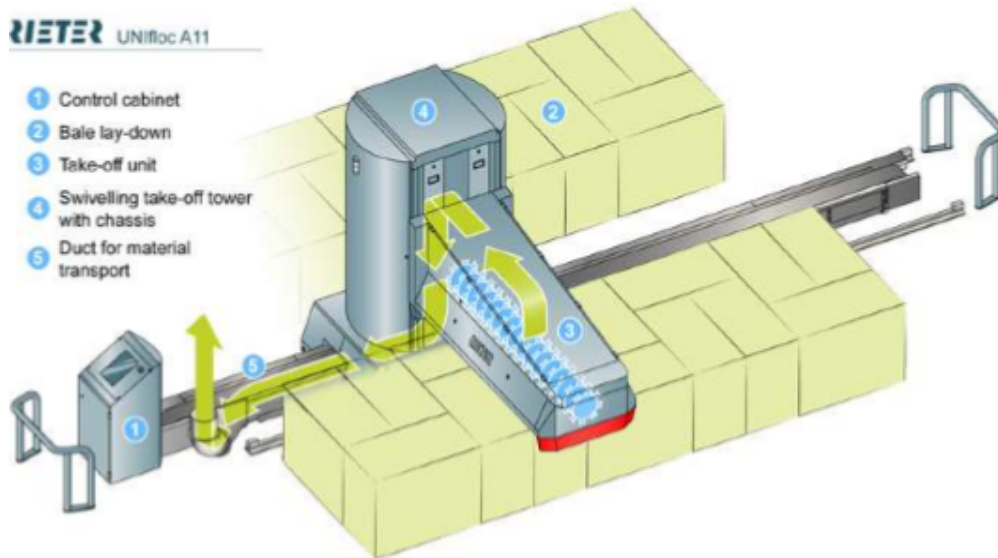


Spinning and ginning operation

Level-II

Based on March 2022, Curriculum Version 1



Module Title: - Performing spinning preparatory

Operations

Module code: IND GSO2 M05 0322

Nominal duration: 100 Hour

Prepared by: Ministry of Labour and Skill

August, 2022

Addis Ababa, Ethiopia

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Acknowledgment

Ministry of Labor and Skills wish to extend thanks and appreciation to the many representatives of TVET instructors and respective industry experts who donated their time and expertise to the development of this Teaching, Training and Learning Materials (TTLM).

Acronym

OHS: occupational health and safety

TTLM: Teaching, training learning material

TVET: technical and vocational education and training

PPE: personal protective equipment

EHS: environmental health and safety

LAP: learning activity performance

SOP: standard operating procedure

Introduction to the Module

In textile ginning and spinning field; the pre spinning operation helps to know the production steps and operation of pre spinning machineries to ensure the desired outcomes are performed as per the requirements for the standard quality production of spinning process.

This module is designed to meet the industry requirement under the spinning and ginning occupational standard, particularly for the unit of competency: setup and load machine and operate and control machines.

This module covers the units:

- Set up and load machine
- machines Operation and control

- product quality
- Complete operations

Learning Objective of the Module

- Apply set up and load machines
- Carry out operations and controls of machines
- Check The product quality
- Completing the pre spinning operation

Module Instruction

For effective use this modules trainees are expected to follow the following module instruction:

1. Read the information written in each unit
2. Accomplish the Self-checks at the end of each unit
3. Perform Operation Sheets which were provided at the end of units
4. Do the “LAP test” given at the end of each unit and
5. Read the identified reference book for Examples and exercise

Unit one: Set up and load machine

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

- OHS practices
- Production specifications
- Machine settings and adjustment
- Spinning preparatory machine operation
- Material defects

This unit will also assist you to attain the learning outcomes stated in the cover page.

Specifically, upon completion of this learning guide, you will be able to:

- Apply OHS practice
- Follow production specifications
- Determine and apply machine settings and adjustments
- Understand and apply spinning preparatory machine operation
- Determine material defects

1.1 OHS practices

1.1.1 Occupational Health and Safety

Occupational health and safety hazards during the operational phase of textile manufacturing projects primarily include the following:

Respiratory & Dermal contact hazards

Dust: Exposure to fine particulates is mainly associated with natural fibers and yarn manufacturing processes. Cotton dust is generated during the handling or processing of cotton and contains cotton fibers and other potential chemical and microbiological contaminants (e.g. bacteria, fungi, pesticides, and herbicides). Exposure to cotton dust can generate respiratory hazards.

Prevention and control of occupational health and safety hazards relevant to natural fiber dust include the following

- Installation of dust extraction, recycling and ventilation systems to remove dust from work areas, especially in cotton mills;
- Use of vacuum cleaning of surfaces instead of compressed air “sweeping” techniques;
- Implementation of regular housekeeping procedures, especially in the “flocking” area; Use of mechanical methods to handle cotton and cotton waste;
- Use of personal protective equipment (PPE) for exposed workers, such as masks and respirators, as necessary.

Physical Hazards

Activities related to the maintenance operations of industry- specific equipment (e.g. blow room cards, spinning machinery) may expose workers to physical impacts, particularly with reference to hot surfaces and moving equipment. Prevention and control of these impacts include the implementation of general protection measures (e.g. machine guarding and lock-out-tag-out systems and procedures), as described in the **General EHS Guidelines**.

Heat

The most significant risk of exposure to heat and high humidity occurs during wet processing and dry finishing operations and is caused by the use of steam and hot fluids in these processes.

Prevention and control recommendations are presented in the **General EHS Guidelines**.

Noise

The main sources of noise in textile plants are associated with yarn processing (e.g. texturizing and twisting and doubling) and woven fabric production. Noise management, including the use of personal hearing protection, is described in the **General EHS**

Guidelines.

Personal protective equipment

Protective equipment = tools to do the job

Protective equipment, including personal protective equipment for:

- Eyes,
- Face,
- Head, and extremities,
- Protective clothing,
- Respiratory devices, and
- Protective shields and barriers,

Shall be provided, used, and maintained in a sanitary and reliable condition

Wherever it is necessary by reason of hazards of processes or environment

1.1.3 Safe material handling

Material handling can be defined as: art and science of conveying, elevating, positioning, transporting, packaging and storing of materials Starting from the time, the raw material enters the mill gate and goes out of the mill gate in the form of finished products; it is handled at all stages within mill boundaries such as within and between raw material stores, various section of production department, machine to machine and finished product stores. A material may be handled even 50 times or more before it changes to finished product. It has been estimated that average material handling cost is roughly 10-30% of the total production cost depending upon product to process. By saving in the material handling cost, the cost of production can be reduced considerably. Material handling involves the movement of materials, manually or mechanically in batches or one item at a time within the plant. The movement may be horizontal, vertical or the combination of these two.

Material movement adds to the cost but not to the product value. The ideal mill would have an absolute minimum of materials handling and more use of mechanical material handling equipment's. The shortage of labour and increasing wages cost demand the most efficient use of labour.

Proper material handling offers benefits for:

- i. Improving productivity
- ii. Increasing the handling capacity
- iii. Reducing man-power
- iv. Increasing the speed of material movement
- v. Reducing materials wastage

- vi. Promoting easier and cleaner handling
- vii. Eliminating idle time of machines, equipment and workers
- viii. Reduce fatigue incurred by the workers
- ix. Increasing safety and minimizing accidents
- x. Locate and stock material better and in less space
- xi. Minimizing production cost, etc

Functions of material handling section

There are basically two functions of material handling section:

1. To select production machinery and assist in plant layout so as to eliminate as far as possible the need of material handling. For examples: in a spinning mills chute feed cards, open end spinning machine, auto-doffing ring frames and autoconer etc. reduce the material handling activities hence material handling cost.
2. To choose most appropriate material handling equipment which is safe and can fulfill material handling requirements at the minimum possible overall cost. For example: Air conveyor pipes in within the blow-room and between blow-room and cards, big size plastic container trolley for handling ring frame bobbins, cones and fabrics in a textile mill

Principles of material handling

In general, principles of material handling are as under:

- i. Minimize the movements involved in a production process.
- ii. Minimize the distance moved by adopting shortest routes.
- iii. In order to speed up the material movements, employ mechanical aids in place of manual labour.
- iv. For moving optimum number of pieces in one unit; use the principles of containerization, unit load or pillarization.
- v. Appropriate, standard, efficient, effective, flexible, safe and proper sized material handling equipment's should be selected.
- vi. In order to minimize back tracking and duplicate handling; change in sequence of production operations.
- vii. If possible, utilize gravity for assisting material movements wherever possible.
- viii. To reduce damage to the materials during handling and economize material handling process; design trolleys, packages, containers and drums etc.

- ix. Handling equipment's are so arranged that these should minimize distances moved by products and at the same time handling equipment's should not interfere with other machine or operation
- x. To avoid any interruption in handling; material handling equipment's should periodically be checked, repaired and maintained.

Selection of material handling equipment's

There are two most important aspects for analyzing or solving a material handling problem is: engineering aspect, and economic aspect. Engineering factors include: the condition of existing building and plant layout, production processes and equipment's, nature of materials and products to be handled, usefulness and effectiveness of existing material handling equipment. The economic factors include the cost of material handling equipment, operating costs, repair and maintenance costs and taxes etc. The choice of particular equipment depends upon specific requirements or the condition of an industry.

- For selection of Material handling equipment, the following factors should be taken into account:

i) Type/shape of materials to be transported:

The size of material, its shape, weight, delicacy and its chances of getting damaged during handling etc. should be considered.

ii) Mill building and layout

: The route of material movement, width of doors and aisles, inequality in floor levels, height of the ceiling, strength of floor and walls, columns and pillars etc. to a great extent influence the choice of a material handling equipment's.

iii) Machine production

Different machines have different outputs per unit time. The material handling equipment should be able to handle the maximum output.

iv) Type of material flow pattern:

A horizontal flow pattern will need trucks, overheads bridge cranes, conveyors etc, whereas a vertical flow pattern will require elevators, conveyors, pipes etc.

v) Types of production:

The selection of the material handling equipment's depends a great extent on type of production such as: mass production and batch production. Conveyors are more suitable for mass production on fixed routes and powered trucks for batch production.

vi) Other factors

Some other factors also considered during selection of material handling cost are: cost of material handling equipment, handling costs, life of the equipment and amount of care and maintenance required for the equipment.

Ergonomic arrangements of work place

Definitions of ergonomics

- Ergonomics is a means of improving working conditions and reducing illness at work
- Ergonomics attempts to 'Fit the Job to the Man' rather than 'Fit the Man to the Job'
- Ergonomics is concerned with the design of systems in which people carry out work
- Ergonomics optimizes Efficiency, Health, Safety and Comfort of people through better designs of products and work places

Basic aims of ergonomics

Efficiency in purposeful activity

To achieve desired result without

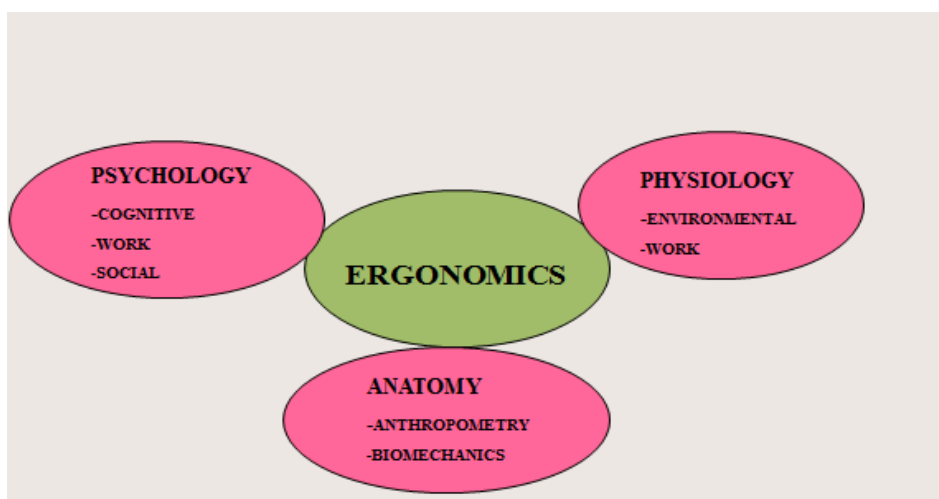
- ✓ Waste
- ✓ Error
- ✓ Damage to persons

Working situation in harmony with the activities of the worker

Ergonomics and Disciplines

- ✚ Ergonomics is a Multi-Disciplinary Science
- ✚ Ergonomics is also an Inter-Disciplinary Science

Disciplines in ergonomics



Ergonomic needs in a workplace

- ❖ **Physical work environment**

Thermal comfort

Noise and vibration control

Adequate and proper lighting

❖ **Chemical environment**

Control of pollution

General and exhaust ventilation

❖ **Work physiology**

Control excessive physical load

Avoid physical and muscular fatigue

Adequate rest pauses

Arrangement of static and dynamic work

❖ **Anthropometry (Body sizes)**

Designs to fit body sizes of users

Appropriate working levels

Adequate work space

Avoid overcrowding of machines and workers

❖ **Occupational Biomechanics**

Appropriate work postures (sitting, standing)

Safe load lifting and carrying techniques

Adopt proper techniques in manual materials handling

❖ **Safety and Ergonomics**

Good housekeeping

Performance feedback

❖ **Systems ergonomics**

Systems groups in problem solving and development work

Participative ergonomics

User centered designs

❖ **Benefits of ergonomics**

Productivity

Product quality

Safety

Health

Reliability

Job satisfaction

Personal development

1.1.5 Safe storage of equipment's

Storage facilities

These should be designed for protection of stock ease of access minimum use of floor space accommodation of quantities to be stored.

