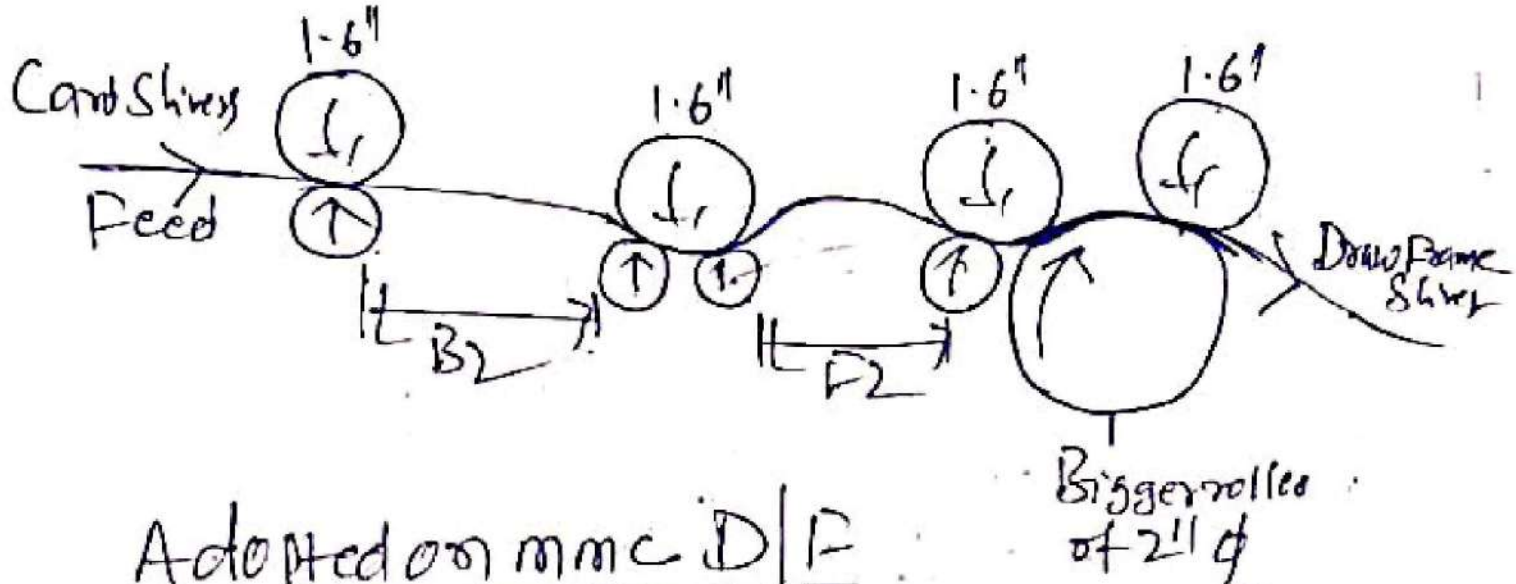
1/1, 1/2, 1/2 from back to Front

This is modern drafting System and Control the fibre effectively. In this type of drafting System, Delivery Speed can go up to 300mts/min

B2 = Break draft in Back zone
F2 = Maindraft in Front zone

$\boxed{T.D = Bd \times md}$

③ 4/5 whitin drafting System



Adopted on mmc D|F

Fibre Control is effective and fibre loss is minimized.

