COURSE - TEXTILE FUNDAMENTALS

Semester - II

PROGRAM – Diploma in Fashion Technology

UNIT I

Course Outcome 1: Identify different raw material for textile production.

Content: Textile Fiber

Definition of textile fiber, Classification of textile fibers on the basis of their origin, physical and chemical properties of – cotton, wool, silk, polyester, viscose and acrylic.

DEFINITION OF TEXTILE FIBER

- What is a fiber?

  Fiber is a unit of matter characterized by flexibility, fineness and high ratio of length to thickness.

- What is textile?

  Textile originally is a woven fabric. The term is now applied to any manufacture from fibers, filaments or yarns, natural or man-made, obtained by interlacing. E.g. thread, cords, ropes, braids, lace, embroidery, nets and cloths made by weaving, knitting, felting, bonding and tufting are textiles.

- Thus textile fibers are the unit of matter characterized by flexibility, fineness and high ratio of length to thickness and used to make textiles.
- What are the essential characteristics of a textile fiber?

There are several primary properties or characteristics necessary for a fiber to become a textile fiber

Fiber length to width ratio (thin but not too thin and enough long)

Fiber uniformity

Fiber strength and flexibility (enough strong and flexible)

Fiber extensibility

Fiber cohesiveness (cohesive = fiber to fiber friction)

FIBER CHARACTERISTIC	DESCRIPTION
Fiber length to width ratio	1:100 0.5 inches to infinitely long Can be twisted into yarn
Fiber uniformity	Uniform in shape and size Irregularity will make yarn unstable Natural fibers are sorted and graded Man-made fibers are tailored as per need
Fiber strength and flexibility	Generally 5 gram per denier (Tenacity = The force per unit linear density necessary to break a known unit of a fiber) Strong enough to stand textile processing Durable enough to provide end use Flexible enough to bend again and again without deterioration

FIBER CHARACTERISITC	DESCRIPTION
Fiber extensibility and elasticity	Extension in length without breakage (less than 5%) At the same time it should be able to recover without deformation Textiles are subjected to stress in daily life
Fiber cohesiveness	Capable of adhering to one another in spinning Due to shape, contour and nature of surface of fiber Due to length in staple fiber Spinning Quality