Some of the commonly applied types are

- Shelves and bins
- Movable bins
- Racks
- Portable facilities
- Flammable liquids chemicals separate storage facilities for each

Storage conditions

- ✓ Temperature
- ✓ Security
- ✓ Organization
- ✓ Containers

Avoid placing on the floor

- Save space by introducing by mult-level racks

Provide a “home” for each material

- Allocate a special permanent place a holder or a container for each tool or work item.

Housekeeping and environmental practices

Management and keep up of facilities according to workplace procedures and standards.

Implementing housekeeping activities

- Cleaning schedule
- 5s and OHS practices
- Waste disposal
- Regular inspection

1.2 Production specifications

1.2.1 Identify necessary specification for product

The specification is probably the easiest section of design products, if all the products has been carried out. The specification draws on the information collected and presented during the production time. The specification is a number of straight forward statements, made

clearly outlining the nature of the project to be designed and manufactured. Specifications are checked to identify requirements for production.

Specification considerations

The following elements need to be considered when producing a specification:

- **Form**-what shape should the product be?
- **Function**-what does the product need to do?
- **User requirements**- what does the target market need/want?
- **Performance requirements**- what properties does the product need to do its job?
- **Materials and components**- what will the product be made from?
- **Scales of production**- how many do you need to produce?
- **Budget**- how much money is available for materials and production?
- **Sustainability**- how can the products impact on the environment be reduced?

A product specification includes

- **A written description** including components and raw materials , quantities and amounts.
- **Samples** of raw materials, components and colours
- **Sizing details** of all different elements
- Appropriate **user instructions** and **aftercare information**.

1.3 Machine settings and adjustment

Adjust machine setting for product requirement

Machine settings are adjusted to meet product requirements. Safe working practices are understood and implemented. Machine is set in accordance with defined procedures. Machine is adjusted to meet specifications and operational requirements and first-off samples are measured for compliance with specifications.

Machines may include:-

- bale pucker
- opener
- blender

- card
- draw frame
- lap former
- comber
- roving frame

Machine is started and stopped in accordance with manufacturer requirements. Machine operations are monitored to ensure correct operation. Waste is sorted according standard procedure. Machine is cleaned when required. Product process and machine faults are identified and corrected where necessary to meet specified requirements:-

Setting of machines according to product requirements like:-

- count
- twist
- Ply
- Tension
- Weight
- Lubrication
- twist direction
- strength
- extension

1.4 Spinning preparatory machine operation

The preparatory operations are:-

1. Bale opening
2. Cleaning
3. Blending
4. Mixing
5. Dust removals
6. Preparation of feed for the next stage

These operations of pre spinning process are briefly discussed in the next chapter

1.5 Material defects

Major material faults are reported

- Defects in Lap and Sliver
- uneven lap
- wrong count
- contamination piecing defect
- immature raw materials
- produced beyond the requirements or specification products like sliver and roving

Self check-1

Test I: short Answer writing

Instruction: write short answer for the given question. You are provided 3 minute for each question and each point has 5Points.

1. What are the pre spinning machines? (5 points)
2. Why we apply OHS before performing every activity (5 points)
3. List some of the product specification (5 points)
4. Describe the processes of pre spinning operation? (5 points)

Note: Satisfactory rating – above 60% Unsatisfactory - below 60%

You can ask you teacher for the copy of the correct answers

Operation sheet-1

OPERATION TITLE: Set up and load pre spinning machines.

Instruction: Use the given, the tools and equipment, machineries set up and load machines. For this operation you have given 1Hour and you are expected to provide the operation

PURPOSE: To understand and perform about the way of setting and loading pre spinning machines.

EQUIPMENT TOOLS AND MATERIALS: safety tools like glove, goggle safety boot, etc bale pucker machines, opener machines, blender machines, card machines, draw frame machines.lap former machines, comber machines, roving frame machines

PROCEDURE:

Step1: Follow the steps for machine setting

Step2: Follow standard procedure of machine set

Step3: Set up the machines according to specification and manufacturer requirement

Step4: Load raw materials

Step5: Start machines properly

Step6: clean the area and handle the waste properly

PRECAUTIONS:

Use of proper OHS materials

- Operational workplace activities
- Restricted space

- Hazardous, controlled or exposed conditions

QUALITY CRITERIA:

The machines are set up and load properly as per the specification.

Lap Test-1

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, workshop, tools and materials you are required to perform the following tasks

Task 1: Identify necessary specification for product.

Task 2: Set up and operate pre spinning machine according to the specification

Task3: Load the product according to the specification

Unit Two: Operate and control machines

This unit to provide you the necessary information regarding the following content coverage and topics:

- Operation of Blow room
- Operation of Carding
- Operation of drawing (breaker and finisher)
- Operation of lap former
- Operation of comber
- Operation of roving frame
- Monitoring pre- spinning machine operations
- Sorting waste
- Minor and major product process and machine faults

This guide will also assist you to attain the learning outcomes stated in the cover page.

Specifically, upon completion of this learning guide, you will be able to:

- Operate blow room operation
- Operate carding machine
- Operate draw frame machine and operation
- Operate lap former
- operate combing machine
- Operate roving frame
- Monitor pre spinning machine operations
- Understand the minor product process and machine faults
- Sort the pre-spinning wastes

2.1 Operations of Blow room

2.1. 1 Blow Room

The blow room is the first stage or the first process in the short staple mechanical spinning processing sequence. The name 'Blow Room' is given to this stage because of the air currents that are commonly used for blowing the fibrous mass and dust during the processing of fibers.

In the blow room the fiber mass is progressively opened, cleaned and mixed. This is done by using a large number of machines. In each of these machines used in blow room if the actions are too severe or sudden then fiber damage will occur.

2.1.2 Functions of Blow Room

Fiber Opening: The tightly packed fiber bales received from the ginning mills have to be opened by opening out the larger fiber lumps into smaller tufts and ultimately opening out the smaller tufts into individual fibers.

Cleaning: All the natural fibers including cotton have considerable amount of impurities present along with them which have to be removed in order to produce a clean yarn.

Mixing/Blending: The properties of the cotton fibres differ from each other from bale to bale and from fibre to fibre because of the natural variations. Therefore, in order to obtain a homogenous and consistent quality yarn, these fibres need to be thoroughly mixed together. Sometimes, in order to have a desired quality at the right price high quality cotton fibres are purposely mixed with low quality fibres.

Preparation of feed for the next stage: The end product of the blow room that is the blow room output should be compatible with the next stage of spinning i.e. carding. The feed to the carding can be either given in the form of lap or in direct fibrous tufts through the chute feeding system.

2.1.3 Blow Room Machinery

In the blow room, all the above functions have to be achieved efficiently and effectively without much wastage and fibre damage. For this purpose various different types of machines are used.

Based on the nature of functionality of these machines, they are classified into five types:

1. Bale Opening Machines
2. Mixing Machines
3. Cleaning Machines

4. Dust Removing Machines

5. Recycling Machines

For these machines to perform optimally, they must be located at specific positions in the blow room line. The modern cotton blow room line can be divided into six distinguished zones based on this purpose.

1. Bale Opening Zone
2. Coarse Opening & Cleaning Zone
3. Mixing/Blending Zone
4. Fine Opening & Cleaning Zone
5. Intense Opening & Cleaning Zone
6. Card Feed Preparation Zone

In case the cotton to be processed has less impurities, then the Zone 5 (intense opening & cleaning) may not be necessary. Furthermore, the Zone 4 (fine cleaning) or the Zone 5 (intense opening & cleaning) and the Zone 6 (card feeding) can be combined together to form a single unit.

The additional operation of dust removal is not associated with any single zone; in fact dust removal is carried out at a greater or lesser extent at every machine of the blow room.

Bale Conditioning

The cotton fibers from the ginning factories are received by the spinning department in form of highly compressed bales that are wrapped by metal or plastic straps. As the bales are received these straps are cut off and the bales are allowed to be conditioned for 24 hours in controlled temperature and between 60% to 80% relative humidity. For this purpose all the spinning mills specifically allocate some floor space for conditioning purpose. This conditioning allows the fibers to relax and maintain a temperature and moisture equilibrium with atmosphere and this reduces the chance of fiber damage and inconsistency in quality.

Bale Lay Down

After the bales are conditioned properly, they are taken to the blow room and placed in groups of special sequence for the first processing stage. This group of bales thus positioned is called as bale lay down. The main aim of a proper bale lay-down is to have fibres with similar properties and spinning attributes from lay-down to lay-down so that spinning machines can be adjusted optimally so that a yarn of consistent quality can be produced over a longer period of time.

Zone-1 (Bale Opening Machines)

After proper bale lay-down, the initial bale feeding is done either by using a parallel set of machines called as hopper feeders or by a single machine called as a bale plucker.

Nowadays, the most popular and modern machine for feeding raw cotton fibers from the bale is the bale plucker. In the following Figure 2.1, the Reiter Uniflock Bale plucker is shown.

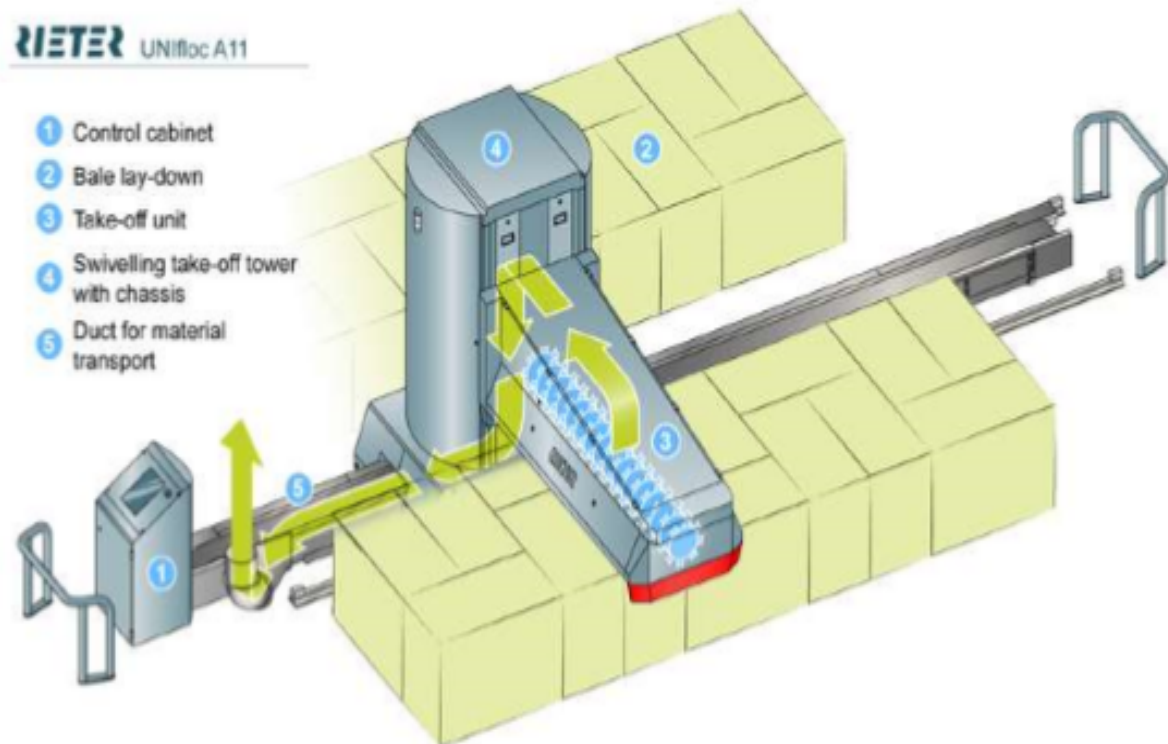


Figure 2.1 Rieter Uniflock, Bale plucker (top feeder)

The bale pluckers are fitted with a travelling head that moves over and past the bale layout and pluck out fibers from top to bottom. They have a great advantage that more than one bale can be processed simultaneously to give a better long term blend. These machines are fitted with computerized control panels and they pluck out the fibrous material from all the bales evenly.

