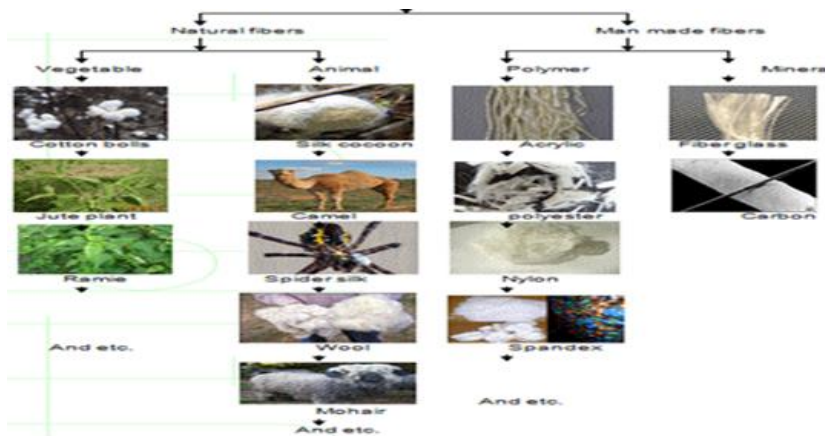


Ginning and Spinning Operation

LEVEL – I

Based on March, 2022 CURRICULUM V-I



Module Title: - Identify fibers and spinning products

Module code: IND GSO1 M02 0322

Nominal duration: 90Hours

Prepared by: Ministry of Labour and Skill

August, 2022

Addis Ababa, Ethiopia

Page 1 of 52	Ministry of Labor and Skills Author/Copyright	Identify fibers and spinning products	Version -1
			August, 2022

Contents

Acknowledgement	4
Introduction to the Module	5
Unit one: Determine job requirements.....	6
1.1 Follow standard operating procedures (SOPs)	6
1.2 Comply with work health and safety (WHS) requirements at all times.....	9
1.3 Use appropriate personal protective equipment (PPE) in accordance with SOPs	9
1.4 Identify job requirements from specifications, drawings, job sheets or work instructions..	10
Self-Check 1	13
Unit Two: Identify types of fibers and spinning products	14
2.1 Prepare work area according to workplace procedures	14
2.2 Identify Types of fibers and spinning products	15
2.3 Generic and trade names of fibers and yarns are identified	19
Self-Check 2.....	21
Unit Three: Identify characteristics of fibers and spinning products.....	22
3.1 Quality of fiber materials, spinning products and yarns.....	22
3.2 Method of measuring fibers and spinning products parameters.....	27
3.3 Maintaining accurate records	28
Self-Check 3.....	31
Unit four: Handle and store materials.....	32
4.1 An appropriate safety procedures and work practices when examining and handling stock	32
Occupational health and safety hazards during the operational phase of textile manufacturing projects primarily include the following:	32
4.2 Appropriate lifting equipment is used to lift heavy or awkward loads.....	34

4.3 Appropriate posture and lifting techniques are used for manual handling of materials.....	38
4.5 Assistance in handling materials is sought when necessary	45
4.5 Storing materials in accordance with enterprise manufacturer's standard practices	46
Self-Check 4.....	49
Reference	50

Acknowledgement

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).

Page 4 of 52	Ministry of Labor and Skills Author/Copyright	Identify fibers and spinning products	Version -1
			August, 2022

Introduction to the Module

Textile fibers have certainly provided an essential element in contemporary society and physical Formation pointing out human comfort. Human is a companion of fashion.

Textile manufacturing process is beginning towards the production of any garment or Textile Products.

The aspirations for quality garment and apparel gave rise to development of textile fiber and textile

The textile companies meet the requirements of human in terms of attire and this attire is brought into the Market after a specific procedure. Textile manufacturing is an extensive and immense industry having a Complex procedure. It undergoes range of stages as converting fiber into yarn, yarn into fabric and so on Ending up with clothing as a concluding product

This module covers the units:

- job requirements
- types of fibers and spinning products
- characteristics of fibers and spinning products
- Handle and store materials

Learning Objective of the Module

- Determine job requirements
- Identify types of fibers and spinning products
- Identify characteristics of fibers and spinning products
- Handle and store materials

For effective use this modules trainee 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” giver at the end of each unit and
5. Read the identified reference book for Examples and exercise

Page 5 of 52	Ministry of Labor and Skills Author/Copyright	Identify fibers and spinning products	Version -1
			August, 2022

Unit one: Determine job requirements

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

- Following standard operating procedures (SOPs)
- Work health and safety (WHS) requirements
- Personal protective equipment (PPE)
- Identifying job requirements

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:

- standard operating procedures (SOPs)
- work health and safety
- personal protective equipment (PPE) in accordance with SOPs
- Identify job requirements

1.1 Follow standard operating procedures (SOPs)

Spinning can be divided into the following three basic operations:

1. Attenuation (drafting) of the roving or sliver to the required linear density
2. Imparting cohesion to the fibrous strand, usually by twist insertion
3. Winding the yarn onto an appropriate package.

Page 6 of 52	Ministry of Labor and Skills Author/Copyright	Identify fibers and spinning products	Version -1 August, 2022
--------------	--	---------------------------------------	----------------------------

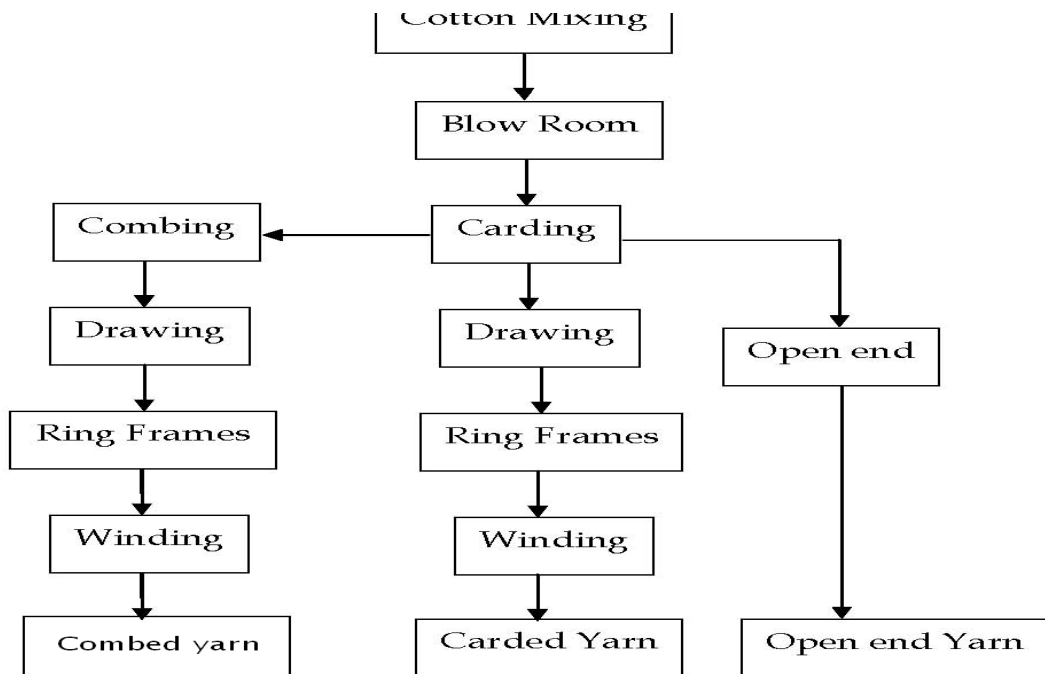


Fig. 1 Sequence of Spinning Process:



Fig. 2 Blow room processes and machines

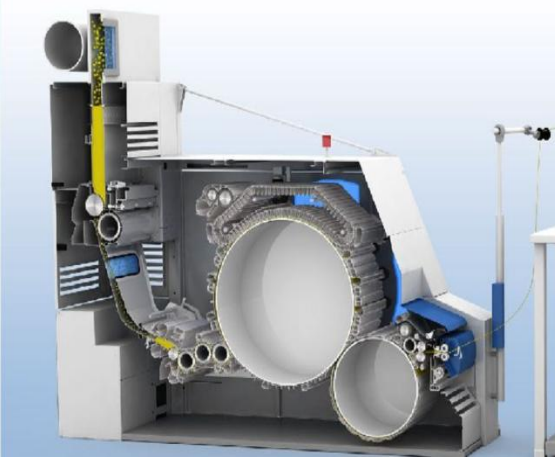


Fig. 3 Carding machines

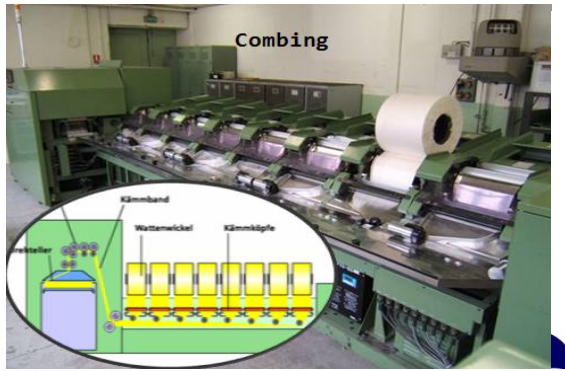


Fig. 4 combing

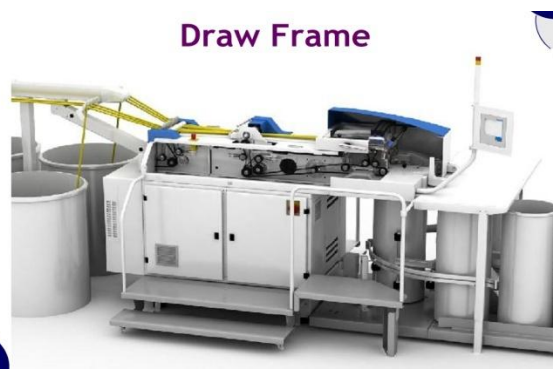


Fig. 5 draw frame

Spinning: The process of making yarns from the textile fiber is called spinning. Spinning is the twisting together of drawn out strands of fibers to form yarn. Product specification for spinning machines varies according to the type of machine, product standard and manufacturing specification.