Total draft is the product of Bd and main draft

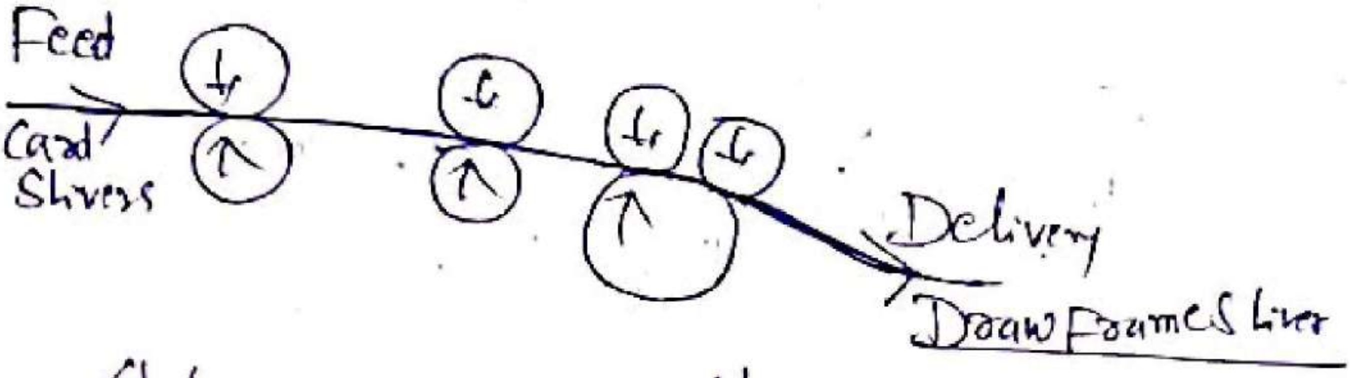
$$\boxed{TD = Bd \times md}$$

Arrangement 1/1, 1/2, 1/2 and 1/1

1/1, 1/2, 1/2 and 1/1 from back to Front

PTO

④ 4/3 drafting System



4/3 — 4 Top rollers
3 Bottom roller.

1/1, 1/1 and 2/1 arrangement
from Back to Front

Adopted on Twin delivery drawframe
of Lmw Company

Salient features

- Most effective drafting System
- Fibre Control is effective and
  fibre loss is Very minimum

PTO

In all the above drafting systems the draft can be calculated as

$$\underline{\text{Draft}} = \frac{\text{Surface Speed of delivery rolle}}{\text{Surface Speed of Feed rolle}}$$

$\boxed{\text{Ex}}$ Feed roller speed is 3960"/min
Delivery roller speed = 880 yards/min
Find the draft

$$\text{Draft} = \frac{\text{S.S. of dR}}{\text{S.S. of FR}}$$

$$= \frac{880 \times 36}{3960} = \frac{31680}{3960} = ⑧$$

Draft = 8

PTO

② If the Bd of drafting system is 1·3 and main draft is 5 times to that of break draft. Find the total draft

Bd = 1·3

Md = 1·3×5 = 6·5

TD = 1·3×6·5 = $\boxed{8·45}$

TD = 8·45

Draw frame is an important machine where Fibres are alligned parallel to each other & quality of sliver is improved.

usually 6 (or) 8 card slivers are combined in draw frame to produce 1 draw frame sliver which is known as Breaker sliver.

If 6 (or) 8 breaker slivers are combined to produce 1 drawframe sliver which is known as finisher sliver.

Doubling means combination of card (or)

Breaker sliver

This will Improve uniformity.

Drafting is usually carried out between pairs of rollers. which are known as Drafting rollers. These rollers are present in a zone known as "Drafting zone" where both top & bottom rollers are fixed. .

Top rollers are driven by frictional contact with bottom rollers & bottom rollers are driven from motor through pulley & gear wheels.

Top rollers are usually loaded by means of spring loading & pneumatic loading. Here load will be distributed uniformly across width of drafting system

<u>Roller setting</u>:- is one of the important factor to be considered for better performance of machinaries & also to produce quality and products.

Roller setting can be defined as distance b/w pairs of rollers. This distance depends on 2.5% span length or effective length of fibres.

$FQI = \frac{LSM}{f}$ HVI (High volume Instr

AFIS (Advanced fibre

Roller setting should always be carried out from front to back ∵ Front roller is fixed

Front zone

F Z – Narrow

B Z – wider

Calculations

$$\text{Draft} = \frac{\text{HK of sliver dd}}{\text{HK of sliver fed}} \times \text{doubling}$$

$$\text{Draft} = \frac{\pi dn \text{ of } dR}{\pi dn \text{ of } FR}$$

$TD = Bd \times Md$

$Dc = \text{Draft} \times DCP$ if DCP is driver.

$\text{Draft} = DC \times DCP$ if DCP is driven.

In Carding

$$AD = \frac{MD \times 100}{100 - w}$$

$$AD = \frac{MD}{1 - w\%} = \frac{MD}{1 - \frac{w}{100}} = \frac{MD}{100 - w} \times 100$$

AD is always > MD ∵ waste extraction.