The production rates of such modern bale openers ranges from 750 kg/hour to 1000 kg/hour

The hopper feeders and the bale pluckers should perform the following functions:

- Extract material evenly from bales.
- Open the fibrous material gently.
- Open the material up to smallest tufts.
- Form tufts of equal sizes.
- Process many bales possible in a single charge.
- Easily programmable.

- Blend fibres at the start of the process.

All the bale opening machines not only feed the raw fibres but also do the tuft opening. This opening actually starts from the point when these feeders start plucking the fibres for an initial feed (schematic representation) as shown in figure 2.2 below:

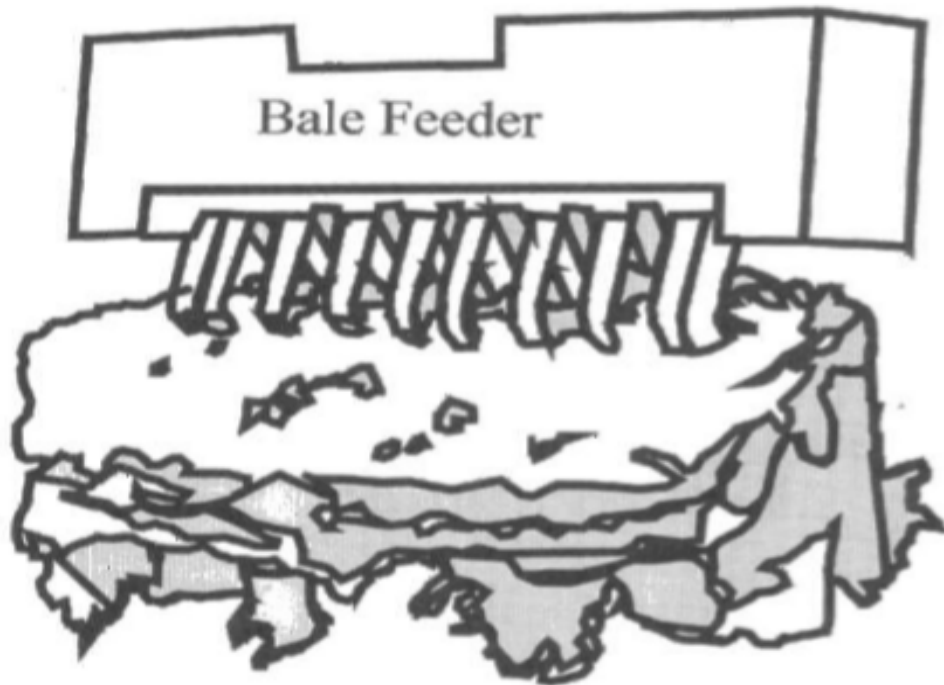


Figure 2.2 Diagrammatic representation of bale pluck in

Zone-2 (Coarse Cleaning Machines): The coarse cleaning machines directly get their feed from the bale plucker. The striking and beating elements in this zone are widely spaced and hence the opening of the fibres is also very minimal. The main purpose of these machines is to open up the mass of fibers into large tufts which are then converted into smaller tufts by using more intense opening and cleaning machines in the next zones. The machines in these zones are sometimes not even fitted with cleaning devices or even if these cleaning devices are present, they can only remove a fraction of the impurities.

Different machine manufacturers have developed different types of coarse cleaning machines.

The most commonly used ones are:

Uni-Cleaner

The uni-cleaner or the mono-cylinder cleaner relies on the use of a single beater drum having its surface covered with spikes. The fiber material enters the machine from one side due to a suction effect produced at the other side of the machine. To ensure that fibers may not pass the exit pipe untreated by the beater, the following arrangement is done:

The hood of the machine around the beater is designed in three parts in such a way that the fiber mass is forced to fall back into the region of the beater after being beaten by the beater. In this way the fibers are forced to circulate the beater many a times in a cycloid route to give required opening and cleaning.

The exit opening of the machine is kept higher than the in-feed opening of the machine so that it also ensures that only the smallest tufts can pass straight through but the bigger tufts are always subjected to the beating action of the beater. The schematic arrangement is given in Figure 2.3

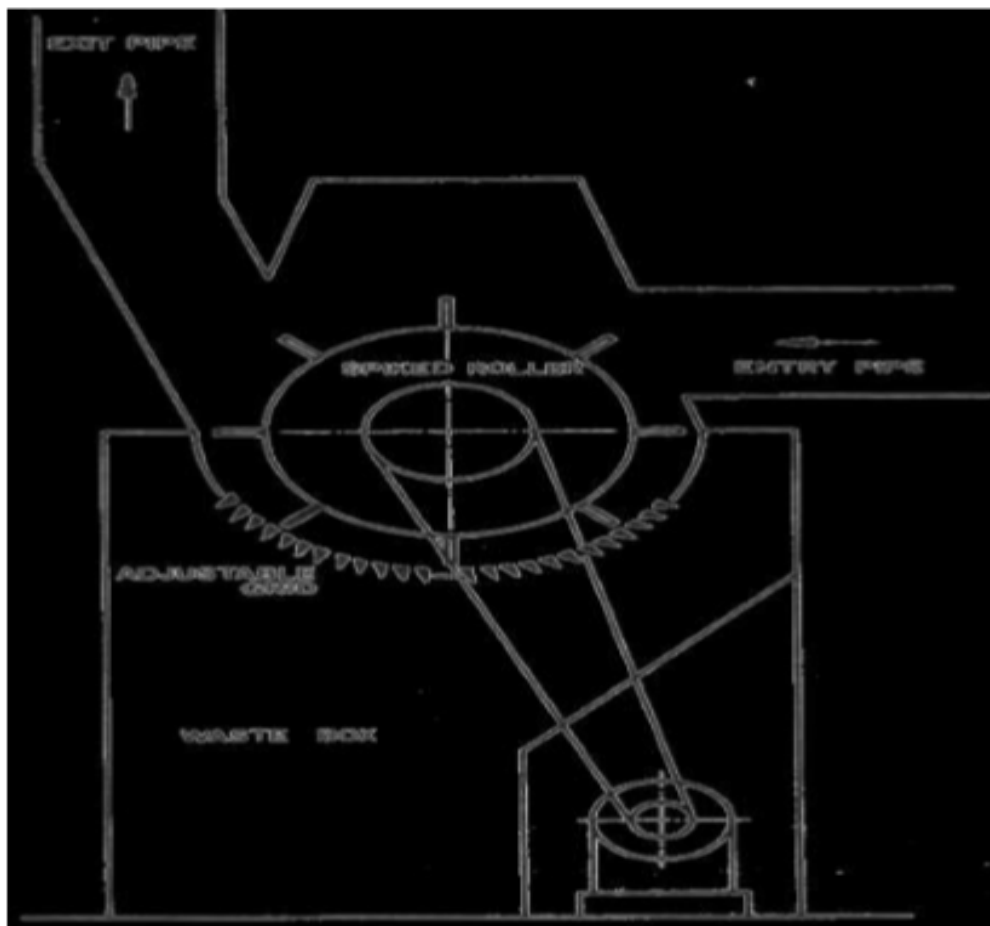


Figure 2.3 Cross sectional view of Rieter Mono-cylinder cleaner

Zone 4 (Blending/Mixing Machines)

The Uni-mix the uni- mix is a combination of both blending and cleaning machine and both of these two operations are carried out within the single machine. The machine can be divided into three sections namely:

- Storage Section
- Intermediate Chamber
- Delivery Section

The fibers are pneumatically fed into six individual vertical storage chambers of the machine. The fibers coming out of each of the six chambers are then taken on a common lattice or a conveyer belt that takes the fibrous material to an intermediate chamber with the help of an inclined or upright lattice. From here the material passes through a delivery section to the next machine with the help of a pneumatic suction. In the delivery section, a cleaning roller is used which does the coarse cleaning of the fibers as they are being delivered to the next machine.

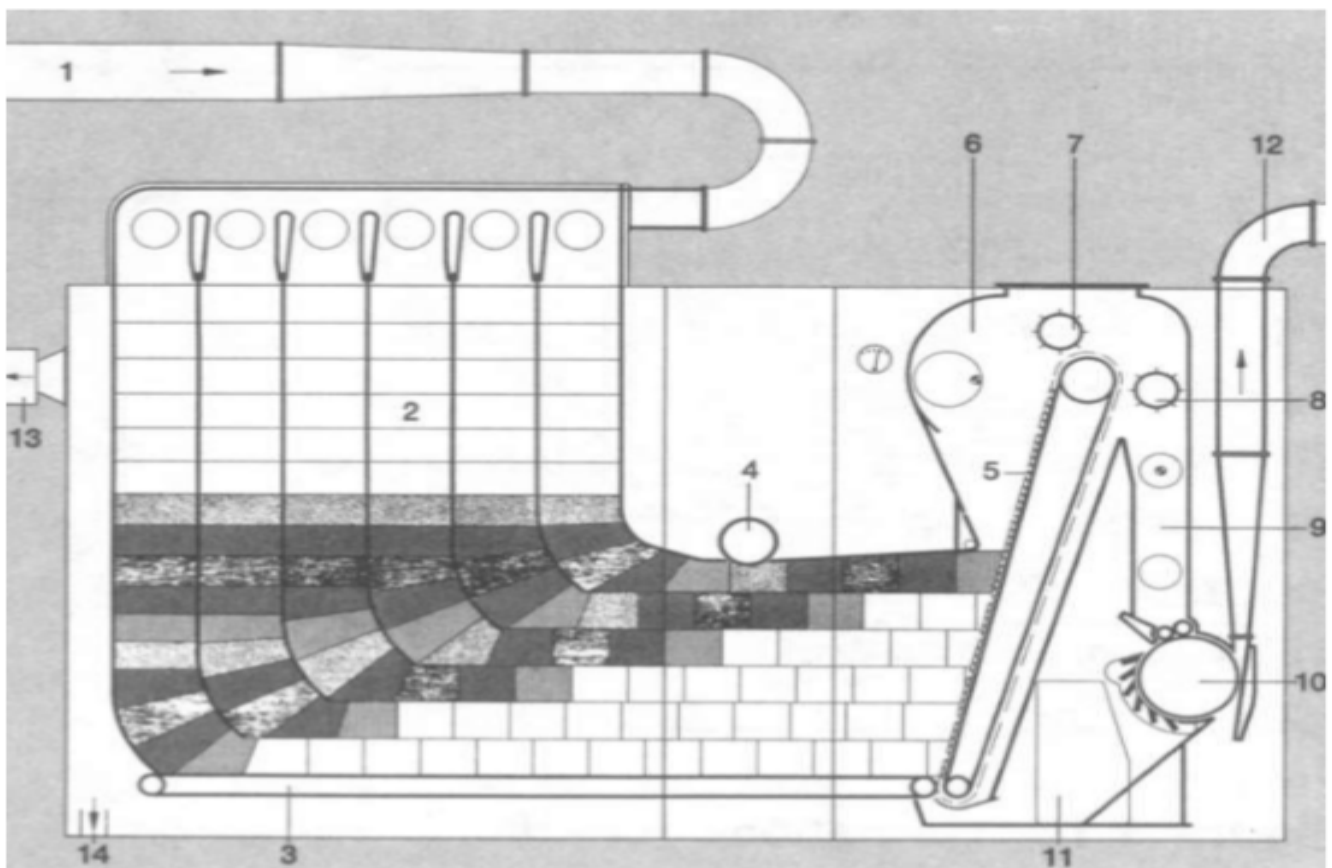


Figure 2.4 shows the cross sectional view of schematic arrangement of Reiter multi-mixer
 (1)Feed Pipe (2) Filling Chambers (3) Conveyer Belt (4) Conveying Roller (5) Upright Lattice (6) Intermediate Chamber (7) Stripper Roller (8) Take-off Roller (9) Filling Trunk (10) Cleaner Roller (11) Waste Chamber (12) Fiber Delivery Exhaust Piping (14) Exhaust Air Outlet