Specification may include:-

- Count
- Twist
- Tension and weight
- Lubrication
- Twist direction
- Strength

A product specification includes

- A working drawing of the product in black and white showing front and back view measurement details, exploded drawings, highlighting key details, details of seams,
- A written description including components and fabrics, quantities and amounts.
- Samples of fabrics, components and colours
- Sizing details of all different elements
- Appropriate user instructions and aftercare information.

Industry Specification: In industry the product and manufacturing specifications incorporate

- Fabric specification –type, weight, colour, fastness, abrasion, resistance, feel/texture

Page 8 of 52	Ministry of Labor and Skills Author/Copyright	Identify fibers and spinning products	Version -1
			August, 2022

- Garment specification- style, size, dimensions, colours, types of fabrics.
- Component specification- fastenings, interlining, zips, fastenings.

1.2 Comply with work health and safety (WHS) requirements at all times

Machine should be cleaned before and after use according to the standard for quality product and specification.

Clean the different mechanisms in the machine at the scheduled interval as instructed.

- Periodically clean the parts like drum brush as instructed
- Ensure the waxing discs are clean.
- Keep the wastes in waste bags, piercer bags, or in aprons.
- Clean the waste accumulation from different parts of the machine from time to time.
- Use proper tools for cleaning.

Identify and report machine faults

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. Major machine faults are reported.

- double ends
- high thin places
- wrong count
- Contamination
- piecing up
- false twisting and fault identification






1.3 Use appropriate personal protective equipment (PPE) in accordance with SOPs

Workplace personal protective equipments /PPE/ : Personal protecting equipment's are any materials that are used to cover body parts to protect the worker from different disease causing organisms, direct sun radiation and any other physical damages. This equipment's may be provided by purchasing from markets or by making from local materials.

Page 9 of 52	Ministry of Labor and Skills Author/Copyright	Identify fibers and spinning products	Version -1 August, 2022
--------------	--	---------------------------------------	----------------------------

- Manual handling
- Standard operating procedure
- Personal protective equipment(PPE)
- Safe material handling
- Safe storage of materials
- Ergonomic arrangement of workplace
- Housekeeping
- Hazard control and risk management

Table1: Some of personal protecting materials

No	Materials	Description
1		Body safety cloth (tuta): - This cloth is a type of cloth which covers all the body part except the head and the fingers. It is used to protect the
2		Sun hat:- is the material, that is used to protect head from direct sun radiation
3		Eye protecting device: - it is used to protect the eye from different damages
4		Boot:- it is used to protect leg from sharpen and other damaging
5		Hand glove: - which is made of leather or strong flexible plastic rubber, it used to cover fingers to protect from sharpen materials.

1.4 Identify job requirements from specifications, drawings, job sheets or work instructions

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:-

- Ring frame machines Open end machines Setting of machines according to product requirements like:-
 - count

- twist
- Ply
- Tension
- Weight
- Lubrication
- twist direction
- strength
- Extension
- Hank/count

Machine setting is adjusted for product requirement

- 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: - Machine operations may include
 - Drafting splicing
 - Piecing up, joining and Fault identification

Table 2: Material flow in spinning /carded yarn manufacturing/

Machine	Input Material	Out Put Material	Package Form	
Opening & cleaning	Blow Room machines	Raw cotton	Lap or chute feed	-
Carding	Card	Lap or chute feed	Card sliver	Slivers in Can
1st drawing	Breaker Draw frame	Card sliver	Drawn sliver	Sliver can
2nd drawing	Finisher Draw frame	Drawn sliver	Drawn sliver	Sliver can for Roving
Roving	Speed Frame	Drawn sliver	Roving	Roving bobbin
Spinning	Ring spinning frame	Roving	Ring-spun yarn	Spinning Cops

Post-Spinning processes Winding Yarn in spinning cops Yarn on cones Yarn on Cones

Major machine faults are reported Double ends:

- High thin places
- Wrong count
- Contamination
- Piecing up
- False twisting
- Fault identification

Defects in spinning cops like uneven cops, slough off, stained bunch of yarn etc., are to be identified and informed to supervisor for necessary action. Defects in cones like irregular shaped cones, soft or hard cones, stitches formation in cones and Ribbon formation etc. are to be identified and informed to supervisor for necessary action. Defects such as yarn shade variation, twist variation, stains etc. are also to be identified and informed to supervisor for necessary action.

Self-Check 1	Written Test
---------------------	---------------------

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

1. What are the Clean the different mechanisms of machine?
2. What are the Major machines faults are reported Double ends?
3. List some of the product specification for performing spinning operations
4. List the names of 5 spinning machines?
5. What are the three basic Spinning can be operations?
6. Spinning machines varies according to the type of -----and-----
7. What is the product specification?
8. List Workplace personal protective equipments /PPE/?

Unit Two: Identify types of fibers and spinning products

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

- Preparing work area according to workplace procedures
- Identifying types of fibers and spinning products
- Generic and trade names of fibers and yarns

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:

- Preparing work area according to workplace
- Determine Types of fibers and spinning products
- Generic and trade names of fibers and yarns

2.1 Prepare work area according to workplace procedures

Industrial production is a process depending on men and machine. In textile mill, men and machine are to sides of a coin: smooth functioning of the mill depends on science, technology and engineering on one hand. Studies have shown that accidents occur mainly due to unsafe actions, unsafe conditions and carelessness negligence. The textile industry is today equipped with complicated and fast moving production machines. So it necessary that everyone follows safety precautions in order to prevent accidents. Accidents: Causes and Prevention

An accident is unplanned and unexpected event that causes injury to a persons or persons and damage to property and damage to environment. Accidents occur as a result of unsafe action or due to exposure to unsafe mechanical and physical condition. Accidents can also happen due to human failure. To prevent accidents, one should examine how they are caused, and determine what the exact causes are, and then take appropriate actions to eliminate the identified causes.

Two major factors can give rise to accidents.

Unsafe actions unsafe actions may be result of lack awareness or lack of knowledge about the right practice or lack of skill on the part os Worker.

Attitude Studies have shown that more accidents are caused due to negative attitude and then due to bad, unsafe habits at workplace.

- Over confidence: ‘It could never happen to me’

Page 14 of 52	Ministry of Labor and Skills	Identify fibers and spinning products	Version -1
	Author/Copyright		August, 2022

- Stubbornness: ‘I will do it in my own way’
- Sarcasm: ‘why should I bother about it’
- Carelessness: what safety! Safety is kid stuff.

Unsafe mechanical/ physical condition

- Inadequate illumination
- Lack of or inadequate personal protection.
- Poor housekeeping; defective condition, rough, sharp, slippery etc.
- Inadequate guarded machine parts etc.

Electrical safety

- Failure to take precaution against electrical hazards may lead to serious injuries. Statistics show that 15% to 20% of electrical accidents turn out to be fatal. The most common electrical injuries are shock or burn.
- Tips on electrical safety
- Permit only qualified persons to undertake electrical repairs.
- Do not take short cuts follow safe procedure?
- Ensure that extension wire is free from cuts, damage insulation, kinks or joints.
- Check that the pins of socket are not loose.
- Ensure easy access to shut off power supply.

Precautions during running machine

- Do not touch the running portion of any machine
- Never open or remove safety covers on running machine
- Do not wear loose clothing-loosely fitting jackets, long sleeves etc.
- Never put any tool or science or comb etc. in an open

Implementation stage: There is no readymade formula for implementing in an organization. Also overnight implementation is not possible. Top management should have patience to get the full benefit. Each organization should establish and develop implementation methodology depending on the requirement, available

2.2 Identify Types of fibers and spinning products

The most widely used fibers were wool, cotton, silk, hemp and flax (for linen). With the advent of the Industrial Revolution, mechanization of the production process was started, allowing

Page 15 of 52	Ministry of Labor and Skills Author/Copyright	Identify fibers and spinning products	Version -1 August, 2022
---------------	--	---------------------------------------	----------------------------

totally new and faster methods of manufacturing. Over the next 300 years, developments were taking place both in processing and advance in engineered fibers that had totally changed the textile landscape. The first man-made or manufactured fibers, namely viscose (regenerated cellulose fibers), were developed in the fag end of nineteenth century and its industrial production was really started in the early twentieth century. Synthetic fibers were developed in the late 1930s and production took off after the Second World War. The aim in the 21st century is to create fibers that are both functional and sustainable, along with inherent smartness that can be adapted precisely to the changing needs of today’s users. Designers, whether in fashion or textiles, always seek to push the boundaries of design, by exploiting the key characteristics of fibers and their properties.