In R/F. $MD = \dfrac{AD \times 100}{100 - Tc}$

Next sem.

Tc - Twist contraction.

MD is always > AD ∵ of Tc

- Production of D/F in Kgs per shift of 8 hrs at given η for 2 deliveries

$$= \underset{\text{Yds/min}}{\text{DS in}} \times \frac{1}{840 \times \text{Ne of dd sliver}} \times \frac{60 \times \text{shift} \times \eta \times}{2.205}$$

invariably - Regular

1) Find total draft of drawframe using following details.

Draft in BZ = 1.3

Draft in FZ = 300% of Draft in BZ

$$\begin{array}{r} 1.3 \\ 3.9 \\ \hline 5.2 \end{array}$$

Total Draft = Draft in BZ × Draft in FZ

~~= 1.3 * 0.39~~ =

= 5.2 × 1.3 = [illegible]

2) Find Hank of draw frame sliver dd in Ne & K. Tex if doubling is 8 and draft is 8.5 and Sliver fed is 0.14 Ne

$$\text{Draft} = \frac{\text{Hank of sliver dd}}{\text{Hk of sliver fed}} \times \text{doubling}$$

$$8.5 = \frac{x}{0.14} \times 8$$

$x = 0.14\ Ne$

$$kTex = \frac{590.5}{0.14 \times 1000} = 4.21\ kTex$$

3) Find total draft of draw frame if break draft is 1.4 & Tension draft is 1.6 & Main draft is 4.2.

Total draft = BD × TD × MD

= 1.4 × 1.6 × 4.2

= 9.4

Note:- Total draft is always product of Intermediate drafts (Multiplication)

⑤ Find production of draw frame in kgs/day at 98% efficiency if DS = 800 m/min & no. of deliveries is 2 & sliver delivered is 0.12 Ne.

$$= 800 \times 1.1 \times \frac{1}{8940 \times 0.12} \times \frac{60 \times 24 \times 0.98 \times 2}{2.205}$$

$$= \frac{11,174.60}{3} \text{ kg/Day}$$

$= 3724.8$ Kg/8 hrs

$= 465.6$ Kg/hr.

⑥ Find efficiency of draw frame from following particulars prodn/8hs for 2d = 3400 kg

DS = 1000 mts/min

Ne dd : 0.16 Ne.

$$3400 = 1000 \times 1.1 \times \frac{1}{840 \times 0.16} \times \frac{60 \times 8 \times \eta \times 2}{2.205}$$

$$\eta = \frac{3400 \times 840 \times 0.16 \times 2.205}{60 \times 8 \times 2 \times 1000 \times 1.1} = 0.95$$

$$\eta = 95.4\%$$

⑦ If 8 card slivers each of 3.5 k Tex is fed to Draw frame Calculate TD if delivered hank is 0.15 Ne.

$$\text{Draft} = \frac{\text{Hank of } \overset{\text{slives}}{DB}}{\text{Hank of sliver fed}} \times \text{doubling}$$

$$\text{Sliver fea} = \frac{590.5}{3.5 \times 1000} = 0.168 \text{Ne}$$

$$= \frac{0.15}{0.168} \times 8$$

$$= 7.14.$$

*/IMP

⑧ If D.S of draw frame is 800 m/min & feed roller speed is 110.4 yds/min what is draft of D/F.

$$\text{Draft} = \frac{\pi d n \text{ of } DR}{\pi d n \text{ of } FR} = \frac{\cancel{3.14} \times 800 \times 1.1}{\cancel{3.14} \times 110.4}$$

$$= 8$$

9) Find Hk of silver dd on drawframe from following particulars.

prodn / 8hrs at 98% efficiency = 2400 kg

2 deliveries. DS = 700 mts/min.

$$2400 = 700 \times 1.1 \times \frac{1}{840 \times Ne} \times \frac{60 \times 8 \times 0.98 \times 2}{2.205}$$

$$Ne = 0.162\ Ne$$

10) Find TD of draw frame using following data

DS = 999 mts/min.

MR speed = 172 mts/min

BR speed = 127 Yds/min.