COURSE - TEXTILE FUNDAMENTALS

Lecture 02

Semester - II

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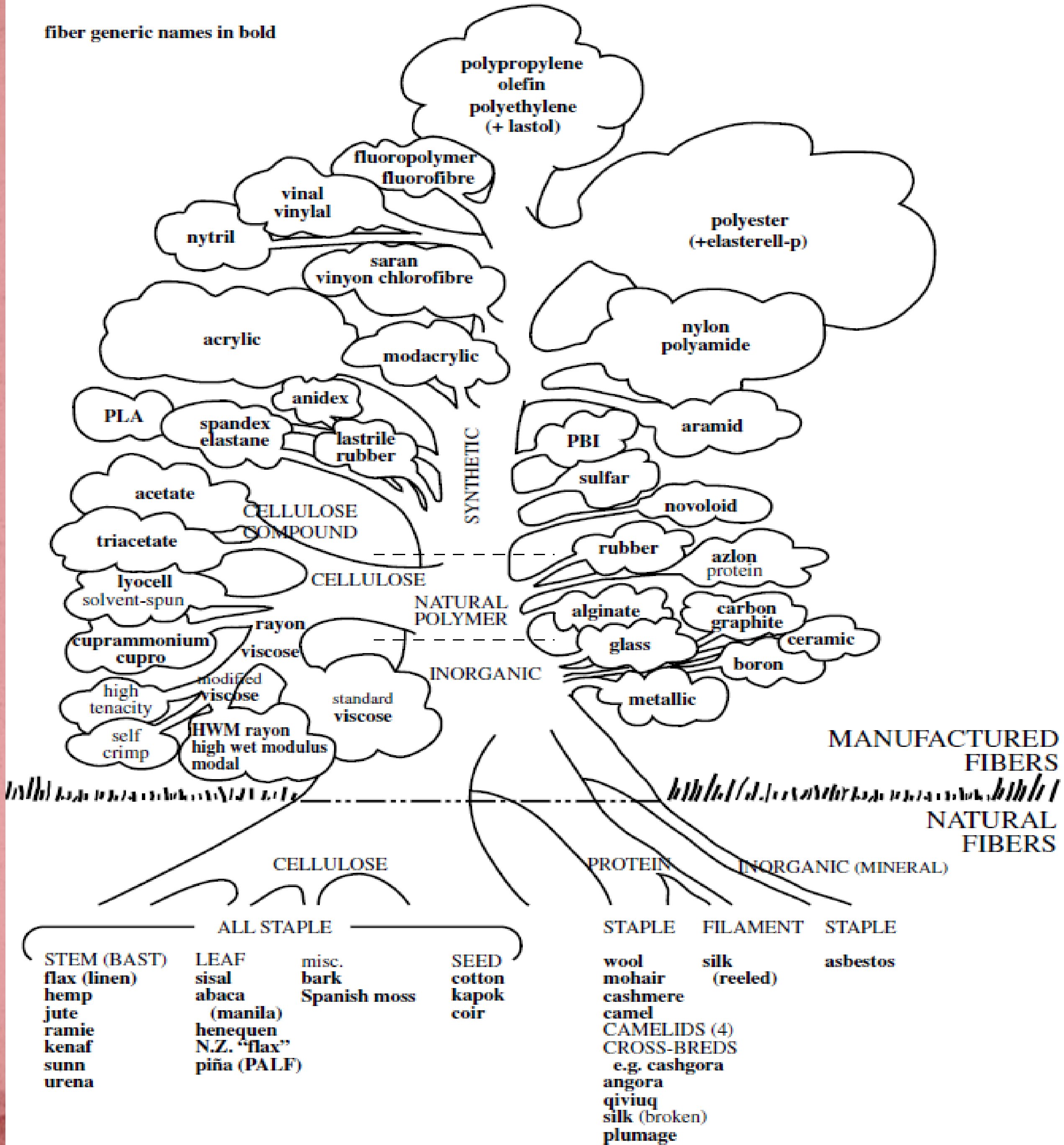
1. TEXTILE FIBERS

- Classification of important textile fibres based on their origin and constituents

  The two main divisions in textile fibers are NATURAL and MANUFACTURED or MAN-MADE
- Textile fibers may be STAPLE or FILAMENT. **Staple** fibers are relatively short, measured in millimeters or inches. **Filament fibers are relatively long, measured** in meters or yards.
- Most natural fibers are staple; the only natural filament fiber is reeled or cultivated silk. On the other hand, all MF fibers can be staple or filament; they begin as filament, and in this form can give silky or (reeled) silk-like fabrics. They can also be cut or broken into staple to give fabrics that look and feel more like wool, cotton, or linen.

TEXTILE FIBER "FAMILY TREE"