At present, there are three basic types of fibers groups as given below:

- Natural fibers
- Regenerated fibers
- Synthetic fibers

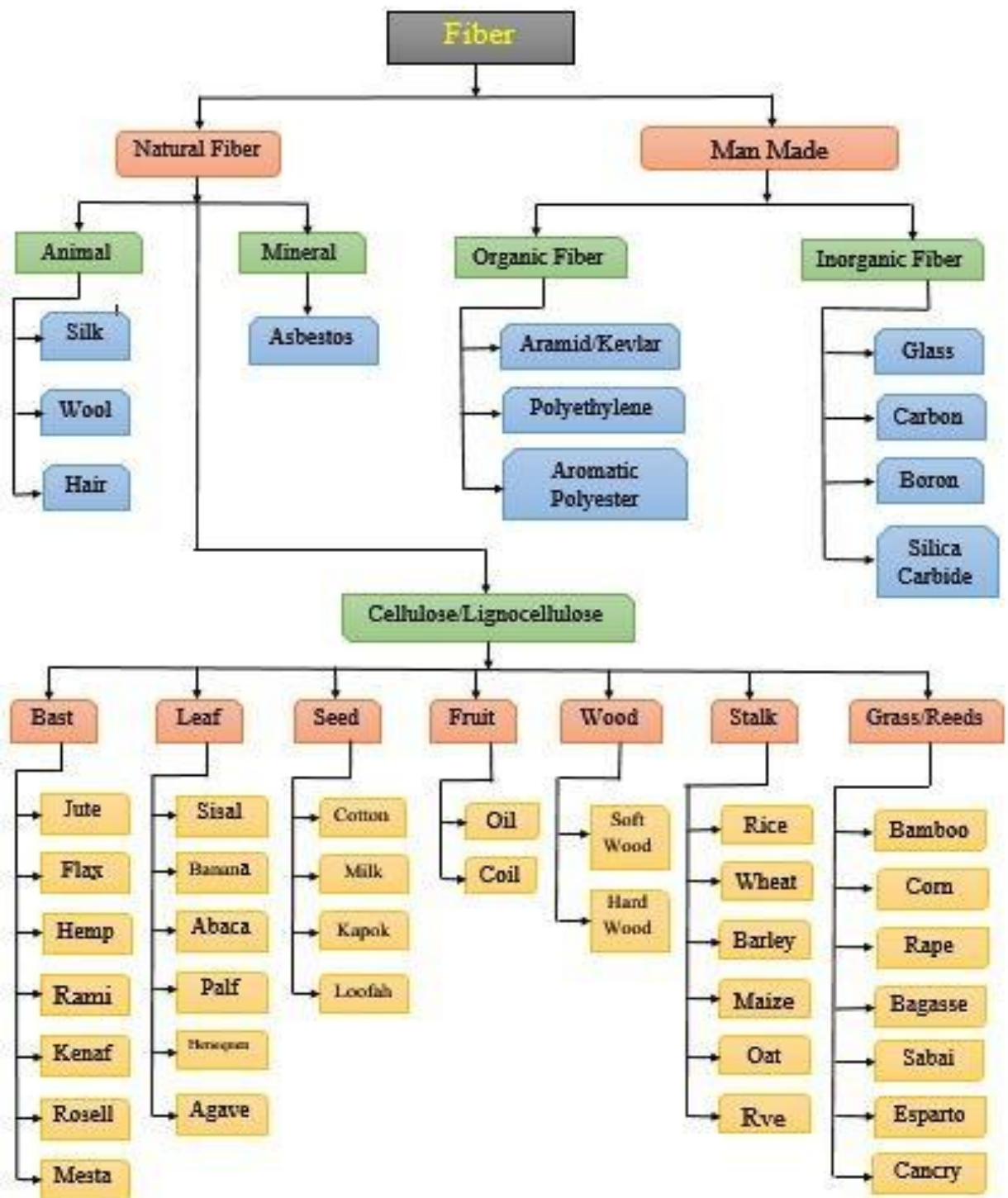


Fig. 6 Fibre classification

Based on the chemical composition of the fibers, natural fibers can be divided into two main types: Asbestos is the only natural mineral fiber and it is no longer in use as it has been found to

Page 17 of 52	Ministry of Labor and Skills Author/Copyright	Identify fibers and spinning products	Version -1 August, 2022
---------------	--	---------------------------------------	----------------------------

be carcinogenic in nature. Animal (protein-based) fibers can be divided into the following categories:

- Wool (from sheep)
- Hair (e.g. from goats, such as mohair and cashmere; or from rabbits, such as angora)
- Silk (from silkworms) Based on which part of the plant the fibers come from, vegetable fibers can be divided into:

- Seed hairs (e.g. cotton)
- Bats (fibers derived from the outer, or bats, layers of plant stems, e.g. flax, hemp and jute)
- Leaf (e.g. sisal) Manufactured or man-made fibers can be classified as:

- Synthetic or chemical polymers, e.g. polyester, nylon (polyamide), acrylic, Lycra
- Regenerated, e.g. viscose, modal, acetate
- Inorganic, e.g. carbon, glass, ceramic and metallic fibers Non-polymer or inorganic fibers are discussed in Chapter 7. Synthetic polymer fibers can be classified in a number of ways. One such classification is as follows (included with their technical definitions):

- Polyesters: It is defined as “any long-chain synthetic polymer composed of at least 85% by weight of an ester of a substituted aromatic carboxylic acid, including, but not restricted to, substituted terephthalate units and Para substituted hydroxyl benzoate units” (e.g. PET, PTT, PBT, PEN, PLA, high-modulus high-tenacity (HM-HT) fibers).

- Polyamides: It is defined as “polymers having in the chain recurring amide groups, at least 85% of which are attached to aliphatic or cyclo-aliphatic groups” (e.g. nylon, PVA, PVC).

- Aramids: These are defined as “polyamides, where each amide group is formed by the reaction of an amino group of one molecule with a carboxyl group of another” (e.g. Kevlar, Nomex).

- Olefins: It is defined as “manufactured fibres in which the basic unit is any long-chain synthetic polymer composed of at least 85% by weight of ethylene, propylene or other olefin units” (e.g. polypropylene, polyethylene).

- Elastomers: It is defined as “materials that, at room temperature, can be stretched repeatedly to at least twice their original length, and upon immediate release will return to approximately the original length” (e.g. polyurethane, Lycra, Spandex).

- Acrylics: It is defined as “manufactured fibers in which the basic substance is a long-chain synthetic polymer composed of at least 85% by weight of acrylonitrile units”.

Page 18 of 52	Ministry of Labor and Skills Author/Copyright	Identify fibers and spinning products	Version -1 August, 2022
---------------	--	---------------------------------------	----------------------------