Figure 2.4 the cross sectional view of schematic arrangement of multi-mixer

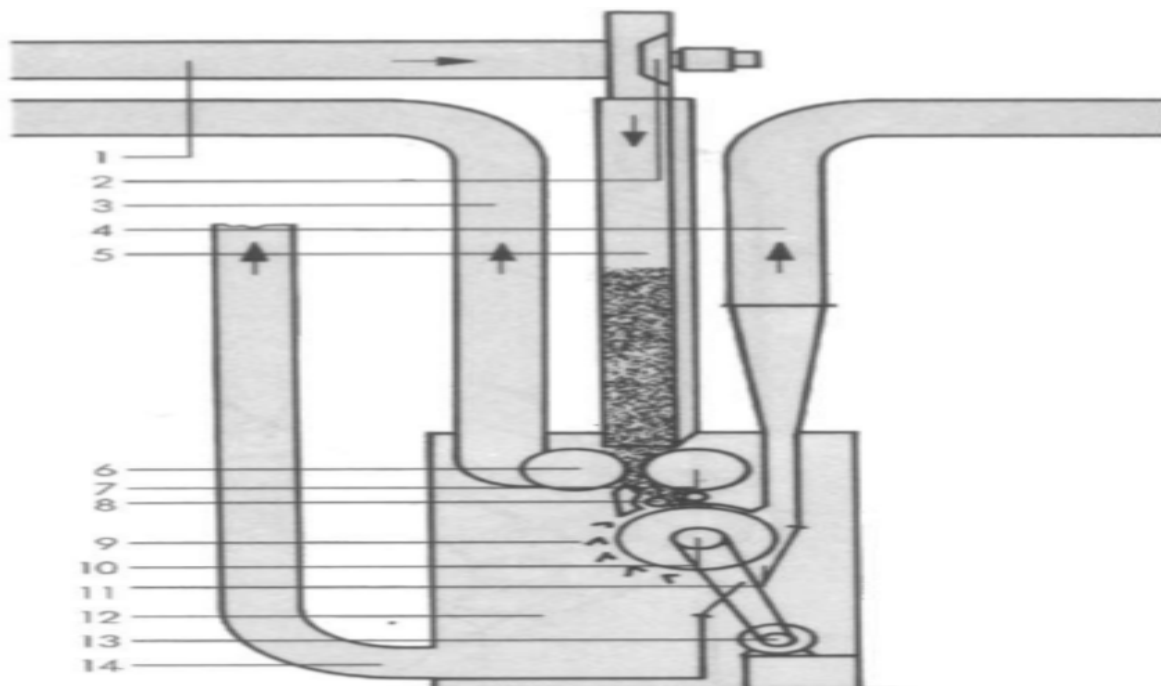
Zone-4 (Fine Opening & Cleaning Machines)

The Zone 4 cleaning machines although utilizes the same principles of opening and cleaning as that of the Zone 2 cleaning machines, they have some important differences:

- (a) The Zone 4 machines are always fed using clamp feed that is to make sure that controlled amount of fiber size and fiber quantity is fed.
- (b) The spacing of the beater with the hood of the machine and with the grids is kept finer.
- (c) Finer and more number of striking elements (pins, blades, spikes, etc.) are used.
- (d) The speed of the beaters is usually kept higher.

Zone-5 (Intense Opening & Cleaning Machines)

In majority of the cases, the Zone 5 machines utilizes either the Kirschner beater or the carding roller (roller covered with saw teeth) as the main tool for functioning as an opening and cleaning device. However, the way and the place where these opening rollers are used and positioned vary from manufacturer to manufacturer. A widely used intense opener and cleaner is the Rieter ERM cleaner as shown in Figure 2.5 below.



- (1) Material Supply (2) Feed Head with Fan (3) Exhaust Air Piping (4) Material Delivery
- (5) Material Chute (6) Plain Drum (7) Dust Cage (8) Feed Rollers (9) Knife Grid (10) Beater
- (11) Suction Duct (12) Waste Chamber (13) Driving Motor (14) Waste Removal Pipe

Figure 2.5 the cross sectional view of schematic arrangement of the ERM Cleaner

Zone-6 (Card Feed Preparation Machine)

Card Feed Preparation Zone

The feed to the carding machine is possible to be carried out in two ways i.e. pneumatic chute feed with fibres in opened form and lap feed with fibres in form of a sheet or web. However whatever the feed method is used, it is essential that the feeding material to the card should be

homogenous over a long term period. In this regard the lap feed is generally preferred because:

The lap feed to the card is less problematic and it is much easy to control the homogeneity of the lap as compared to chute feed.

- It can be easily operated with several blends.
- With these advantages, the lap feed also has some serious disadvantages:
- Greater manual effort is required to transport the lap roller.
- Laps can be an additional source of faults.

When the lap roller becomes full it has to be replaced by a new empty one, it also requires extra effort. Since laps are heavily compressed, it puts additional burden on the carding machine.

Because of these serious limitations all the modern cards are fed through the chute feed rather than lap feed. However, if lap feed is to be prepared.

2.2 Operations of Carding

2.2.1 The Carding Process

The carding is a one of the most important process of the various processes of short staple spinning system. Carding is an operation where the tufty condition of the fibres is converted into an individual fibre form. The separation of fibres in individual form is one fundamental operation of carding while the other fundamental operation is the formation of the card sliver. The carding is a very important process because unless the fibres are separated into individuals, they cannot be spun into smooth and uniform yarns neither can they be blended properly with other fibres.

2.2.2 Functions of Carding

Opening: As the blow room only opens the fibre mass from larger tufts to small ones, the main objective of the carding machine is to further open up the smallest tufts into an individual fibre form.

Cleaning: The removal of impurities is also an important objective carried out by the card. Since not all the impurities are removed by the blow room, it is essential at the carding to remove the remaining impurities. Modern carding machines can remove about 85 to 95% of the foreign matter present in the fed fibres. The overall degree of cleaning achieved by both blow room and carding room can be as high as 95 to 99%.

Mixing & Blending: As the fibres are processed in the carding machine, they are not only opened up to the extent of the individual fibre form but also are thoroughly mixed together.

Sometimes blending of two or more different types of fibres can take place at the carding machine. The card can be a very good point of blending as with the carding action an intimate fibre to fibre blending is achieved.

Disentanglement of Neps: Because of the repetitive beating and opening of the fibres, the number of neps increases from machine to machine in the blow room line. The carding machine due to its special action on the fibers opens the majority of the neps and hence their number is reduced considerably.

Removal of short fibers: The carding machine also removes a very small quantity of short fibres. The amount of short fibers removed at the carding process is not more than 1%.

Sliver Formation: The end product of the carding machine is produced in a form of a cylindrical mass of fibers called as silver. The sliver is the very first intermediate product of spinning that start to resemble somehow like a yarn.

Fiber Orientation: Although not majority of the fibres in the card sliver are parallel and aligned however with formation of the card sliver, the fibres for the very first time becomes slightly parallel and assumes some longitudinal orientation. So the carding process also helps to create partial longitudinal orientation of the fibres.

2.2.3 Types of Carding Machines

Depending upon the staple length of the fibres to be processed, two types of carding machines are available:

- **Revolving Flat Card**
- **Roller and Clearer Card**

Revolving flat card is meant for short staple fibres with staple length up to 2 inches. The name 'Revolving Flat' card is given because these cards make use of flats that revolve on an endless path. The cotton fibres are carded using the revolving flat card.

The roller and clearer card instead of having revolving flats have number of pairs of working and clearing rollers based on which its name is given. The roller and clearer card is mainly used for woolen fibers and is also sometimes called as woolen card.

The carding action refers to passing of fibre material in between two moving wire surfaces. This typical action is repeatedly carried out in the carding machine to individualize the fibres. At various stages of the carding machine the fibres are forced to pass through closely spaced surfaces covered with sharp metal teeth.

The use of these sharp pointed surfaces gives rise to two types of actions:

- Point to point action or Carding Action

- Point to back action or Stripping Action

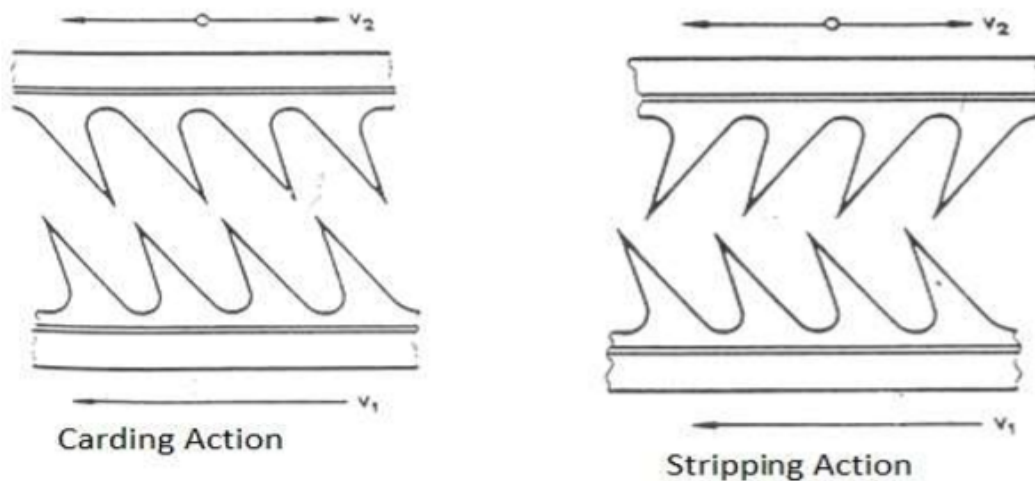


Figure 2.6 Schematic arrangements of wire points for both carding and stripping actions

2.5.3 Carding Action

The carding action is used to separate and individualize fibres. This action takes place between:

- Feed roller and taker-in
- Cylinder and flats

Requirements of Carding Action

There should be two moving wiry surfaces between which fibres are subjected. The action between these two wiry surfaces should be point to point. There should be a difference in the surface speed of these two surfaces. Greater the speed difference more carding power is achieved

Carding Power = Surface Speed of Cylinder / Surface Speed of Flats

To achieve best carding power, the speed of the flats should be kept as low as possible. The optimum running speed of flats is about 4 to 6 inches per minute. To vary the carding power the surface speed of the flats is altered depending upon the opening and cleaning required at carding.

The distance between the two wiry surfaces should be constant. For cotton fibres a gauge of 8/1000 to 10/1000 of an inch is used.

Stripping Action

The stripping action is used to transfer the material from one place to the other. As the material

is transferred by this action, opening and cleaning also takes place. Stripping action takes place between:

- Taker-in and cylinder
- Cylinder and doffer
- Doffer and stripping roller

Requirements of Stripping Action

- There should be two moving wiry surfaces.
- The action between these two wiry surfaces must be point to back.
- There should be a difference in the surface speed of two surfaces.
- However the difference in the surface speeds should not be as high as that in carding action.
- The recommended difference ratio is 1:2 i.e. the surface to which the material is to be transferred should have twice the surface speed.
- The distance between the two wiry surfaces should be constant. For cotton fibres a gauge of 3/1000 to 7/1000 of an inch is used.