~~TD = pdt of~~

$$BD = \frac{SS\ of\ MR}{SS\ of\ BR} = \frac{172 \times 1.1}{127} = 1.48$$

$$MD = \frac{SS\ of\ FR}{SS\ of\ MR} = \frac{999}{172} = 5.8.$$

$$TD = 1.48 \times 5.8 = 8.58$$

Module-5
Modern Developments in D/F

Modern Development in D/F has been focused on following points

① To increase the quantity of sliver and also to increase the production at R/F

2) To improve quality of Sliver and Yarn

3) To improve processing performance of machinaries

4) To provide safety measures in order to minimize industrial accidents

5) To create healthy working environment.

Quality & quantity are two faces of same coin. Both are equally required to run the industry effectively

Following are developments made on draw frame

① DS increased upto 1000 mts/min. i.e., 3000 kgs/shift of 8 hrs.

② Efficiency has gone upto 98% +

③ Improved D/S & L/S → Loading system
Drafting system

④ Signals are provided and limit switches for the indication of problems and to correct them.

⑤ Display board on Machine

⑥ Auto doffing system - to push the filled can out and to take in the empty Can

⑦ Autoleveller - Online monitoring device

⑧ CV% of Sliver is < 0.7%

~~Ex~~

~~Salient features of Modern D/F~~

* Present day drawframes

① Trutzschler D/F TD-03 Model

② Salient features:-

① 4/3 drafting System

② Pneumatic loading

③ DS upto 800 mts/min

④ production - 2000 kgs/shift

⑤ CV% < 0.7%

② Twin Delivery Draw frame (TDF)
(Lakshmi Machine works)

Salient features.

- Two -heads can be independently operated.
- Max delivery speed is 1000 mts/min
- All quality details are displayed on screen
- 4/3 drafting system
- Auto doffing

Preparatory process to comber

preparatory process is required to the comber because of following reasons

1) comber cylinder needles get damaged if card sliver is directly fed because of the fibres oriented in different directions.

2) There will be tremendous loss of good fibres if card sliver is directly fed.

3) comber need Narrow lap (NL) as its feeding material

④

The following are combination of preparatory process to the comber.

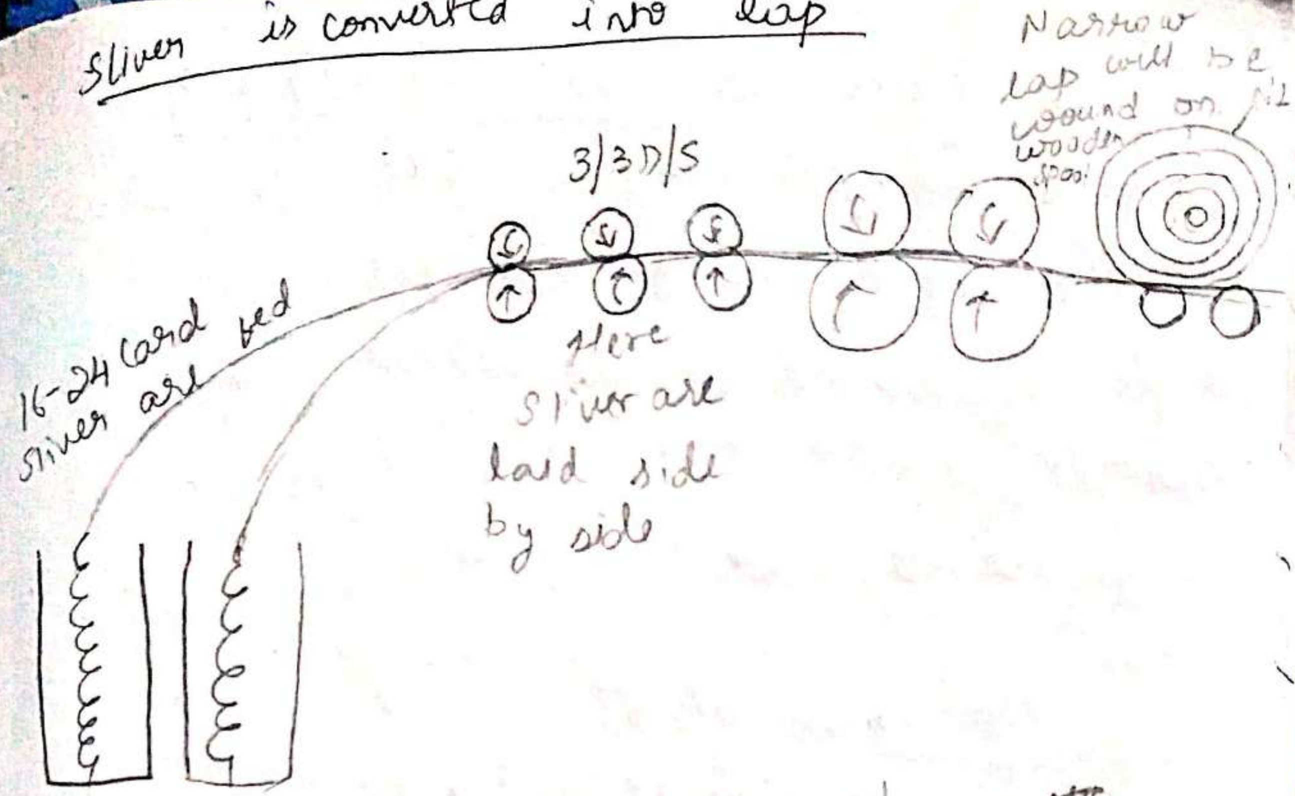
1) SLM - Sliver Lap Machine] Combination.
2) RLM - Ribbon Lap Machine