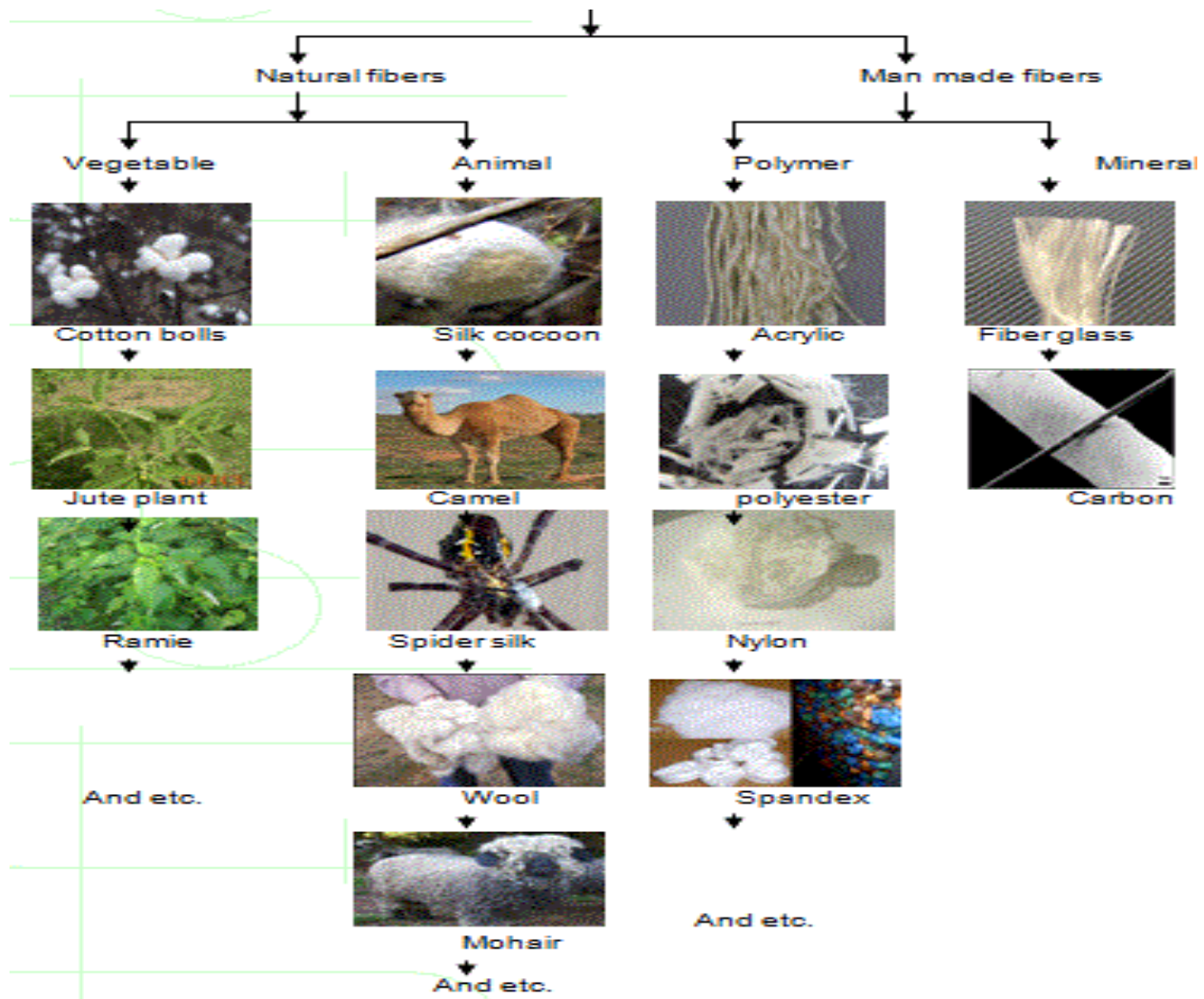


Fig. 7 types of fiber

2.3 Generic and trade names of fibers and yarns are identified

Yarn is an essential element in the design and manufacture of fibrous textile products. It forms an important immediate stage product in many methods of textile production. Yarn is an assembly of fibers twisted together to form a continuous strand that suited for the process of fabric manufacture. Yarn is the building block of a fabric and hence, it contributes significantly to the fabric properties. Yarn is “a generic term for a continuous strand of textile fibers, filaments, or material in a form that is very much suitable for knitting, weaving, or intertwining to form a textile fabric. In general, two major categories of yarn are commercially available, viz. staple fiber (or spun) yarns and continuous filament yarns. The former is made by the mechanical processing of staple fibers (either natural or synthetic or a combination of both these fibers)

Page 19 of 52	Ministry of Labor and Skills Author/Copyright	Identify fibers and spinning products	Version -1 August, 2022
---------------	--	---------------------------------------	----------------------------

using twisting or wrapping techniques. The latter is made by extruding continuous filaments from the synthetic polymers (e.g. polyester, nylon and polypropylene). From these two categories, many different types of yarns can be spun

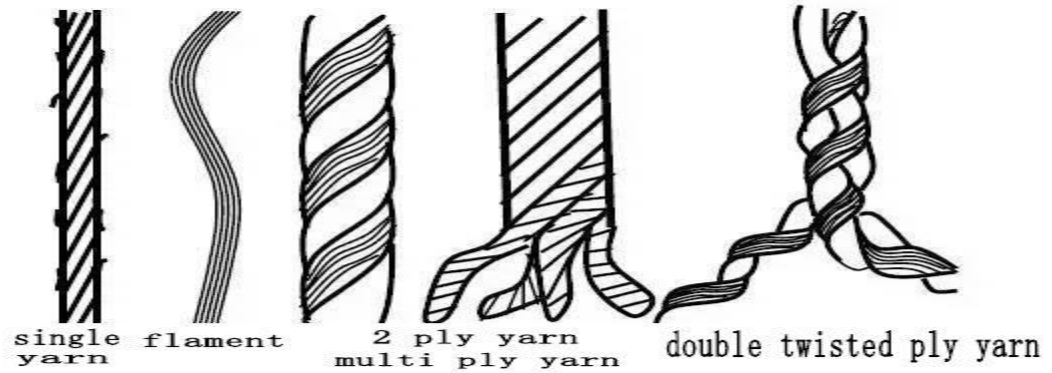


Fig. 8 Types of yarn

Self-Check 2	Written Test
--------------	--------------

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

1. What is the Electrical safety?
2. What are the Accident Causes and Prevention?
3. What are the Precautions during running machine?
4. What are the fibers properties?
5. List the three basic types of fibers?
I, -----
II, -----
III, -----
6. List the most widely used fibers, -----,-----,-----
7. ----- is an essential element in the design and manufacture of fibers textile products.
8. List the types of fibers?

Unit Three: Identify characteristics of fibers and spinning products

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

- Quality of fiber materials, spinning products and yarns
- Method of measuring fibers and spinning products parameters
- Maintaining accurate records

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:

- Determine Quality of fiber materials, spinning products and yarns
- Method of measuring fibers and spinning products parameters
- Maintaining accurate records

3.1 Quality of fiber materials, spinning products and yarns

The quality of a textile product can be evaluated based on some dimensions of quality such as performance, reliability, durability, and aesthetics. The customer may focus on the ability of textile product (such as yarn and fabric) to fit the intended purpose provided that it is supplied at the right time and price. On the other hand, it may focus on the durability of these products. The product of post spinning machines should be checked against quality standard, manufacturer specification and product requirements. Like:-

- Count
- Twist
- Ply
- Tension
- Weight
- Lubrication
- Twist direction
- Strength

Page 22 of 52	Ministry of Labor and Skills Author/Copyright	Identify fibers and spinning products	Version -1
			August, 2022

- Extension
- Hank/count

Yarn quality characteristics

Yarn is a long continuous length of interlocked fibers, suitable for use in the production of textiles, sewing, crocheting, knitting, weaving and rope making. Yarn can be made from any number of synthetic or natural fibers. The following are some quality characteristics of cotton yarn

- **Yarn count** (Yarn numbering):- In spinning room, increased efficiency of operation and improved yarn quality are two major benefits to be derived from effective quality control throughout the preceding operations. The important features of yarn, which are evaluated to determine its quality, are yarn number (count), strength, twist, appearance and evenness. Common yarn numbering systems are cotton English system, Tex, Denier, Metric count, and Worsted system.
- **Yarn strength:** Strength has been accepted by many, as one of the most vital characteristics of yarn. The factors which influence the yarn strength are: staple length of fiber- the longer the fiber the stronger is the yarn, fiber fineness- fine fiber gives greater yarn strength than coarse fibers, fiber strength, twist (as the twist value increase the strength of yarn also increase), and fiber length distribution in the yarn (variation in the distribution of fiber length will cause a variation in yarn strength).
- **Twist of cotton yarn:** The cotton yarn twist is characterized by the number of twists or turns per meter of length and the directions of twist S-twist and Z-twist. Yarn twist needs continuous follow up during production process to minimize the variations.
- **Hairiness of yarn:** These are protruding ends of single fibers or loops formed by separate fiber on the yarn surface. The presence of fiber ends or loops on the yarn surface is called hairiness or fluffiness. The yarn hairiness depends on the kind of fibers, the degree of their straightening, methods of spinning and twisting, and other factors.
- **Yarn evenness:** A deviations in linear density of spinning products (sliver, roving, and yarn) or man-made filament yarns in some portions on one or other side from the mean value determine their unevenness in linear density.

- **Cotton yarn tension:** The tension of yarn should be constant during production or process. There should be a standard value (limit) of yarn tension for each type and count of yarn. When the tension of yarn increase, internal deformation takes place and leads to breakage.

Yarn abrasion: at any stages of processing in the textile industry the fibers and yarns often rub against each other and against the surfaces of the machines working parts.

Spun yarn is made by twisting staple fibers together to make a cohesive thread, or "single. Twisting fibers into yarn in the process called spinning can be dated back to the Upper Paleolithic and yarn spinning was one of the very first processes to be industrialized. Spun yarns may contain a single type of fiber, or be a blend of various types. Combining synthetic fibers (which can have high strength, luster, and fire retardant qualities) with natural fibers (which have good water absorbency and skin comforting qualities) is very common. The most widely used blends are cotton-polyester and wool-acrylic fiber blends. Blends of different natural fibers are common too, especially with more expensive fibers such as alpaca, angora and cashmere.

Yarn is selected for different textiles based on the characteristics of the yarn fibers, such as warmth (wool), light weight (cotton or rayon), durability (nylon is added to sock yarn, for example), or softness (cashmere, alpaca).

Yarn is composed of twisted strands of fiber, which are known as plies when grouped together. These strands of yarn are twisted together (plied) in the opposite direction to make a thicker yarn. Depending on the direction of this final twist, the yarn will have either s twist or z twist. For a single ply yarn, the direction of the final twist is the same as its original twist. The twist direction of yarn can affect the final properties of the fabric, and combined use of the two twist directions can nullify skewing in knitted fabric.

Filament yarn

Filament yarn consists of filament fibers (very long continuous fibers) either twisted together or only grouped together. Thicker monofilaments are typically used for industrial purposes rather than fabric production or decoration. Silk is a natural filament, and synthetic filament yarns are used to produce silk-like effects.

Texturized yarns

Page 24 of 52	Ministry of Labor and Skills Author/Copyright	Identify fibers and spinning products	Version -1 August, 2022
---------------	--	---------------------------------------	----------------------------

Texturized yarns are made by a process of air texturizing filament yarns, which combines multiple filament yarns into a yarn with some of the characteristics of spun yarns.

Yarn quality characteristics

Yarn is a long continuous length of interlocked fibers, suitable for use in the production of textiles, sewing, crocheting, knitting, weaving and rope making. Yarn can be made from any number of synthetic or natural fibers. The following are some quality characteristics of cotton.

Yarn count (Yarn numbering): In spinning room, increased efficiency of operation and improved yarn quality are two major benefits to be derived from effective quality control throughout the preceding operations. The important features of yarn, which are evaluated to determine its quality, are yarn number (count), strength, twist, appearance and evenness. Common yarn numbering systems are cotton English system, Tex, Denier and Metric count.