The operation of the card can be divided into three main functional areas:

Feeding

Carding

Doffing

(1) Feeding Region

Functions of the Feeding Region

Feeding of fibres to the carding machine at a controlled and pre- determined rate is according to the speed and productivity of the machine.

- Thorough opening of the fibres.
- Removal of impurities (cleaning).
- Transferring the fibres from the taker-in to the main cylinder.

Carding Region

Functions of the Carding Region

- Intensive opening of the fibres into individual fibre form.
- Removal of the remaining trash and impurities.
- Removal of short fibres

Carding Action

The major carding action takes place in the area between the main cylinder of the card and revolving flats. As the material is stripped off the taker-in towards the main cylinder, the fibre

mass is subjected to severe carding action due to a significant difference in the surface speed of the cylinder and flats.

Removal of Trash & Short Fibres

During the carding action between the flats and the main cylinder the waste gets embedded into the interspacing between the adjacent wires of the flats. The waste includes mainly the short fibres, neps, trash particles and dust. It is therefore very essential to clean off the surface of the flats so that the carding action between the main cylinder and the flats may not be affected. In old carding machines manual cleaning was carried out by stopping the machine after a specific period of time (4 to 6 hours). However in modern cards the waste removal off the flats is carried out continuously with the normal operation.

(3) Doffing Region

Functions of the Doffing Region

- Transferring of fibres from the main cylinder on to the doffer.
- Stripping the fibre web from the doffer.
- Gathering the fibre web into a twistless strand (sliver).
- Condensing or calendaring the sliver.
- Depositing the sliver into the sliver can.

The Doffing Operation

The cylinder is followed by a roller called as doffer. The main purpose of the doffer is to take the individual fibres coming from the cylinder and to condense them to a web form. The diameter of the doffer is 24 to 27” and it rotates at a speed of 20 to 60 rpm. The surface speed of the cylinder is about 20 to 25 times more than the surface of the doffer. This helps to create a thick layer of fibres on the surface of the doffer.

2.3 Operations of drawing (breaker and finisher)

2.3.1 The Drawing Process

The carding process is one of the most important process in short staple spinning as it separates fibres into individual form and also removes the remaining portion of impurities left by the blow room. Despite of many advantages of the carding process it has a big drawback of producing variation and misalignment of the fibers within the card sliver. The alignment and the slight parallelization achieved at the carding region between the main cylinder and flat largely disappears again because of the doffing action at the doffer. During the transfer of the fibres from the cylinder to the doffer hooked surfaces in the fibres arise. About 50% of

the fibres in the card sliver has trailing hooks, 15% fibres have leading hooks and 15% of the fibres have double hooks and only a small portion (20%) of the fibres remain straight.

In order to produce a strong and uniform yarn it is necessary to straighten and align the fibres and to improve the evenness of the sliver. All of these objectives are achieved by the drawing process carried out by a machine called as the draw frame. At the draw frame a number of card slivers are drawn or stretched between several pairs of rollers. As the fibres are attenuated or drafted, the fibres are straightened and aligned to the axis of the sliver in the direction in which they are drawn.

2.3.2 Functions of the Draw Frame

- ❖ To straighten the fibres and to make them parallel to the central axis of the sliver. This is done by subjecting the sliver in between several pairs of rollers with each subsequent pair of rollers moving faster than the previous one. The drafting tends to reduce the linear density of the sliver.
- ❖ To improve the evenness of the sliver. This is achieved by feeding more than one sliver at the frame and drawing it together. The feed of multiple slivers is called as doubling. Most commonly 6 to 8 sliver are fed to the draw frame and hence a doubling of 6 to 8 is achieved.
- ❖ To produce a proper weight of sliver required for the following process.

Doubling and drafting are the two main processes employed at the draw frame. Drafting tends to decrease the linear density of the sliver whereas doubling tends to cancel out the effect of drafting. If drafting and double are of same proportion then the drawn silver will have same linear density as that of the card sliver. But, if the drafting employed is more than the doubling than the resultant drawn sliver will be finer than the fed card sliver and vice versa. Therefore the degree of drafting and doubling actually depends upon the required final count of the yarn.

2.3.3 Main Parts of the Draw Frame

The draw frames are built with one or two deliveries. The single delivery draw frame is more efficient and flexible but the double delivery draw frames have the advantage of having twice the production covering nearly the same floor area as that of the single delivery draw frame.

The double delivery draw frames also have a less initial cost. A standard draw frame is divided into following sections:

1. Creel Section
2. Drafting Section
3. Sliver Condensing Section

4. Coiler Section
5. Suction Section

Creel Section

Creel is the portion of the draw frame where the card sliver cans are placed. The cans behind the draw frame are placed in two most common arrangements:

- ❖ The nested creel arrangement
- ❖ In-Line creel arrangement

In nested creel arrangement, the cans are placed in a rectangular group. Such an arrangement is exclusively used for single delivery draw frames. On the other hand the in-line creel arrangement has all the cans placed in a straight line and is mostly used for double delivery draw frames. Both the arrangements are shown in Figures 2.7: a and b below:

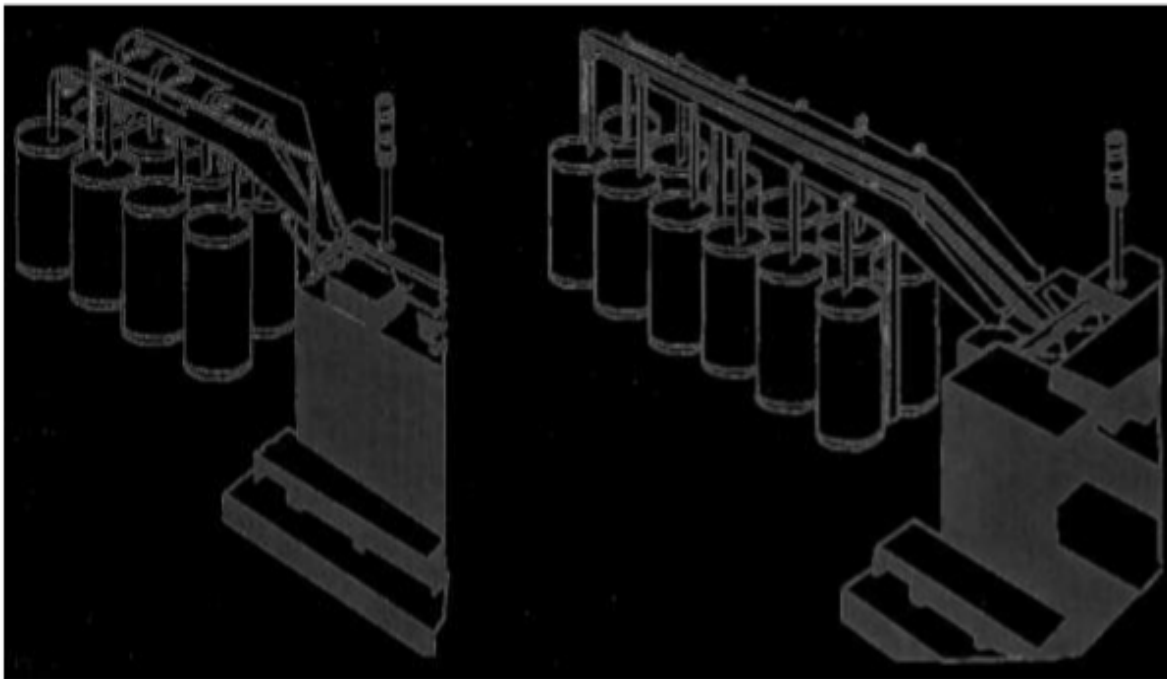


Figure 2.7 The schematic arrangements of single and double delivery draw frames

Drafting Section

The drafting of the sliver at the draw frame is carried out by roller drafting method in which the card sliver is passed through two or more pairs of rollers. In modern draw frames the top rollers used are rubber coated and are called as cots while the bottom rollers are steel rollers having fine flutes on their surfaces. The cots exert pressure on the bottom rollers and their surface is treated with anti-static material. The back cots exert less pressure as compared to the next succeeding cot in the drafting system.

All of these arrangements give good results when set appropriately. A 4 over 4 roller drafting system is shown figure 2.8 below:

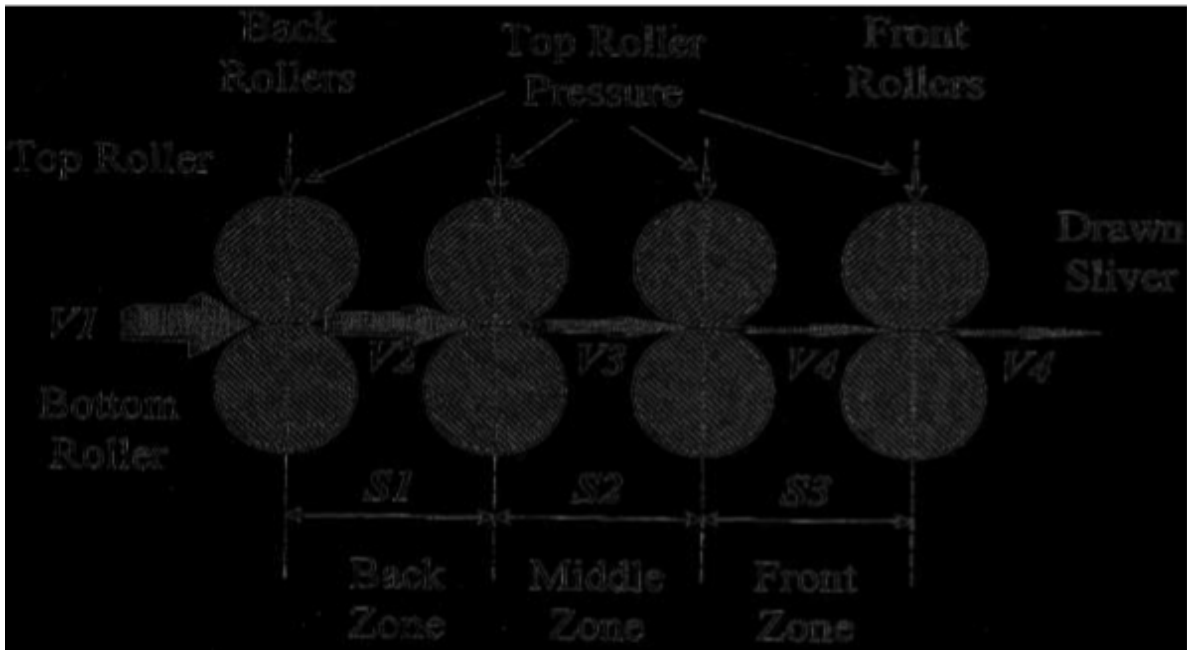


Figure 2.8 the schematic arrangement of the 4/4 drafting system

Sliver Condensing Section

The flat fiber web (consisting of several card slivers) exiting the drafting section must be converted back into a web. The fiber web leaving the front pair of drafting rollers is passed through a converging tube and is guided to a specially designed condensing funnel called as the trumpet guide

The degree of condensing at the trumpet guide is essential for providing a good fibre to fibre cohesion to hold them better in a sliver. However if too much condensing is done then the drawn sliver develops thick places.

After condensing of fibres at the trumpet guide back into a sliver form, the sliver is passed through a pair of calendar rollers which does a further compressing of the fibre mass and ultimately deposits the drawn sliver into a sliver can.

Coiler Section

The drawn sliver coming out of the calendar rollers is passed through a coiler tube fixed on a coiler plate. The coiler gears fixed on the coiler plate help to rotate the coiler tube so that sliver can be laid in the can in form of special coils.



Figure 2.9 the schematic arrangement of the coiler tube

Suction Section

As the fibres move swiftly over the surface of the drafting rollers, dust and lint may be dislodged into the air. The purpose of the suction system on the draw frame is to remove these particles so that they might not get deposited on the surface of the drafting rollers and also to maintain a dust and lint free working environment. The accumulation of the fibrous mass on the surface of the rollers causes unevenness in drafting and sometimes also causes sliver breakages causing the machine to stop.