① one D/F passage] Combination
Lap former

1) In both the cases the no. of passages b/w card & comber is even only

① Sliver Lap Machine

Sliver is converted into lap



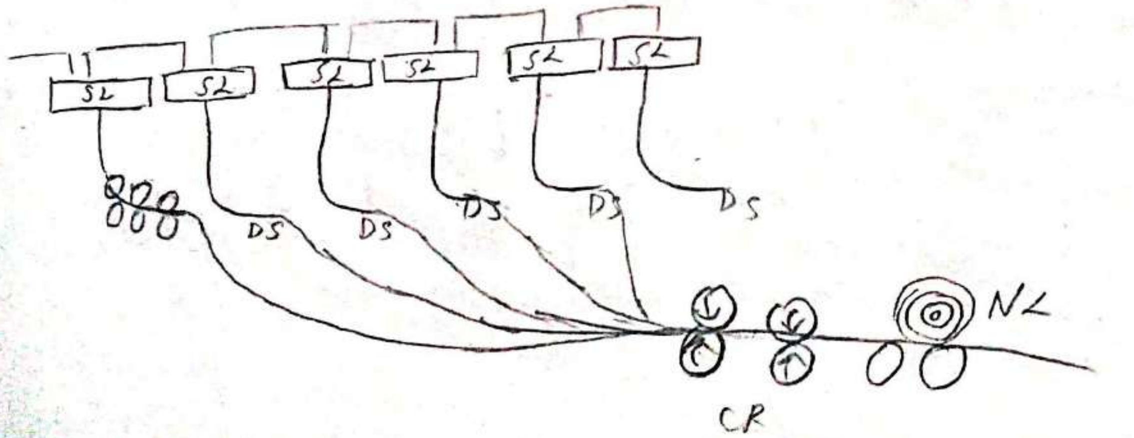
Narrow lap will be wound on ~~the~~ wooden spool

16-24 card slivers are fed and pass through, 3/3 drafting system where slivers are laid side by side in drafting system and finally calendered b/w pair of calender rollers & wound onto wooden spool.

This is known as narrow lap.

This lap is feeding material to ribbon lap machine.

② RLM:-



Here each head is having drafting system & after drafting all laps will be superimposed and colendered.
& finally wound on to wooden spool.
End product of RLM i.e., NL is feeding material to comber.

Pre comber draft

and its influence on the quality of sliver.

Draft is [illegible] the degree in which the material is attenuated (or) drawn out

Pre comb draft refer to draft given in the preparatory processes.

The draft given in SL & RL machine (or)
Sliver Ribbon
Lap lap

Draft given in drawframe & lap former is known as pre comb draft.

If draft given in SLM is 1.5 and given in RLM is 08. Then pre comb draft = 12 (1.5 × 8)

If draft given in drawframe is 8 and Lap forming is 2 Then the pcd = 8 × 2 = 16 ideal pre combed draft is <u>14-16</u> to make performance of comber better.