Yarn strength: Strength has been accepted by many, as one of the most vital characteristics of yarn. The factors which influence the yarn strength are: staple length of fiber- the longer the fiber the stronger is the yarn, fiber fineness- fine fiber gives greater yarn strength than coarse fibers, fiber strength, twist (as the twist value increase the strength of yarn also increase), and fiber length distribution in the yarn (variation in the distribution of fiber length will cause a variation in yarn strength).

Twist of cotton yarn: The cotton yarn twist is characterized by the number of twists or turns per meter of length and the directions of twist S-twist and Z-twist. Yarn twist needs continuous follow up during production process to minimize the variations.

Hairiness of yarn: These are protruding ends of single fibers or loops formed by separate fiber on the yarn surface. The presence of fiber ends or loops on the yarn surface is called hairiness or fluffiness. The yarn hairiness depends on the kind of fibers, the degree of their straightening, methods of spinning and twisting, and other factors.

Yarn evenness: A deviations in linear density of spinning products (sliver, roving, and yarn) or man-made filament yarns in some portions on one or other side from the mean value determine their unevenness in linear density.

Cotton yarn tension: The tension of yarn should be constant during production or process. There should be a standard value (limit) of yarn tension for each type and count of yarn. When the tension of yarn increase, internal deformation takes place and leads to breakage.

Page 25 of 52	Ministry of Labor and Skills Author/Copyright	Identify fibers and spinning products	Version -1 August, 2022
---------------	--	---------------------------------------	----------------------------

Yarn abrasion: at any stages of processing in the textile industry the fibers and yarns often rub against each other and against the surfaces of the machines working parts.

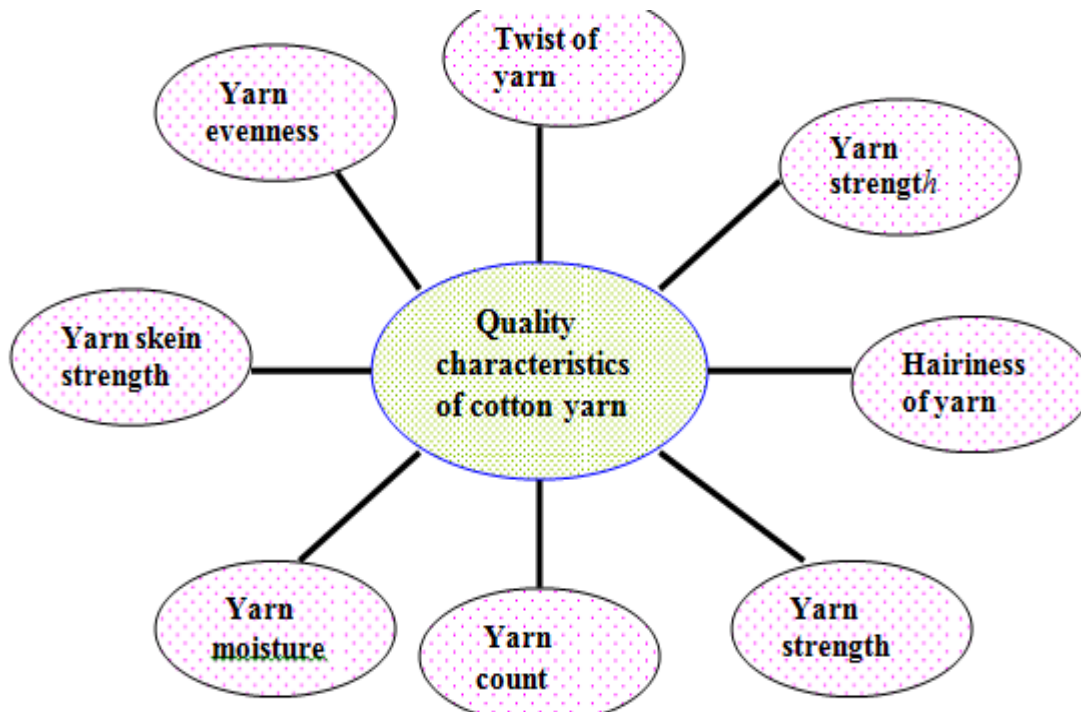


Fig. 9 Quality characteristics of yarn

Color

Yarn may be used UN dyed, or may be color with natural or artificial dyes. Most yarns have a single uniform hue, but there is also a wide selection of variegated yarns:

- Heat hired or tweed: yarn with flecks of different color fiber
- Ombre: variegated yarn with light and dark shades of a single hue
- Multicolored: variegated yarn with two or more distinct hues (a "parrot color way" might have green, yellow and red)
- Self-striping: yarn dyed with lengths of color that will automatically create stripes in a knitted or crocheted object
- Marled: yarn made from strands of different-colored yarn twisted together, sometimes in closely related hues



Fig. 10 colored yarn

Measurements (Quantities)

Yarn quantities for handcrafts are usually measured and sold by weight in ounces or grams. Common sizes include 25 g, 50 g, and 100 g skeins. Some companies also primarily measure in ounces with common sizes being three-ounce, four-ounce, six-ounce, and eight-ounce skeins. Textile measurements are taken at a standard temperature and humidity, because fibers can absorb moisture from the air. The actual length of the yarn contained in a ball or skein can vary due to the inherent heaviness of the fiber and the thickness of the strand; for instance, a 50 g skein of lace weight mohair may contain several hundred meters, while a 50 g skein of bulky wool may contain only 60 meters.

In Europe, textile engineers often use the unit tex, which is the weight in grams of a kilometer of yarn, or decitex, which is a finer measurement corresponding to the weight in grams of 10 km of yarn. Many other units have been used over time by different industries

3.2 Method of measuring fibers and spinning products parameters

Assessing product fault and nonconformity materials during the operation of post spinning machines are very useful to control the quality of the product is checked against quality standards. Product is assessed for faults and non-conformances. Product faults are rectified or reported. Product is checked against quality standards .Product is assessed for faults and non-conformances. Product faults are rectified or reported. Yarn faults are:-

- Double ends
- High thin places
- Wrong count
- Contamination

Page 27 of 52	Ministry of Labor and Skills Author/Copyright	Identify fibers and spinning products	Version -1
			August, 2022

- Piecing up
- False twisting
- Fault identification

3.3 Maintaining accurate records

Record-keeping is an integral part of general production- related duties and tasks. It is not an optional extra to be fitted in if circumstances allow (NMC 2009). Records include anything that makes reference to the work. The approach to record keeping that courts of law adopt tends to be that ‘if it is not recorded, it has not been done’. Good record keeping helps to improve accountability and shows how decisions related to work were made (NMC 2009)

Follow these three general principles to develop records and documents:

1. Keep it short and simple. Use bullet points and flow diagrams instead of long sentences and lengthy paragraphs.
2. Clarity is important. Step-by-step instructions are easily understood.
3. Use a standardized, consistent format. Although different programs may need different documents and records, using a similar approach will help staff learn quickly.

A controlled document or record must contain the following:

- Title
- Creation/revision date
- Page number
- Prepared by/issued by
- Approved date
- Approval signature

By including this information on each page a facility will be able to maintain control of the document or record. Include this information either in the header (top of the page), footer (bottom of the page) or in a combination of the two.

Controlled documentation also ensures that when the system is revised or updated, processors will use only the most up-to-date documents or records. This also helps processors make sure that changes are not made to the system without proper knowledge and approval.

A number of common problems with record-keeping have been identified. These are:

- Absence of clarity e.g. the meaning of 'Had a good day' and ‘slept well’ is not clear

Page 28 of 52	Ministry of Labor and Skills Author/Copyright	Identify fibers and spinning products	Version -1 August, 2022
---------------	--	---------------------------------------	----------------------------

- Failure to record action taken when a problem is identified, e.g. 'is suffering increasing pain' then no record of action taken
- Missing information, e.g. administration of a drug not documented
- Spelling mistakes, e.g. error in name resulting in wrong diagnosis
- Inaccurate records, e.g. changing a dressing or giving medication, when in fact the patient had not received the recorded treatment (leading to a nurse being removed from the Register)
- Failure to document conversations
- Failure to document care given
- Failure to document special needs
- Failure to record telephone calls, e.g. on risk of suicide
- Failures in communication between healthcare professionals
- Too much jargon
- Patient identification, e.g. entry of information on an identity band, clinical documentation and failure to transfer patient details on continuation sheets Scope

Documentation and Record Keeping

The good record keeping as an integral and essential to the provision of safe and effective care

.They acknowledge that good record keeping has a range of important functions including:

- improving communication between healthcare professionals
- supporting delivery and continuity of patient care
- demonstrating clinical judgments and decision making identifying risk for patients

Records:- Provide evidence of various actions taken to demonstrate compliance with instructions, e.g. activities, events, investigations, and in the case of manufactured batches a history of each batch of product, including its distribution. Records include the raw data which is used to generate other records. For electronic records regulated users should define which data are to be used as raw data. At least, all data on which quality decisions are based should be defined as raw data. Good documentation constitutes an essential part of the quality assurance system and is key to operating in compliance with GMP requirements. The various types of documents and media used should be fully defined in the manufacturer's Quality Management.

Page 29 of 52	Ministry of Labor and Skills Author/Copyright	Identify fibers and spinning products	Version -1 August, 2022
---------------	--	---------------------------------------	----------------------------

Documentation may exist in a variety of **forms**, including paper-based, electronic or photographic media. The main objective of the system of documentation utilized must be to establish, control, monitor and record all activities which directly or indirectly impact on all aspects of the quality of medicinal products. The Quality Management System should include sufficient instructional detail to facilitate a common understanding of the requirements, in addition to providing for sufficient recording of the various processes and evaluation of any observations, so that ongoing application of the requirements may be demonstrated. There are two primary types of documentation used to manage and record GMP compliance: instructions (directions, requirements) and records/reports. Appropriate good documentation practice should be applied with respect to the type of document.