2.4 Operations of lap former

2.4.1 Comber Lap Preparation

Since the main function of combing is to remove short fibres, if the carded slivers are directly fed to the combing machine, the waste extraction would be very high and also lot of fibre breakage will take place. This is due to the fact that fibre orientation in the card sliver is very poor and also the card sliver has majority of hooked surfaces. So, it is desirable for the card sliver to be prepared into such a form which is suitable for the combing operation. For this reason, a suitable lap with straight and parallel fibres is formed which is presented as a feeding material to the comber. .

2.4.2 Methods of Comber Lap Preparation

Commercially two systems of preparing the comber lap are used in the industry:

- Lap Doubling System
- Sliver Doubling System

Lap Doubling System

In the lap doubling comber preparation system, the carded sliver is passed through a sliver lap machine followed by a ribbon lap machine.

Sliver Lap Machine

The sliver lap machine is divided into the following regions:

- Creel Region
- Drafting Region
- Winding Region

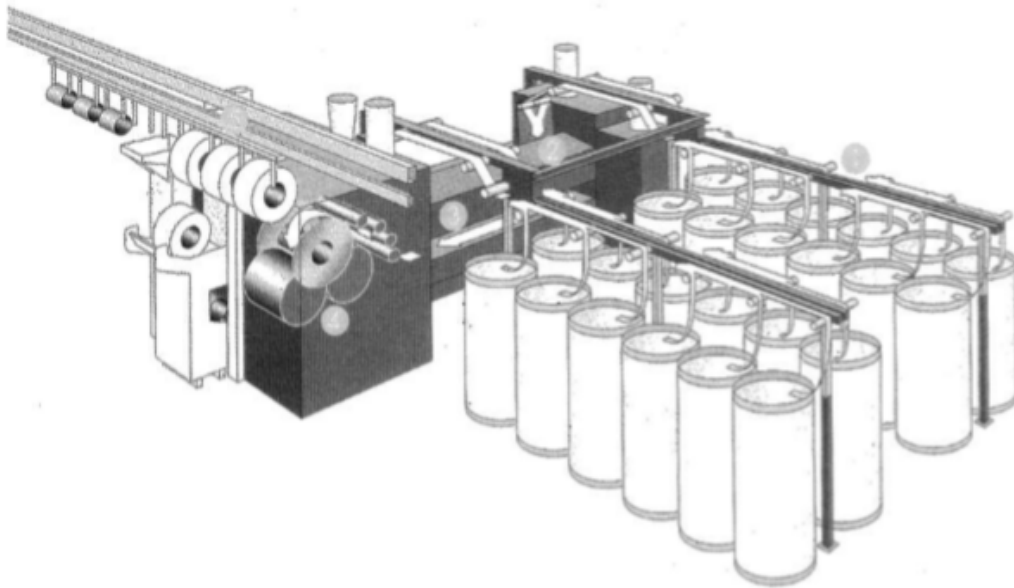


Figure2. 10the pictorial view of the Sliver Lap machine

Creel Region

The creel of the machine consists of two feed arrangements; each usually holds 12 card sliver cans. All together it gives a doubling of 24. All card slivers after passing through series of guide rollers enter the drafting arrangement.

Drafting Arrangement

The sliver lap machine commonly uses a 4 over 4 roller drafting system with top roller pneumatically weighted. The pneumatic pressure can be adjusted up to 1600 Newtons. A total draft of 1.3 to 3 is given at this arrangement.

Winding Region

The sheet or web of fibres after being drafted out is passed over a guide plate or deflecting plate which changes its direction towards four calender rollers. The high compression (up to 16000 Newtons) created by the calender rollers transforms the fibre web into a lap. The lap then passes through two winding rollers that press against the lap tube with a pressure of 10000

Newtons and assists in winding of the lap on to the lap tube. The lap tube is placed on lap weighing devices which on the modern machines automatically removes the lap roll when its required weight has been reached and is ejected on an automatic transport system that will take the lap roll directly to the next machine i.e. ribbon lap machine.

2.5 Operations of comber

2.5.1 The Combing Process

Combing is an optional process in the mechanical processing of short staple fibres necessary for the preparation of high quality combed yarn. The process of combing is carried out after carding and the combed sliver after passing through the draw frame follows the regular path of yarn formation process.

The carded sliver still has some trash particles, neps and short fibers in it. In addition to it, the individual fibers in the card sliver are not well aligned longitudinally and majority of them have hooked surfaces. The basic purpose of combing is to remove short fibers and remaining impurities and to make the fibers well aligned and straight so that only long high quality long fibers are used for yarn making a yarn. The carding process brings out following positive influence on the yarn character:

- ❖ More uniform yarns and stronger yarns can be made as compared to carded yarns.
- ❖ Owing to greater cleanliness and alignment of the fibres, the combed yarns are much smoother and have better lustre as compared to carded yarns.
- ❖ Combed yarns are less hairy and compact as compared to carded yarns.
- ❖ Combed yarns can be spun into much finer counts as compared to the carded yarns.
- ❖ Counts finer than 40 Ne are usually spun with combing where uniformity and quality is required. .

2.5.2 Functions of Combing

- ❖ To separate the long fibres from the short ones. The longer fibres are processed into a combed sliver whereas the shorter fibres are removed as a waste. Depending upon the quality of the yarn required predetermined quantity of short fibres are removed during the combing process.
- ❖ To eliminate the remaining impurities and trash left by the carding process. The waste combination of trash, short fibres and neps is collectively also called a noil. The amount of noil removed during combing ranges from 5% to 25% depending upon the quality of the yarn.
- ❖ Elimination of majority of the neps in the fibre material

- ❖ To straighten and align the separated long fibres.
- ❖ To create a combed sliver with maximum possible evenness.

2.5.3 The Combing Machine

Many different types of combers are used for different fibre materials, combers can be classified into following types:

- Rectilinear Combers (used for cotton)
- Circular Combers (used for worsted)
- Rotary Combers (used for spun silk)
- Hackling Machines (used for bast fibres)

Feeding

The combing cycle begins with the feed of the lap. The lap sheet is fed to the comber between the feed roller and smooth cushion plate also called as the bottom nipper. The top nipper or the nipper knife moves down to fix on the bottom nipper (cushion plate). Hence the lap sheet is gripped between the top and the bottom nippers.

Sliver Condensing & Drafting

The combed web taken by the detaching rollers is delivered to the web pan having a trumpet guide on its one side

The combed web is pulled through the trumpet guide with the help of a pair of calender rollers that converts the web into a combed sliver. The combed slivers coming from all the heads of the comber are laid side by side and are passed through a draw box where a draft of 5 to 12 is given. Most commonly a 3 over 5 roller drafting is used where the rollers are inclined at an. The drafted slivers are coiled into sliver cans. On modern combing machines, the sliver cans are automatically doffed on completion.

2.6 Operations of roving frame

2.6.1 The Roving Process

The drawn sliver is composed of clean and straightened fibres lying parallel to one another and to the axis of the sliver. These characteristics of a drawn sliver are ideal for creation of a yarn.

However this is not possible because if the drawn sliver is to be directly converted into a yarn it would require a mechanical draft of a range of 300 to 600. But even on the most modern machines technologically it is not possible construct a ring frame that could give such high drafts in a single process. So an intermediate stage of drafting is carried out using the roving frame. The draft given at the roving frame reduces the linear density of the drawn sliver into a

less thick strand of fibres suitable as an input to the ring frame. This roving which is fed to the ring frame can then be easily converted into a yarn by giving a draft of 15 to 40.

Another advantage of making roving is to have a better package as an input to the ring frame. The roving frame produces roving on compact small packages called as bobbins. The bobbins are much more convenient to transport and have less chances to get damaged as compared to the can sliver mode of package.

2.6.2 Functions of the Roving Frame

The basic function of the roving frame is attenuation or drafting so that the mass per unit length of the sliver may be reduced down to the extent which is suitable to be fed to the ring frame.

The range of draft given at the roving frame is 5 to 20.

After drafting the fine strand of fibres (roving) has very little coherence and becomes unsuitable for further attenuation at the ring frame. So a protective twist must be imparted to give coherence to the fibres and to give strength to the roving. The amount of twist given at the roving frame is low and ranges from 0.7 to 2 TPI.

The drafted and twisted roving has to be properly wound on a package called as bobbin. This is done by the winding operation at the roving frame. The winding operation is a complex mechanical process which not only winds the roving on the bobbin but also maintains a special built of the package.

2.6.3 Main Parts of the Roving Frame

A standard type of a modern roving frame has the following sections:

- Creel Section
- Drafting Section
- Winding Section

Creel Section

The creel is the area designated for the drawn sliver cans which are positioned at the back of the machine. Just above the cans number of independently driven guide rollers are provided that helps the sliver to move toward the drafting section.

Drafting Section

A typical drafting section of the roving frame is composed of 3 over 3 roller arrangement.

However some of the machines also make use of 3 over 4 roller drafting arrangement.

Regardless of the type of roller arrangement the bottom roller used is always a steel fluted roller while the top roller is covered with some synthetic rubber covering. The top rollers are pressed down with sufficient force on to the bottom rollers to ensure proper grip of the fibres.

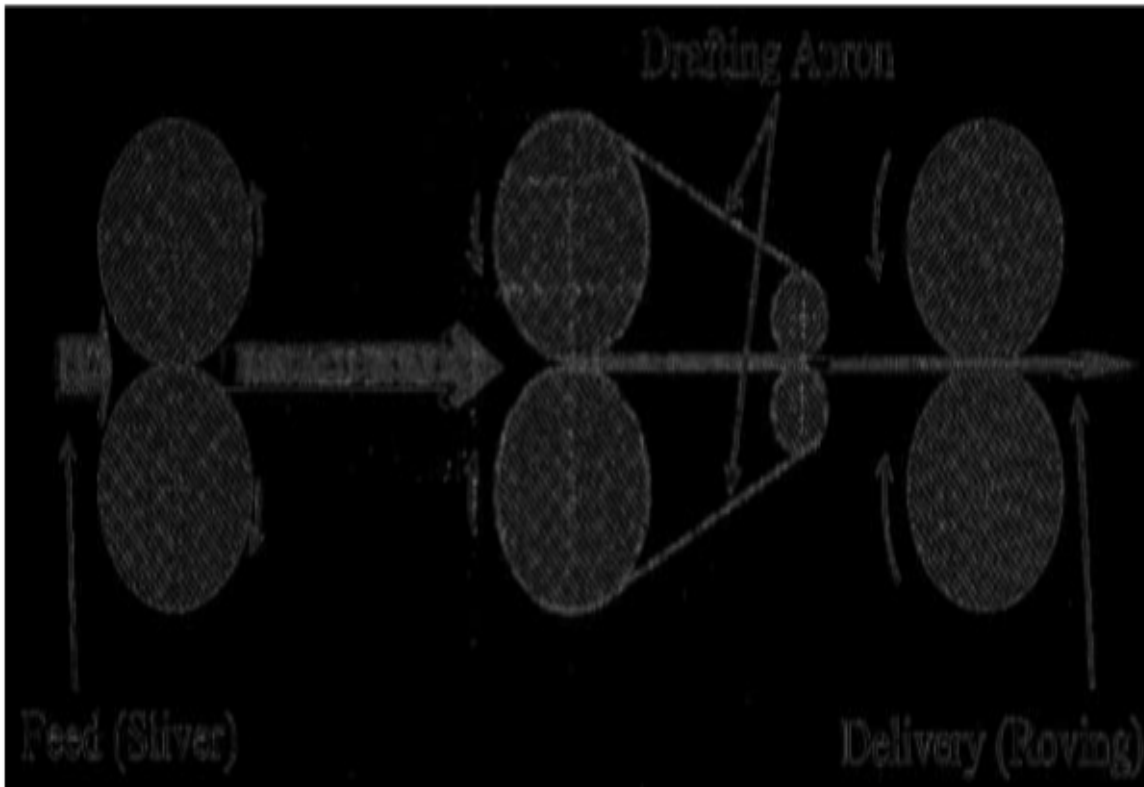


Figure2. 11 the cross sectional view of the drafting roller arrangement

Use of Condensers in the Drafting Section

Three specially designed trumpet guides or condensers are used in the drafting section of the machine. First trumpet guide also known as in-feed condenser is used just before the back pair of drafting rollers and its purpose is to lead the sliver properly into the drafting arrangement.