fiber generic names in bold



NATURAL FIBERS

fiber generic names in bold

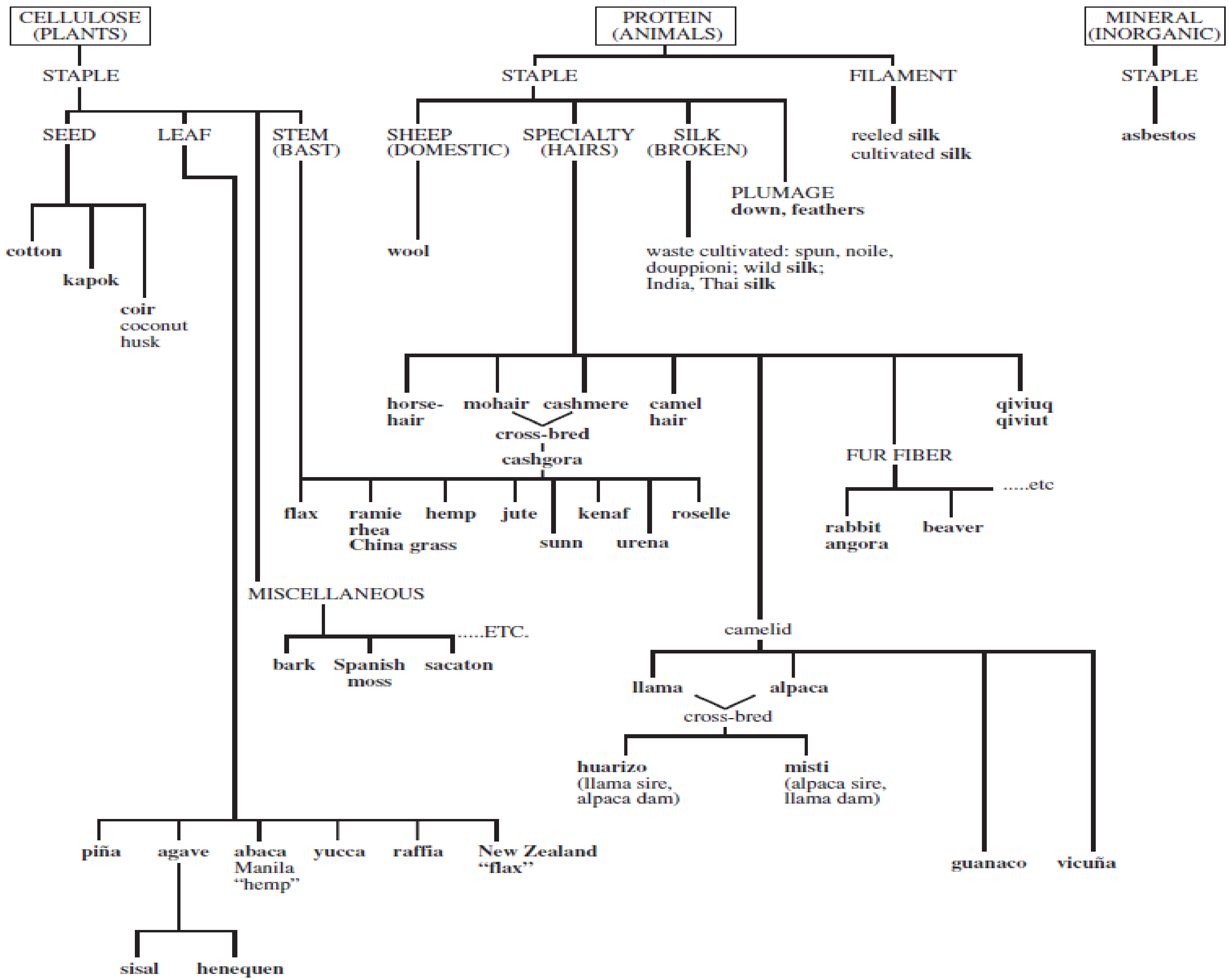


Figure 2.4 Natural fibers flowchart.