Page 30 of 52	Ministry of Labor and Skills Author/Copyright	Identify fibers and spinning products	Version -1
			August, 2022

Self-Check 3	Written Test
---------------------	---------------------

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

1. What are the general principles to develop report and documentation?
2. What are the common problems related with report keeping?
3. Why we keep production related records?
4. What are the means of checking product against standard?
5. Why we can assess Product faults and non-conformities?
6. What are the advantages of rectifying and reporting machine faults?
7. The good record keeping has a range of important functions including:
 - I, -----
 - II, -----
 - III, -----
8. ----- is Provide evidence of various actions taken to demonstrate compliance with instructions.

Unit four: Handle and store materials

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

- An appropriate safety procedures and work practices when examining and handling stock
- appropriate lifting equipment to lift heavy or awkward loads
- appropriate posture and lifting techniques for manual handling of materials
- Assistance in handling materials
- Storing materials in accordance with enterprise manufacturer's standard practices

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:

- An appropriate safety procedures and work practices when examining and handling stock
- appropriate lifting equipment to lift heavy or awkward loads
- appropriate posture and lifting techniques for manual handling of materials
- Assistance in handling materials
- Storing materials in accordance with enterprise manufacturer's standard practices

4.1 An appropriate safety procedures and work practices when examining and handling stock

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

- Chemical hazards Physical hazards Heat
- Noise
- Ionizing and non-ionizing radiation

Chemical Hazards Respiratory & Dermal contact hazards

Dust: Exposure to fine particulates is mainly associated with natural fibers and yarn

Page 32 of 52	Ministry of Labor and Skills Author/Copyright	Identify fibers and spinning products	Version -1 August, 2022
---------------	--	---------------------------------------	----------------------------

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 (e.g. byssinosis in cotton manufacturing, chronic bronchitis, asthma, and emphysema). 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.

Volatile Organic Compounds (VOC): Exposure to VOC emissions is related to the use of solvents in textile printing processes, fabric cleaning, and heat treatments (e.g. thermo fixation, drying, and curing). Worker exposure can cause skin and respiratory impacts. Exposure to certain compounds (e.g. carbon disulfide in rayon manufacturing) may have significant toxic effects, including nervous system and heart diseases.

Prevention and control techniques to reduce VOC exposure hazards include the following:

- Use of hoods and enclosed equipment;
- Use of well-ventilated rooms, with a slight positive pressure, for process control operators, and as worker rest stations;
- Use of shift and task rotation strategies for workers to minimize VOC exposure;
- Installation of extraction and air recycling systems to remove VOCs from the work area with use of appropriate abatement technologies (e.g. scrubbers employing activated carbon absorbers) or routing the extracted vapors

Physical Hazards

Activities related to the maintenance operations of industry- specific equipment (e.g. cards, spinning machinery, looms, and setters) may expose workers to physical impacts, particularly with reference to hot surfaces and moving equipment. Prevention and control of these impacts

Page 33 of 52	Ministry of Labor and Skills Author/Copyright	Identify fibers and spinning products	Version -1 August, 2022
---------------	--	---------------------------------------	----------------------------

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.

Ionizing and Non-Ionizing Radiation: X-ray stations are sometimes used for continuous monitoring of the foam thickness in continuous foam dyeing and for tank level control systems. Operators of this equipment should be protected through the use of ionizing radiation protection measures to limit exposure doses, as described in the **General EHS Guidelines**.

4.2 Appropriate lifting equipment is used to lift heavy or awkward loads

- Read technical manuals to understand equipment and controls
- Disassemble machinery and equipment when there is a problem
- Repair or replace broken or malfunctioning components
- Perform tests and run initial batches to make sure that the machine is running smoothly
- Adjust and calibrate equipment and machinery to optimal specifications.

Put sequence operations to carryout load shifting to carry out load shifting equipment the operation should be performed sequentially. According to the load, type and handling methods.

Use load shifting balance the most common load shift equipment

1. For vertical direction (up and down)

- Block and tackle
- Elevators
- Pillar crane

2. For transport devices

- Wheel barrows
- Hand and power trucks
- Industrial narrow railways tractors

Page 34 of 52	Ministry of Labor and Skills Author/Copyright	Identify fibers and spinning products	Version -1 August, 2022
---------------	--	---------------------------------------	----------------------------

- Pipe lines
- Carts and trolleys

3. Lifting and transport

- Hoists with trolleys running on overhead rails
- Fork lifts truck
- Crone trucks
- Front end loader / backhoe
- Some of the application of the above equipment in textile field

1. Block and tackle

Simple devices to lift vertically up or down heavy pieces of the equipment position them by the use of winding rope or steel chain to get mechanical advantages

E.g. It could be used to position a jacquard machine on a loom.

Warp beam and sizing beam can be handled by suitable block and tackle devices.

2. Elevators/ lifts

In the textile field, the winding machinery is occasionally accommodated in a floor above spinning as the winding machinery in general are light in weight.

This would be given advantages in reducing the building cost.

3. Crane

Cranes provide more flexibility in movement than conveyors because the loads handled can be more varied with respect to their shape and weight. Cranes provide less flexibility in movement than industrial trucks because they only can operate within a restricted area. Most cranes utilize trolley-and-tracks for horizontal movement and hoists for vertical movement, although manipulators can be used if precise positioning of the load is required.

- The most common cranes include the jib, bridge, gantry, and stacker cranes.

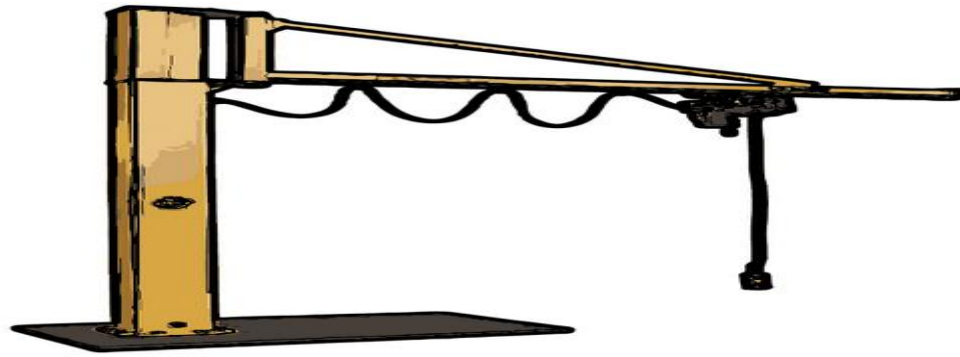


Fig. 11 Crane

4. Hand trucks and wheels barrows

Hand trucks (including carts and dollies), the simplest type of industrial truck, cannot transport or stack pallets, is non-powered, and requires the operator to walk. A pallet jack, which cannot stack a pallet, uses front wheels mounted inside the end of forks that extend to the floor as the pallet is only lifted enough to clear the floor for subsequent travel.

A counterbalanced lift truck (sometimes referred to as a forklift truck, but other attachments besides forks can be used) can transport and stack pallets and allows the operator to ride on the truck. The weight of the vehicle (and operator) behind the front wheels of truck counterbalances weight of the load (and weight of vehicle beyond front wheels); the front wheels act as a fulcrum or pivot point. Narrow-aisle trucks usually require that the operator stand-up while riding in order to reduce the truck's turning radius. Reach mechanisms and outrigger arms that straddle and support a load can be used in addition to the just the counterbalance of the truck. On a turret truck, the forks rotate during stacking, eliminating the need for the truck itself to turn in narrow aisles. An order picker allows the operator to be lifted with the load to allow for less-than-pallet-load picking.

Pallet truck /hand truck

Page 36 of 52	Ministry of Labor and Skills Author/Copyright	Identify fibers and spinning products	Version -1
			August, 2022



Fig. 12 Pallet truck

5. Pipe lines

Chemical in wet processing house are supplied to machines, through pip lines from storage tanks.

6. Front end loader/ backhoe

- A loader also known as bucket loader/scop loader:- is a types of tractor usually wheeled ,sometimes on trucks, that has the front mouthed.
- A loader is commonly used to move a stockpiled material from ground level and disposed it in to a waiting dump truck or open trench excavation.
- The loader assembly may be removal attachment or permanent mounted.
- Loaders are mainly for uploading materials into trucks, laying pipe. These are used for transporting fibres, yarn and cloth bales



Fig. 13 Front end loader

4.3 Appropriate posture and lifting techniques are used for manual handling of materials

A wide range of material handling equipment's is available in the market; which are suitable to the most of the industrial requirements.