The second trumpet guide is used near the nip of the middle pair of rollers and the third one is used just before the front pair of rollers. The main function of the last two guides is to bring back the fiber mass into a strand that tends to tear apart because of the drafting action.

The trumpet guides are usually mounted on a reciprocating bar giving the sliver a traversing motion so that the wear of the rollers may spread out gradually over the entire width of the roller.

Draft Distribution

An important consideration of the drafting zone is the draft distribution i.e. how much draft should be given in the back and front zones. The draft at the back zone is called as break draft and it should be as low as feasible while majority of the draft is given at the front zone where there is an apron control over the fibers and is called as the main draft.

Winding Section

The winding section comprises of a spindle and a flyer. A spindle is a long steel shaft that acts as a support and a driving element for the flyer. The flyer is a special component of the roving frame that helps to insert twist in the roving.

Following two main objectives of the roving frame:

- Twisting
- Package Winding

Twisting

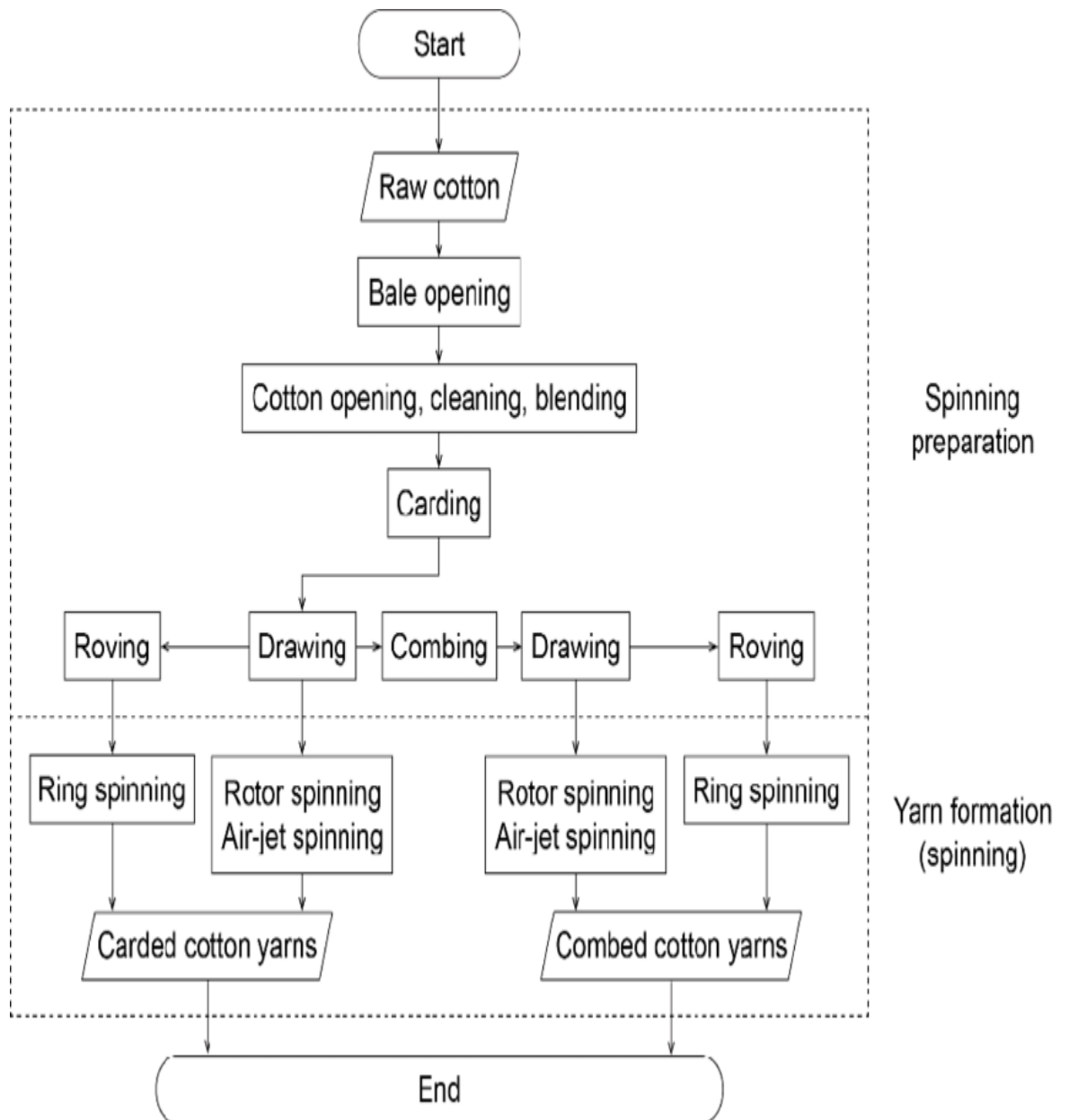
The sliver after being drafting out to form a roving coming from the front delivery rollers have little fibre cohesion among themselves and is weak to be wound on packages and also may not sustain further drafting at the next stage of processing i.e. the ring frame. So in order to give cohesion and strength to the roving strand a small amount of protective twist is given. The twist is imparted by using a flyer method of twist insertion.

Package Winding

In order for the winding to take place on the surface of the bobbin, the surface speed of the roving coming from the flyer should be different from the surface speed of the bobbin. The bobbin therefore is driven independently of the flyer and it rotates with the collar around the spindle.

2.7 Monitoring pre- spinning machine operations

The monitoring of pre spinning machine operations is described in the following process flow cart. According to the sequence and operation machines are monitored and operated.



Figurw2.11 spinning process flow chart

2.8 Sorting waste

2.8.1 Definition and Concept of the waste:

Waste is type of material which has not in use, discarded some waste are useful some are not useful. Waste which is usable are use for the courser count yarn, open end spinning etc,. Those waste are not reusable are sold out to the market at low prices these waste are seeds, coats, leafy matter etc, are use as fertilizers in a farm.

2.8.2 TYPES OF WASTE:

In Textile mill there are two major types of wastes generated

- Soft type of waste
- Hard type of waste

Soft waste: - The waste which is in fibers form is called as the soft waste. The soft waste is generated from carding to the speed frame (Including all types of slivers). These soft wastes are reusable for producing a low quality of yarn. Examples coarser count yarn or open-end spinning yarn.

Hard waste: - The waste which is not reusable is called as hard waste. These wastes are produced in ring frame and the winding department.

Types of waste in blow room

- Dropping
- Seeds, cotes
- Dust, Dirt
- Floor sweep

Improving the cleaning efficiency and reducing waste at Blow room

To improving cleaning efficiency of beater first examine the mechanical condition of the machine spikes on the krishner beater blades and fingers on the blades and porcupine openers and rapiers or replace as required, the inter grid bars space should be checks for any chock up the waste is affected by change such as..

- Distance between the grid bars and angles between of inclination of bars (2-3mm)
- Speed of the beaters (680 rpm)
- Fan speed is related to the beater speed (1000)mm
- Setting between the beaters and feed rollers (8-10mm)
- Setting between the beaters and gridbar(10mm)

Types of waste at carding

- Flat strips
- Licker-in waste
- Sliver cut
- Filter waste
- Floor sweep

- Dropping

Controlling the waste at the card

- Higher licker-in speed or greater wire points density on licker-in gives higher cleaning efficiency accompanied the lint lost under the licker-in
- Use of the perforated under casing helps in reducing waste
- With other speed and setting held constant the flat strip waste varies almost proportionately with the flat speed
- Flat strip waste increases due to wider front and back plate setting.
- For controlling the cleaning of the card, almost the only place is the licker-in region
- Card is an excellent cleaning machine for seed coats especially the cylinder flat region which removes 80% of the seed coats.
- Higher flat with high cylinder speed can be used for better removal of seed coats and also reducing neps thick places. Seed coats content of 0.1% in the card sliver can be considered as satisfactory
- 5 to 7% more good cleaning efficiency can be achieved by using tandem carding

Types of the waste in comber

- Noils
- Lap wastages
- Sliver wastage
- Swipper wastages.

For an effective removal of short fibers retention of long fiber, removal of neps the following considerations are of almost importance during combing:

In carding trailing hooks are more in number when compared to leading hooks they are removed when fed as leading hooks by keeping an even number of reversals between the cards and the comber

By increasing the pre combing draft waste can be reduced to significant level at comber without affecting the resultant yarn quality however a high comber draft also results in extremely low inter fiber cohesion causing excessive lap like frequent sliver breaks at comber, draw frame and the can feeder inner creel there for a pre comber draft of 30-40 for counts up to 40s is adequate pre comber draft of above 20s is suitable only for very long staple cottons.

Neps can be controlled during the carding process most of the neps should be removed during card process not combing. It is often more economical to run cards a somewhat low production rate than to take out extra comber waste.

Simplex / Roving Frame Waste:

Simplex is an intermediate process in which sliver is converted into low twist material called roving. The sliver which is taken from draw frame is thicker so it is not suitable for manufacturing of yarn. The sliver is drafted many times from its original length during roving frame process and little amount of twist is inserted to it to improve the strength of roving. This roving is wound on to the large packages. These packages are used as input material during ring frame process. During the processing of sliver to roving, sometime breakage is happening either of sliver or roving which gives the generation of soft waste around 0.5%. The roving waste can be used after removing from the bobbin and a preopening is required on the machine available for the purpose.

2.9 Minor and major product process and machine faults

Carding Machine Faults:

Carding is known as the heart of total spinning. Carding machine produces sliver from processing laps. In total process of carding, there are various faults are arise which are deeply discussed in this article.

List of Carding Faults in Spinning:

All the faults of carding process have pointed out in the below:

1. Variation of sliver,
2. Web sagging,
3. Hole in web,
4. Cloudy web,
5. High nep count.

Reasons and Remedies of Carding Faults in Spinning:

1. Variation of sliver:

Causes:

- Uneven and irregular lap feed.
- Wider setting of taker in to cylinder and feed plate to feed roller.
- Excessive tension between calendar rollers to coiler head.

- Due to damage of calendar roller or doffer or feed plate.

Remedies:

- Lap feeding should be even and regular.
- Perfect setting should be kept at feed plate to feed roller and taker in to cylinder.
- Required tension should be applied between calendar rollers to coiler head.
- Fault free calendar roller or feed plate or doffer should be used.

2. Web Sagging:

Causes:

- Lower amount of humidity.
- Excessive doffer speed.
- Tension draft lower among cylinder and doffer.

Remedies:

- Humidity should be kept at 50-60%.
- Required amount of doffer speed should be used.
- Increasing tension draft among doffer and cylinder.

3. Hole in web:

Causes:

- Different heights of wire points.
- Faulty wire on doffer or card.

Remedies:

- Wire height should be same for all.
- Fault free wire should be used on card or doffer.

4. Cloudy Web:

Causes:

- Wide setting among flats and cylinder.
- Over loading of wire.
- Defective wire on flats, doffer, taker in and cylinder.

Remedies:

- Exact setting should be applied between cylinder and flats.

- Grinding the organs of card.
- Fault free wire should be used on doffer, cylinder, taker in and flats.

5. High nep count:

Causes:

- Too wide setting among flat and cylinder or cylinder and doffer.
- Higher amount of relative humidity %.
- Faulty doffer, taker in wire.
- Improper setting among cylinder to flat and cylinder to doffer.

Remedies:

- Perfect settings have to use between carding cylinder and doffer or flat and cylinder.
- Relative humidity% should be perfect.
- Damage free taker in or doffer wire have to use.
- Correct settings have to apply between cylinder to doffer and cylinder to flat.

Self check-2

Test-I choice

Instruction: select the correct answer for the give choice. You have given 1 Minute for each question. Each question carries 2 Point.