MANUFACTURED FIBERS

fiber generic names in bold

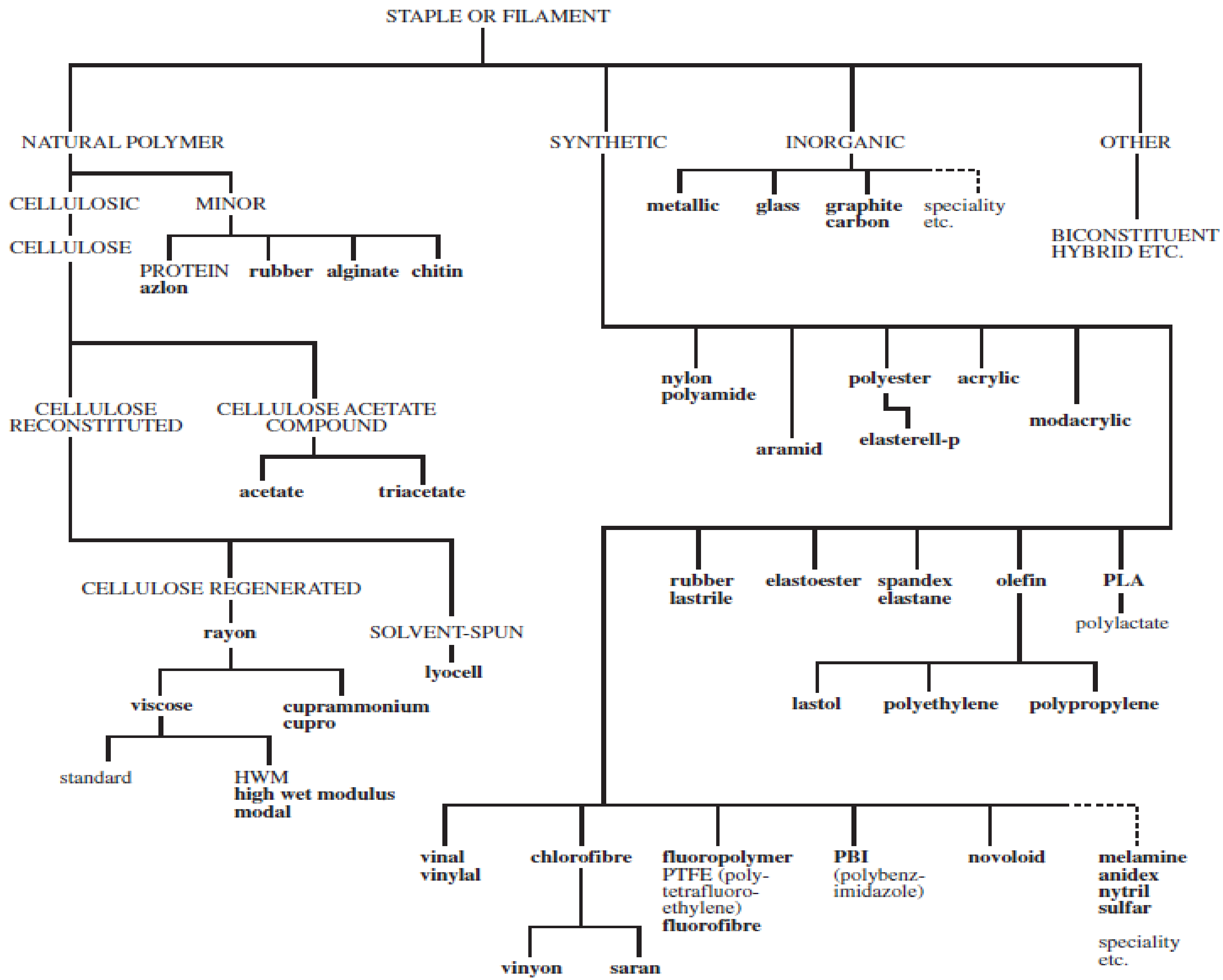


Figure 2.5 Manufactured fibers flowchart.

Cellulosic Fibers
- Cotton
- Flax
- Other natural cellulosic fibers
- Rayon

Cellulosic Ester Fibers
- Acetate
- Triacetate

Protein (Natural Polyamide) Fibers
- Wool
- Silk
- Other natural and regenerated protein fibers

Polyamide (Nylon) Fibers
- Nylon 6 and 6,6
- Aramid
- Other nylon fibers

Polyester Fibers
- Polyethylene terephthalate
- Poly-1,4-cyclohexylenedimethylene terephthalate
- Other polyester fibers

Acrylic and Modacrylic Fibers
- Acrylic
- Modacrylic
- Other acrylics

Polyolefin Fibers

- Polyethylene
- Polypropylene

Vinyl Fibers

- Vinyon
- Vinal
- Vinyon-vinal matrix
- Saran
- Polytetrafluoroethylene

Elastomeric Fibers

- Rubber
- Spandex
- Other elastomeric fibers

Mineral and Metallic Fibers

- Glass
- Inorganic
- Asbestos
- Metallic

Miscellaneous Fibers

- Novaloid
- Carbon
- Poly(m-phenylenedibenzimidazole)
- Polyimide

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1. TEXTILE FIBERS

- What are the other important properties of fiber that are not essential?