Types of material handling equipment's used in the spinning mills are as under

Table 3: Material handling in spinning unit

S. No.	Process	Material	Material handling Equipment
1.	From supplier to mill	Cotton/polyester in bale form	Truck or train or ship
2.	From truck to store	Bale of raw material	Manual 2, 3 or 4 wheeled truck
3.	Raw material store to mixing section	Bale	Manual 2, 3 or 4 wheeled truck
4.	Mixing to blow room line	Loose cotton	Special designed trolleys or lattice or suction
5.	Blow room to card	Laps or loose cotton	Specially designed trolley or Air pipe conveyor and chute
6.	Carding to draw Frame	Sliver cans	Manual trolley or cans fitted castrol wheels
7.	Draw Frames to Speed Frame	Sliver cans	Manual trolley or cans fitted castrol wheels
8.	Speed frame to ring frame	Roving bobbins	Manual trolley/Tapa or special designed trolley
9.	Ring frame doffing	Ring bobbins	Doffing trolleys
10	Ring frame to winding	Ring bobbins	Specially designed plastic trolley
11	Winding to packing	Cones	Big size plastic trolley or special designed trolley

From truck to mill stores

In the most of the textile spinning mills, raw material i. e. cotton or polyester or viscose in the forms of bale and other supplies are carried to mills by means of motor trucks. After arrival of trucks, cotton or manmade fibres bales are manually pushed down on the floor. These bales are transported with the help of 2, 3 or 4-wheeled industrial trucks/trolleys (Figure 1&2) for storing in godown one by one. This consumes time, requires more workers. Sometimes Forklifts (Figures 3) can be used to unload bales (2 or 3 at a time) directly from trucks, transport and stack them in godowns

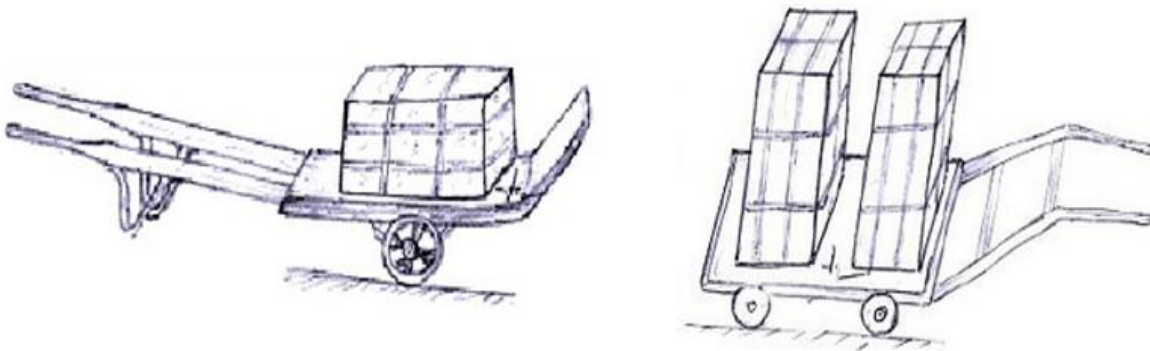


Fig. 14 wheeled industrial trucks

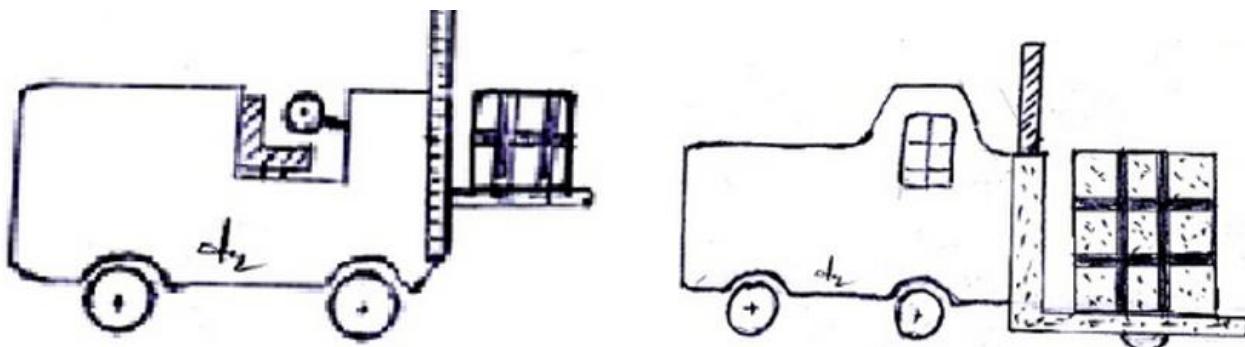


Fig. 15 fork lifts

From carding machine to draw frame and draw frame to speed frame

The material delivered in the form of sliver at the carding machine, comber and draw frame is collected in cans. According to machine make and design, they may be various sizes such as can's diameter is 14", 16", 42" or 48" etc. with and without wheels. (Figure 11)

These cans (both full and empty) are to be transported between cards, draw frames, comber preparatory machines, combers and fly frames. In many mills, cans are transported manually by dragging them on the floor. This practice would not only spoil the floor, damage the can and result in wastage of sliver but also consume more time.

- The trolley shown in Figure 12. can be used to carry 3 or 4 cans at a time. For easy transportation, latest cans are of big size and having wheels (caster) at bottom

From speed frame to ring frame

In the conventional practice, speed frame doffers normally keep the doffed bobbins on the arms and then carry 6 to 8 bobbins by hand to the storage place. This practice is not only laborious but

also sometimes results in bobbins falling on the floor and the roving material getting spoiled. It is also cause injuries to the workers. Mostly, big size plastic container trolley is used for handling the material from speed frame to ring frame. (Figure 14). It can handle one full doff of a speed frame bobbins. Here, bobbins are haphazardly stacked. This often causes damages especially at the bottom row. The most appropriate trolley for carrying full bobbins to ring frames without causing any damage to the roving, is specially designed porcupine type trolley (Figure 15). In this type of trolley, each bobbin is placed separately on a peg.

Post spinning: In many mills, full cones are transported to the packing section by using basket or steel trolley. This practice would cause damages to the cones. To avoid this, mills must use trolleys fitted with cone holder pegs (Figure 19). When the cones are kept in this trolley, it is easy to inspect them for package defects. This trolley can also be used to transport cheeses from doubler winding machines to TFO twisting/ring doubling

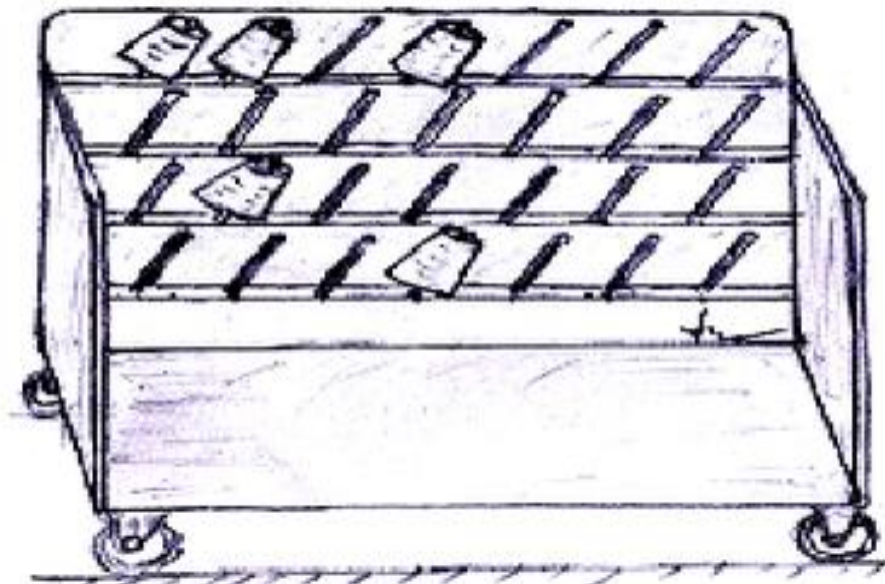


Fig. 16 cone holder pegs

Table 4: Material handling in weaving units

S. No.	Process	Material	Material handling Equipment
1.	Winding cones to warping	Cones	Container plastic trolley or trolleys fitted with cone holder pegs
2.	Warping beams to sizing	Warping beam	Warp Beam Carrier
3.	Sizing to beaming	Sized beam	Manual 2 or 4 wheeled truck, Hoist
4.	Beaming to loom shed	Weave's beam	Special designed trolleys
5.	Loomshed to grey inpection	Cloth beam	Specially designed trolley

Warping to sizing

Special designed equipment's are used to carry warp beam (Figure 20) and to carry empty be

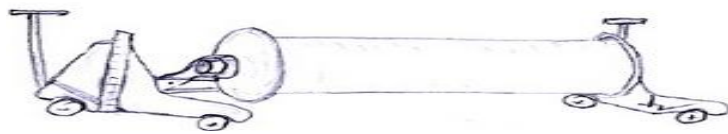


Fig.17: Warp Beam Carrier

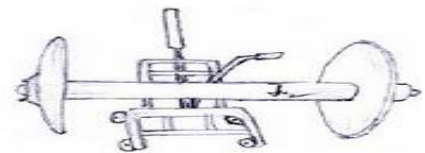


Fig. 18: Empty Beam Carrie

The warp beam should be stacked on rails by which they will be held at a height above the floor and will be supported on barrel rather than on flanges. Beam can be stacked on vertical racks (Figure 23). This method will require less space compared to the earlier., but separate beam lifting arrangement are required for loading and unloading the beams. Either overhead mono-rail with a chain lock or beam lifting trucks can be used for this purpose.

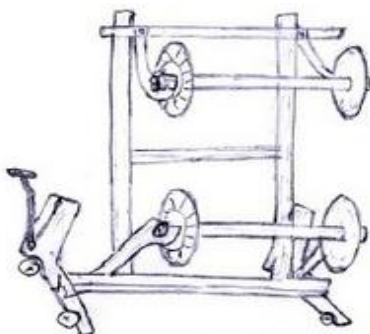


Fig. 19 Double Warp Beam Carrier

Fig. 20 Cloth Roll Stocker Trolley

Requests are received and, where relevant, tasks are organized, confirmed and recorded according to specified procedures. Assistance is provided in transfer or removal of materials or products as required. Appropriate methods of removal and transfer and manual handling techniques are used.