1. The basic function attenuation and drafting are mainly done by _____
A, drawing B, combing C, carding D, roving
2. optional process in the mechanical processing of short staple fibres necessary for the preparation of high quality combed yarn
A, roving B, carding C, combing **D, drawing**
3. Which one of the following task is not performed in blow room?
A, Mixing B, drafting C cleaning D opening
4. The machine in the spinning preparatory operation is _____
A, carding B chute feeder C, uniflock D, uni-mix
5. From the following operations which one is not tasks of blow room
A, opening B, twisting C, cleaning D, mixing

Test II: short Answer writing

Instruction: write short answer for the given question. You are provided 3 minute for each question and each point has 5Points.

1. What are the functions of combing?
2. Write down at least three operations perform in spinning preparatory?
3. Write the machineries of pre spinning

Test III: describe briefly

Instruction: write brief answer for the given question. You are provided 1ours for each question and each point has 10Points

1. Discuss the process flow of pre spinning operations.
2. What are the functions of blow room?

Note: Satisfactory rating – above 60% Unsatisfactory - below 60%

You can ask you teacher for the copy of the correct answer

Operation seet-2

OPERATION TITLE: Set up and load pre spinning machines.

Instruction: Use the given, the tools and equipment, machineries to operate and monitor machines. For this operation you have given 8Hour and you are expected to provide the operation

PURPOSE: To understand and perform operating and monitoring pre spinning machines.

EQUIPMENT TOOLS AND MATERIALS: safety tools like glove, goggle safety boot, etc bale pucker machines, opener machines, blender machines, card machines, draw frame machines.lap former machines, comber machines, roving frame machines

PROCEDURE:

Step1: Follow the steps for machine setting

Step2: Follow standard procedure of machine set

Step3: Set up the machines according to specification and manufacturer requirement

Step4: Load raw materials

Step5: Start machines properly

Step6: operate and monitor as per the requirements

Step7: clean the area and handle the waste properly

PRECAUTIONS:

Use of proper OHS materials

- Use proper Operational workplace activities
- Use Restricted space
- Hazardous, controlled or exposed conditions

QUALITY CRITERIA:

The machines are monitored and operate properly as per the specification

Lap Test-2

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, workshop, tools and materials you are required to perform the following tasks within 3 hours.

Task 1: Operate and monitor blow room machine according to the specification

Task 2: Operate and monitor carding machine according to the specification

Task 3: Operate and monitor draw frame machine according to the specification

Task 4: Operate and monitor combing and lap former machine according to the specification

Task 5: Operate and monitor roving frame machine according to the specification

Unit Three: Check product quality

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

- Spinning preparatory product quality standards
- Product faults and non-conformances
- Rectifying or reporting product faults

This guide will also assist you to attain the learning outcomes stated in the cover page.

Specifically, upon completion of this learning guide, you will be able to:

- Understand spinning preparatory product quality standard
- Determine and correct product faults and non conformance
- Rectify and report product faults

3.1 Spinning preparatory product quality standards

There are different quality standard in the product of spinning preparatory

Some of them are:-

- Sliver count
- Sliver weight
- Evenness
- Degree of parallelization etc

In pre spinning process every quality criteria's of the product or quality standard set to produce as to be performed in order to get the desired product.

Pre spinning operation is performed producing lap and sliver. Produced lap & sliver have quality standards. Sliver is assessed for faults and non conformances. Faulty slivers are rectified or reported

3.2 Product faults and non-conformances

Asses sliver faults

Patchy web and holes resulting in uneven card sliver

This problem may be due to loading on the cylinder, damaged/pressed wire points in cylinder, doffer or flats, waste accumulation below cylinder under casing or defective under casing, heavy feed to cards, unopened cotton lumps from the cylinder-flat region, damp material and too fine or immature cottons. We need to analyze and find the exact reason prevailing at the time of study and take appropriate corrective action.

Cloudy web

The main reasons for cloudy web are improper setting of feed plate to licker-in, missing or damaged teeth in licker-in, damaged wire points on cylinder or doffer, doffer not set parallel to cylinder, cylinder and doffer not ground accurately, improper settings of cylinder to flat, improper settings of cylinder to back plate, insufficient feed roller grip, excessive fly under doffer and inadequate grinding frequency.

Singles

Singles in the sliver may be due to lap licking, less feed in chutes, part of carded web getting sucked by the waste extractor, damaged doffer wire and direct air currents hitting the web.

Sagging web

Sagging web in a card may be due to insufficient tension draft, very high humidity, worn out key in the calender roller gears, blunt doffer wire, dirty trumpets, heavy material fed to card and inadequate calender roller pressure.

Bars in card web

The bars in card web are mainly due to damaged cylinder wire, doffer wire or back plates across width, improper setting of back plate, eccentric licker-in surface, eccentric doffer surface, eccentric movement of stripping roller and redirecting rollers.

Irregular selvedge in card web

The reasons for irregular selvedge are too wide settings of lap guides or feed guides, damaged clothing at the side, air escaping at the sides of cylinder and excessive accumulation of lint at the sides of the under-casing.

High card waste

Damaged under casings, higher flat speed, wider front plate setting, closer setting of flats, higher pressure in suction unit and fibres getting ruptured are the main reasons for higher card wastes.

Low nep-removal efficiency

Blunt wire points, too wide setting between feed plate and licker-in, uneven settings, burrs in front plate/back plate and card wires of coarse type contribute for low nep removal efficiency.

Higher U% of sliver

Worn out parts, eccentric or wobbling gears, gears meshing too deep, oblong bores of gears, loose keys and key ways, insufficient tightening of gears, bad trumpets, waste accumulation in material patch, improper settings and loading of fibers on cylinder and flats contribute for higher U% of the card sliver.

Medium and long-term irregularity

Medium and long-term irregularity are due to insufficient feed roller grip, higher yard to yard (meter to meter) CV% of lap, the height of material in the chutes not controlled properly, worn out gears in feeding zone, obstruction in the movement of aprons during doffing, higher tension draft, damaged back plate and improper working of autoleveller.

Bulky sliver

Trumpet of a very large size and lower calender pressure are the main reasons for a bulky sliver. When the bulk of fibre is more (higher denier or higher micronaire) the sliver will be bulky.

High breaks

Very small trumpet, worn out trumpet, uneven sliver with bunches of fibres, worn out gears, damaged clothing, air currents disturbing the web, improper temperature and humidity and a very high tension-draft are the normal reason for high sliver breaks.

Fibre rupture at cards

The fibre rupture takes place at cards due to improper opening of tufts at blow room, heavy feed, closer setting between feed plate and lick-in, very dry cotton with moisture content of less than 4% and very high cylinder speeds.

3.3 Rectifying or reporting product faults

Report sliver faults

After assessing sliver fault you have to fix the faults or report for concerned body in order to produce quality product and to meet product specification

For example:-

Variation of sliver:

Causes:

- Uneven and irregular lap feed.
- Wider setting of taker in to cylinder and feed plate to feed roller.
- Excessive tension between calendar roller to coiler head.
- Due to damage of calendar roller or doffer or feed plate.

Remedies:

- Lap feeding should be even and regular.
- Perfect setting should be kept at feed plate to feed roller and taker in to cylinder.
- Required tension should be applied between calendar roller to coiler head.
- Fault free calendar roller or feed plate or doffer should be used.

Web Sagging:

Causes:

- Lower amount of humidity.
- Excessive doffer speed.
- Tension draft lower among cylinder and doffer.

Remedies:

- Humidity should be kept at 50-60%.
- Required amount of doffer speed should be used.
- Increasing tension draft among doffer and cylinder.

Self check-3

Test I: short Answer writing

Instruction: write short answer for the given question. You are provided 10 minute for each question and each point has 7 Points

1. Write quality standards of spinning preparatory products.
2. Why we check product qualities?
3. What are the major product faults in pre spinning?

Note: Satisfactory rating – above 60% Unsatisfactory - below 60%

You can ask you teacher for the copy of the correct answers

Operation sheet-3

OPERATION TITLE: check sliver quality.

Instruction: Use the given, the tools and equipment, to check quality of sliver. For this operation you have given 1Hour and you are expected to provide the operation

PURPOSE: To check the product as per the specification.

EQUIPMENT TOOLS AND MATERIALS: safety tools like glove, goggle safety boot, etc sliver, count tester, evenness tester strength tester

PROCEDURE:

Step1: Follow the steps for checking

Step2: Follow standard procedure of testers

Step3: Set up the testers according to specification and manufacturer requirement

Step4: Load raw materials

Step5: Start testing properly

Step6: operate and monitor testers as per the requirements

Step7: read and interprets results carefully

PRECAUTIONS:

Use of proper OHS materials

- Use proper Operational workplace activities
- Use Restricted space
- Hazardous, controlled or exposed conditions

QUALITY CRITERIA:

The products are checked properly as per the specification

Lap Test-3

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, workshop, tools and materials you are required to perform the following tasks within 1 hours.

Task 1: Check lap and sliver quality using standard and manufacturer requirement

Task 2: Asses sliver faults and Report sliver faults

Unit Four: Complete operations

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

- Doffing and replacing products
- Dispatching product
- Production records and other documentations

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

- Doff and replace product
- Despatch products
- Maintain production report and other documentation

4.1 Doffing and replacing products

Doffing the product

Products are doffed and replaced according to manufacturer specifications

When the running sliver can become full ensure that they are wound till the required weight of package

- Check the package is fully wound to the predetermined weight and start doffing.
- If the required weight is not achieved, fix the sliver on the same sliver can and continue the process to achieve the required weight and then doff the can.
- If excess weight is observed, take it for rewinding to reduce the weight to the desired level as instructed by supervisor.
- Follow the instructions of supervisor/Jobber to stop the machine for doffing or doff the package while the machine is running.
- Ensure that the can doffed are wound up to the desired weight and are within tolerance limit in grams as instructed.
- Keep the hard waste removed during doffing in separate waste collection boxes.

4.2 Dispatching product

Products are unloaded and dispatched to next process

Workers loading and unloading materials should be instructed in safe procedures appropriate to the material they handle. Products are unloaded or dispatch to the next process properly according to the standard. The application of proper material handling should be a mandatory while unload and dispatch.

Cleaning of area is completed to ensure work environment is maintained in a safe and productive manner

At the end of any operation cleaning the work area is very important to ensure the work environment is maintained in a safe and productive manner by applying kaizen and 5 S procedures.

4.3 Production records and other documentations

During spinning preparatory operation every activity regarding to the process has to be recorded and documented.

It is useful for next process to avoid obstacles beyond the standard and to develop better operation for the next time products.

Every incidents and accidents should be recorded like:-

- Results of output
- Machine stoppage
- Breakages
- Noises
- Smells etc

Self check-4

Test I: short Answer writing

Instruction: write short answer for the given question. You are provided 3 minute for each question and each point has 3 Points

1. How we can doff and replace pre spinning products?
2. What are the use of cleaning and maintaining pre spinning operation?
3. Describe the use of maintaining records and documentation.

Note: Satisfactory rating – above 60% Unsatisfactory - below 60%

You can ask you teacher for the copy of the correct answers

Operation sheet-4

OPERATION TITLE: doffing and dispatching products

Instruction: Use the given, the tools and equipment, to complete pre spinning. For this operation you have given 2 Hour and you are expected to provide the operation

PURPOSE: To Complete pre-spinning operation..

EQUIPMENT TOOLS AND MATERIALS:

Safety tools like glove, goggle safety boot, card machines, draw frame machines.lap former machines, comber machines, roving frame machines

PROCEDURE:

Step1: Follow standard operating procedures

Step2: Doff the product properly and replace

Step3: Dispatch to the next process properly

Step4: clean the area and handle the waste properly

Step5: record and report the operational fault and other problems

PRECAUTIONS:

The operation can be performed by following occupational health and safety rule.

Use of proper OHS materials

- Use proper Operational workplace activities
- Use Restricted space
- Hazardous, controlled or exposed conditions
- Work may be conducted in small to large scale enterprises and may involve individual and team activities.

QUALITY CRITERIA:

Complete the preparatory process by proper doffing, dispatching, recording and documentation

Lap Test-4

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, workshop, tools and materials you are required to perform the following tasks within 3 hours.

Task 1.Doff and replace products

Task 2 Unload and dispatch products to the next processes

Task 3 Complete cleaning and maintaining the work environment in a safe manner

Task 4 Keep Production records and documentation