  The properties that increases the value and desirability for an end use but are not essential are called as secondary properties of fiber.

  These secondary properties are as following:

Moisture Absorption	Fiber Resiliency	Abrasion Resistance
Density	Lusture	Chemical Resistance
Thermal Characteristics		Flammability

SECONDARY PROPERTIES	DESCRIPTION	REMEMBER
Moisture Absorption	Depends on fiber chemical and physical structure Calculated as Moisture Regain Moisture Regain = (Conditioned wt – Dry wt)*100/Dry wt at T = 21°C, RH = 65% The percentage absorption of water vapor by a fiber is called as its moisture regain Moisture Content = (Conditioned wt – Dry wt)*100/Conditioned wt Moisture content of a fiber is the percentage of the total weight of the fiber which is due to the moisture present Moisture Content < Moisture Regain	Hydrophobic (water-repel) vs Hydrophylic (water-seeking)
Fiber Resiliency	Ability to absorb shock and recover from deformation Stress (Compression/bending/twisting)	Cotton vs Polyester
Abrasion Resistance	Resistance of fiber to damage when stress is applied	Glass vs Polyester

Luster	The degree of light that is reflected from the surface of *a fiber* Also called as gloss or sheen Use depends on fashion trend	Mercerisation vs Delusterant
Chemical Resistance	Should be resistant to routine chemicals used on textiles Should be resistant to chemicals in the environment like light, gases Should be resistant to micro organisms and other biological agents	Chemical Processing and Chemical Finishes
Density	It is expressed as g / cm^3 It affects aesthetics and use of fiber	Fishnets made of polypropylene
Thermal Characteristics	Should be stable against heat Should be resistant to heat and not ignite readily	Stable in Chemical processes/Iro ning
Flammability	Should not be highly inflammable	Self-extinguish, Flame retardant, other finishes

The lectures 1 and 2 can be summarised as following:

Ideally a textile fiber should have the following properties:

- A melting and/or decomposition point above 220°C.
- A tensile strength of 5 g/denier or greater.
- Elongation at break above 10% with reversible elongation up to 5% strain.
- A moisture absorptivity of 2%-5% moisture uptake.
- Combined moisture regain and air entrapment capability.
- High abrasion resistance.
- Resistance to attack, swelling, or solution in solvents, acids, and bases.
- Self-extinguishing when removed from a flame.

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DIPLOMA IN FASHION TECHNOLOGY

SEMESTER II

- Important properties of fibres: cotton, wool, silk, polyester, rayon, acrylic

  PHYSICAL PROPERTIES

  CHEMICAL PROPERTIES

PHYSICAL PROPERTIES	COTTON	WOOL	SILK	POLYESTER	RAYON	ACRYLIC
Strength (Tenacity in g/denier)	2-5 (dry) 2.4-6 (wet)	1-2 (dry) 0.8-1.8 (wet)	3-6 (dry) 2.5-5 (wet)	3-9 (dry)	2-6 (dry) 1-4 (wet)	2-4 (dry) 1.5-3 (wet)
Extensibility (Elongation)	<10%	25-40%		15-50%	10-30%	20-50%
Elasticity (Elastic Recovery @ 2% elongation)	75%	99%	90%	80-95%	70-100%	99%
Moisture Absorption (Moisture Regain)	7-9%	13-18%	11%	0.1-0.4%	11-13%	1-2.5%
Resiliency	Poor	Excellent	Excellent	Excellent	Poor	Excellent
Abrasion Resistance	Fairly Good	Good	Very Good	Very Good	Fair	Fairly Good

Density	1.54	1.28-1.32	1.25-1.3	1.38	1.5-1.54	1.16-1.18
Lusture	Low	Moderate to High	High	Translucent	High	Moderate
Flammability	Burns fiercely	Burns slowly	Burns Slowly	Burns, Melts	Burns fiercely	Burns Moderately
Hand	Cool	Soft, warm and dry	Smooth, drapable and lustu rous	Smooth	Cool	Soft, warm and dry