Precombed draft has direct influence on performance of comber if pre combe draft increase comber performance reduces

following are examples of hank of end products of different machines.

Hank of B/R Lap = 0.0012 to 0.0014 Ne (WL)

Hank of comber lap = 0.012 to 0.014 Ne (Narrow lap

Hank of Sliver (Card, Comber, D/F) = 0.12 to 0.14 Ne

Hank of speed frame Roving = 1.2 to 1.4 Ne

Count of Yarn at R/F = 12^s to 14^s Ne.

COMBER

Comber is an intermittant process which is used based on requirement of customers.

Following objects are achieved in comber

1) Narrow lap of fibres is firmly held by a pair of jaws known as Nippers.
2) Removal of <u>short fibres and neps</u> from the lap
3) Making the fibres to lie parallel to each other (Drafting)

4) Conversion of narrow lap into uniform sliver

Combing cycle

Combing cycle consists of the following

- cylinder combing - primary combing.
- Top combing - secondary combing
- Laying of just combed and already combed material
- Joining of Both
- Formation of sliver and laying of coils in can.

In this connection.

An Index wheel is provided on the comber head. This is graduated from 0 to 40 Based on index number positions, different objects are achieved.

viva.
∴ In comber cylinder speed is expressed in NPM
Nips/min

Detachment setting FE, NRE, Calculation, Development

1) Detachment setting :- Detachment setting is the distance between bottom nipper to the nip of front pair of detachment. when bottom ~~is at~~ nipper is at its forward position.

Detachment setting refer to the quantity of Noil to be extracted.

quantity of noil extraction is based on detachment setting

Noil extraction in comber vary from 10-25% depending on the quality of yarn required at Ring Frame.

FE and NRE

FE - Fractionating efficiency

An efficiency to extract short fibres present in the lap fed.

$$FE = \frac{\text{SF present in lap} - \text{SF present in sliver}}{\text{SF present in lap}} \times 100$$

FE - 60 to 70 % (Ideal)

NRE - Nep Removal Efficiency

$$NRE - \frac{\text{Neps in lap} - \text{Neps in sliver}}{\text{Neps in lap}} \times 100$$

Note: In spinning - B/R and card are Nep generating machine whereas comber is Nep removal machine

Calulations

production of comber in kgs per shif at given η = $\dfrac{\text{Lapfed/nip in yds} \times \text{NPM} \times \text{sliver dd in lbs/yd} \times 60 \times \text{shift} \times \text{Eff} \times \text{No of heads}}{2.205}$

1) Find production of comber in kgs/8hrs. at 80 % efficiency from following particulars.

Lapfed/nip = 5mm

cylinder speed = 300NPM

Lapfed - 600grains/yd

Noil extracted - 10 %

No. of heads - 8

Sliver dd =

1m = 1000mm
? = 5mm = 0.005m

1m - 1.1 yd
0.005 m = ?

Lapfed/nip = 0.0055 yds

Sliver dd = Lapsfed − Noil extracted

~~Noil extra~~

$= 600 - 60 = 540$ grains / Yd.

$= \frac{540}{7000}$ grains / Yd

$= 0.077$ lbs / Yds.

$$\text{Production} = \frac{0.0055 \times 300 \times 0.077 \times 60 \times 8 \times 0.80 \times 8}{2.205}$$

= ~~70.7 kgs~~

= ~~176~~ 161 kg.

$= 177$ kg

2) Find lap fed / nip in mm to comber from following particulars.

prodn / 8hrs at 85% η = 200kgs.

CS = 320NPM

lap fed = 30gm / mt

453.6g − 1lb

10g

NE = 12%.

~~Lap fed = $\frac{30 \times 10}{453.6 \times 1.1}$~~

Sliver dd = 30 − 3.6 = 26.4 gms / mt $= \frac{26.4}{453.6 \times 1.1}$

$= 0.052$ lb / Yd.

~~Production~~ 200 $= \dfrac{\pi \times 320 \times 0.052 \times 60 \times 8 \times 0.85 \times 8}{2.205}$.