Manual handling techniques: Manual Handling Operations Regulations 1992 (as amended) (MHOR) The Regulations define manual handling as: "...any transporting or supporting of a load (including the lifting, putting down, pushing, pulling, carrying or moving thereof) by hand or bodily force". The load can be an object, person or animal.

LIFTING AND HANDLING

Guidance and Procedures Historically, over 30% of injury accidents at work can be attributed to poor manual handling procedures and techniques.

Common Injuries The physical risks from lifting and handling incorrectly include: **Lifting.**

- Back injuries
- Slipped discs
- Sprains and strains
- Torn ligaments and tendons
- Hernias etc.

Handling.

- Cuts and abrasions
- Crush injuries
- Penetration of sharp objects.

A back injury, once sustained, frequently causes permanent weakness.

The Manual Handling Operations Regulations 1992 impose a duty on employers to manage the risks associated with manual handling activities.

They also establish a clear hierarchy of measures:

1. Avoid hazardous manual handling operations so far as is reasonably practicable
2. Assess any hazardous manual handling operations that cannot be avoided, and
3. Reduce the risk of injury so far as is reasonably practicable.

1. Avoidance. :-A judgment should be made on the nature and likelihood of injury. It need not be necessary to assess in great detail, particularly if the operation can be avoided or the risk of injury is low.

In seeking to avoid manual handling the first question to ask is whether movement of the load can be eliminated altogether. This may be achieved by introducing mechanical aids such as trolleys or sack barrows.

Handle materials and products: Materials handling refers to the process of moving, controlling, protecting as well as storing materials such as goods, items, etc. for manufacture, disposal, and distribution or even for consumption. This process is very crucial because all the materials should be handled well in order to keep it safe, to reach its destination safely and to maintain their quality and condition. In other words, good materials handling is important. Good materials handling is important because it will help you:

- **Eliminate accidents.** If good materials handling is applied, accidents can be prevented and eliminated as this means proper and careful handling is performed.
- **Reduce stress and effort.** Through good materials handling, stress and effort can be minimized. If you are handling materials the right way and you are eliminating all the factors that would make material handling a risky and challenging such as a non-functional equipment, ineffective workers, etc., then materials handling would be a stress-free process.
- **Minimize time spent on distribution, storage,** etc. If you are applying good materials handling, then you are definitely making storage, manufacture, distribution, or consumption of materials and goods less time-consuming. This is because good materials handling means applying solutions that can help make this process quick and easy.
- **Eliminate redundant work.** If there is good material handling, there is no need for you to utilize redundant workers that will only take time and cost extra expenses. When you apply good materials handling, you are also saving money since you are not jeopardizing the quality and condition of the products as well as you are no longer spending a lot to pay extra workers just to ensure that the materials or product are handled well.

There are two essential things needed to apply good materials handling. These are:

Page 43 of 52	Ministry of Labor and Skills Author/Copyright	Identify fibers and spinning products	Version -1 August, 2022
---------------	--	---------------------------------------	----------------------------

- **Expert material handlers.** If you are manually handling materials and products for distribution, storage, etc. this refers to utilizing workers who will serve as material handlers. They are the ones who are going to store, distribute, etc. all the goods to their proper destinations. To ensure good material handling, you need effective material handlers who are really trained and excellent when it comes to the task they are to perform. This will ensure you that they are going to perform materials handling well for the safety of other workers and the products.
- **Efficient material handling storage systems.** If you also want to apply materials handling, efficient storage systems are also necessary. This refers to storage systems that are really functional and automated and can really handle materials well so your time, money and effort would be saved.

Materials handling is not a joke. This is especially true if the materials you are moving or storing are larger materials. This process can be the cause of many warehouse accidents and have earned most companies a lot of workers compensation lawsuits already. For this reason, if you want to save yourself from these lawsuits and prevent tragedies inside the warehouse, make sure that you are applying good materials handling process by hiring expert workers and buying efficient storage systems.

Material handling is the movement, protection, storage and control of materials and products throughout manufacturing, warehousing, distribution, consumption and disposal. As a process, material handling incorporates a wide range of manual, semi-automated and automated equipment and systems that support logistics and make the supply chain work.

Their application helps with:

- Forecasting
- Resource allocation
- Production planning
- Flow and process management
- Inventory management and control
- Customer delivery

Page 44 of 52	Ministry of Labor and Skills Author/Copyright	Identify fibers and spinning products	Version -1
			August, 2022

- After-sales support and service

Material handling equipment is mechanical equipment used for the movement, storage, control and protection of materials, goods and products throughout the process of manufacturing, distribution, consumption and The different types of material handling equipment can be classified into four major categories: transport equipment, positioning equipment, unit load formation equipment, and storage equipment.

4.5 Assistance in handling materials is sought when necessary

Materials handling refers to the process of moving, controlling, protecting as well as storing materials such as goods, items, etc. for manufacture, disposal, and distribution or even for consumption. This process is very crucial because all the materials should be handled well in order to keep it safe, to reach its destination safely and to maintain their quality and condition. In other words, good materials handling is important. Good materials handling is important because it will help you:

- **Eliminate accidents.** If good materials handling is applied, accidents can be prevented and eliminated as this means proper and careful handling is performed.
- **Reduce stress and effort.** Through good materials handling, stress and effort can be minimized. If you are handling materials the right way and you are eliminating all the factors that would make material handling a risky and challenging such as a non-functional equipment, ineffective workers, etc., then materials handling would be a stress-free process.
- **Minimize time spent on distribution, storage,** etc. If you are applying good materials handling, then you are definitely making storage, manufacture, distribution, or consumption of materials and goods less time-consuming. This is because good materials handling means applying solutions that can help make this process quick and easy.
- **Eliminate redundant work.** If there is good material handling, there is no need for you to utilize redundant workers that will only take time and cost extra expenses. When you apply good materials handling, you are also saving money since you are not jeopardizing the quality and condition of the products as well as you are no longer spending a lot to pay extra workers just to ensure that the materials or product are handled well

Page 45 of 52	Ministry of Labor and Skills Author/Copyright	Identify fibers and spinning products	Version -1 August, 2022
---------------	--	---------------------------------------	----------------------------

4.5 Storing materials in accordance with enterprise manufacturer's standard practices

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 (such as fibers for spinning unit or yarns for weaving/ knitting unit and fabrics for wet processing or garmenting units) 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 labor and increasing wages cost demand the most efficient use of labor.

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.

Page 46 of 52	Ministry of Labor and Skills Author/Copyright	Identify fibers and spinning products	Version -1 August, 2022
---------------	--	---------------------------------------	----------------------------

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 labor.
- 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.

Page 47 of 52	Ministry of Labor and Skills Author/Copyright	Identify fibers and spinning products	Version -1
			August, 2022

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.

Self-Check 4	Written Test
---------------------	---------------------

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

1. What is the selection of Material handling equipment factors list?
2. What are the Principles of material handling?
3. -----And-----are the two most important aspects for analyzing or solving a material handling.
4. There are two essential things needed to apply good materials handling is-----
-----and -----
5. What is the most common load shift equipment?

Reference

- Addressing Modern Slavery in Tamil Nadu Textile Industry Feasibility Study And Fabric Forming, 2, 29–34, 1994.
- Bowen, D. A., Living ring finds new believers, Text. Ind., February, 77–79, 1980.
- Brearley, A. and Iredale, J. A, The Woollen Industry, WIRA/British Textile Technology
- De Barr, A. E. and Catling, H., Twist insertion in ring spinning and doubling, J. Text.
- Fuchs, H., Rings and travellers in spinning and twisting, part 2, Int. Text. Bull.,
- Grosberg, P., McNamara, A. B., and Molgaard, J., The performance of ring travellers, Group, Leeds, UK, 1977
- James leloudis and kathryn walbert, Work in a textile mill 2014
- Lord, P. R., Economics, Science and Technology of Yarn Production, North Carolina
- Luu Trong Tuan, Development Strategy for a Textile Firm, 2012
- Oxen ham, W., Developments in short staple yarn manufacture, Textile Progress, The
- Oxtoby, E., Spun Yarn Technology, Butterworth-Heinemann, Boston, MA, 1987.
- Prosino, C. A., Possible speeds of ring spinning frames, Int. Text. Bull., Yarn Forming, Report.
- Sonntag, E. and Artzt, P., Spinning ring diameter productivity, Int. Text. Bull., Yarn Spinning, 3, 235–254, 1973.
- Stalder, H., A new ring and traveller system as the key to more production from the State University, 1981. Textile Institute, ITMA '99 Review, 1–67.

Participants of this Module (training material) preparation

No	Name	Qualification (Level)	Field of Study	Organization/ Institution	Mobile number	E-mail
1	Abdrehman Hassen	B	Garment Enginring	WPTC	0910673126	Abdrehmanhassen39@gmail.com
2	Dawit Gebre	B	Textile Engineering	BuPTC	0920292380	dtexciv@gmail.com
3	Wubishet Tegegne	B	Textile Engineering	BaPTC	0918143343	wubu79@yahoo.com
4	Zemen Amha	B	Textile Engineering	GPTC	0918620373	Zemenamha123@gmail.com