CHEMICAL PROPERTIES	COTTON	WOOL	SILK	POLYESTER	RAYON	ACRY LIC
Effect of Acids	Strong acids destroys	Resist ant	Slow ly dam aged	Resistant Only damaged by hot and Conc	Strong acids destroys at higher rate than cotton	Dama ged by conc acids
Effects of Alkalis	Swell but not damaged	Damag ed	Dam aged	Resistant Only damaged by hot and Conc	Not damage d	Slow degrad ation
Effect of Oxidising Agents	Strong conc affects	Damag ed	Stro ng conc affec ts	Resistant	Strong conc affects	Adequ ate resista nce
Effect of Heat (Damage at)	120°C	150°C	175° C	210-250°C	150°C	190°C

Effect of Reducing Agents	Strong conc affects	Damaged	Little effect	Resistant	Strong conc affects	Adequate resistance
Effect of Biological Agents	Silverfish/Fungus/bacteria/mildew cause rotting and weakening and also foul odor and stain	Damaged by moths Resistant to mildew	Resistant	Resistant	Fungus/bacteria cause weakening Mildew at sever hot humid conditions	Resistant
Effect of Sunlight	Long period of exposure results in loss of strength and yellowing	Slow degradation in sunlight	Rapid loss of strength and yellowing	Slow degradation in sunlight	Long period of exposure results in loss of strength	Resistant

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Textile Fibers

GENERIC NAME	SCIENTIFIC NAME	SOURCE	CONSTITUENT	Trademark or Trademark Name
COTTON	Gossypium	Seed	Cellulose	The seal of cotton
WOOL	Ovis aries	Sheep	Protein	Woolmark
SILK	Bombyx mori	Silkworm	Protein	Silk Mark India

cotton

PURE NEW WOOL

WOOL RICH BLEND

WOOL BLEND PERFORMANCE

Silk Mark Organisation of India

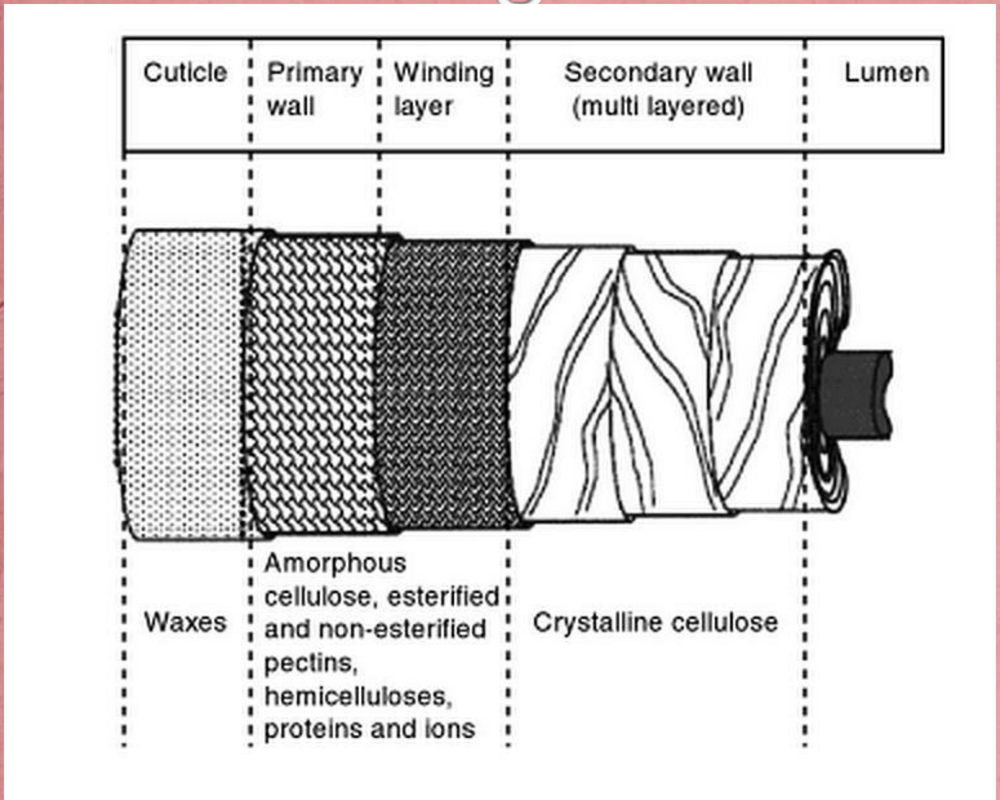
An Initiative of Central Silk Board, Ministry of Textiles, Govt of India