$= \underline{\underline{0.0079}}$ yds.

ST-I 18TX33 22/12/2020 ①

Study of Long and Short creel draw frames

Difference between Long and Short creel draw frames

Long creel Draw Frame	Short creel draw Frame
① Do/2S LR D/F	1) MMC D/F
② only one sliver can be fed through each head	2) Two slivers can be fed through each head.
③ occupy more space	③ occupy less space
④ ~~a~~ Less number of frames/Tenter	④ More number of frames/Tenter
⑤ Quality is good	⑤ Quality is Good.

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Spinning Technology-I

Bercolisation, scouring, Buffing. ~~roll~~ and Shore hardness refer to top rollers of drafting system.

Bercolisation — Mild HCL treatment to top roller to remove dust collected and also to allow air in to cool the rollers.

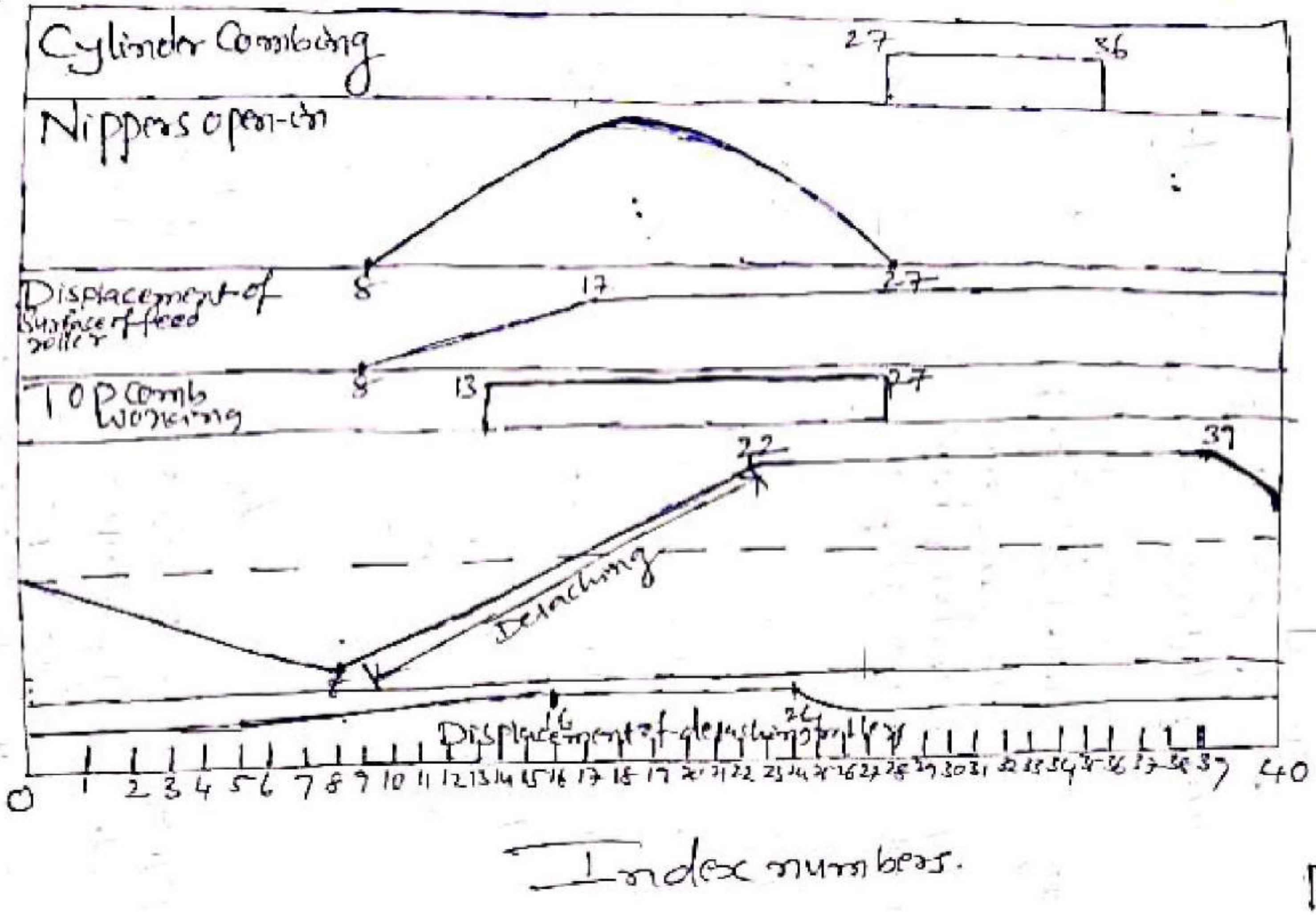
Scouring — Removing fatty matter
Alkali treatment (NaOH)
(Chemical treatment)

Buffing - Mechanical treatment to remove one thin layer from the top roller

Shore hardness — Hardness is measured in terms of degree. It is usually 80'

Roller Eccentricity — Levelling of ~~Top rollers~~. Bottom roller

②



Cylinder Combing
27
36
Nippers open-in
8
27
Displacement of surface of feed roller
8
17
27
Top comb working
8
13
27
22
37
Detaching
8
16
24
Displacement of detaching roller
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
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38
39
40
Index numbers.

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The Complete Combing Cycle Can be explained. with the help of graphical representation through Index numbers

Index wheel is graduated from 0-40

All the operations of Comber is controlled by Index wheel only

Index NO	Operations
27-36	Cylinder needles Combing ie primary Combing
~~39-5~~ 13+27	Top Comb working
6-7	Feed roller movement
13-19	Detaching of Combed fringe
39-5	Already Combed material will overlap with just Combed material
39-8	Length of lap forwarded/nip. (Usually 1·6")
27	All parts occupy same position and Cycle repeats

Gauges used to set the diffrent parts of Comber

1)

Cylinder to detaching roller Setting

for effective primary Combing

2)

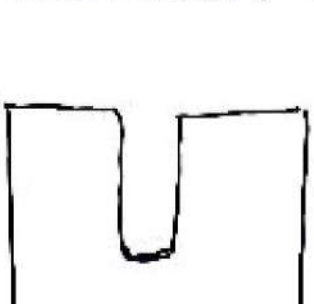
Step gauge

Distance betn bottom nipper to the nip of first pair of detaching roller

"Detachment Setting"

To decide the Quantity of Noil to be extracted.

③

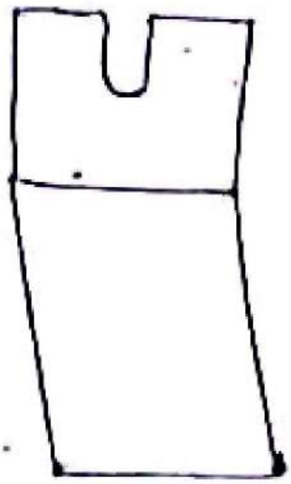


1/32" Trowel gauge

Leather Covered detaching roller to the Top Comb.

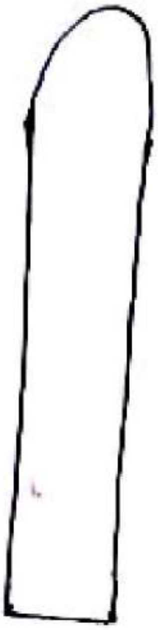
– Effective Secondary Combing

$\frac{25''}{1000}$ Trowel gauge



Nipper Knife to Cylinder needle

A TO achive Effective combing



$\frac{6''}{1000}$ Leaf gauge

TO Set the depth of Top Comb.

Connected to Nail extraction.

Modern Developments in Comber

Following are the Modern Developments in Comber

① Lighter Nippers for easy handling

② 'Uni Comb' to cylinder for effective extraction of Short fibres

③ Cylinder Speed has gone up to 400 NPM

④ Aspiratory System for extraction of Noil

⑤ Bi Coil arrangement for laying of Sliver Coils

⑥ Production has gone up to 30 kgs/hr

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Salient features of Modern Comber

- Uni Comb (or) Half Comb to Cylinder Surface for effective extraction of Short fibres and also to remove Leading hooks from Comber
- Cylinder Speed is >400NPM
- Centralised Noil extraction System
- Automatic Doffing System.
- Increase in the Quantity of Production and remarkable improvement in the Quality of Sliver.