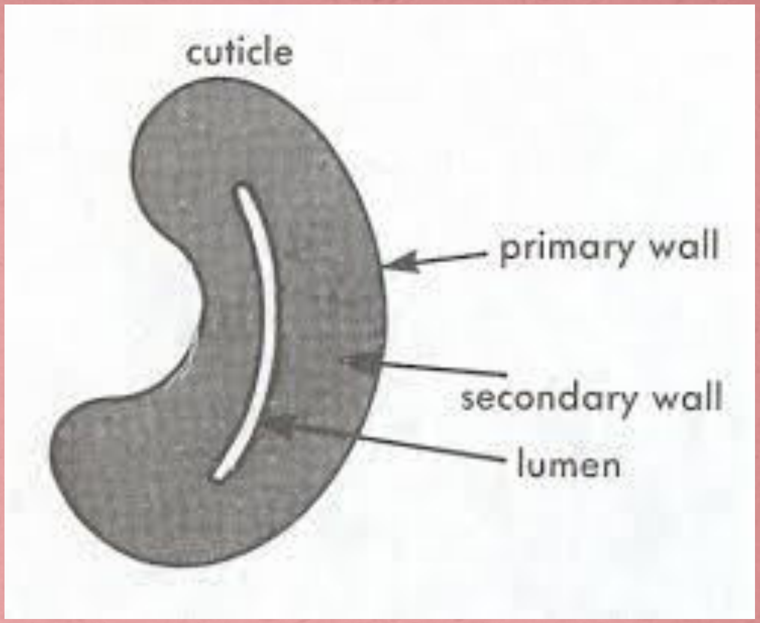
SILK MARK INDIA

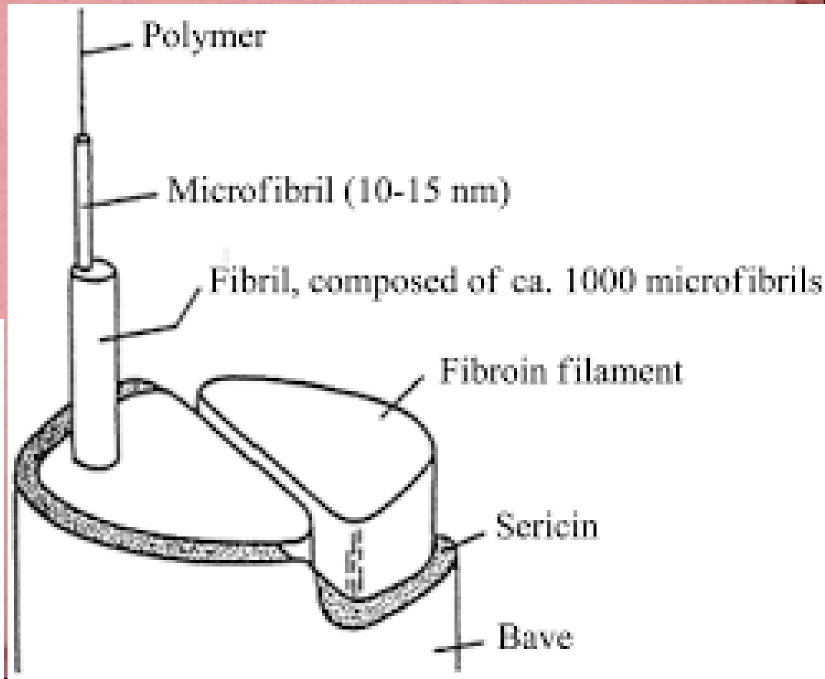
Your Assurance of Pure Silk

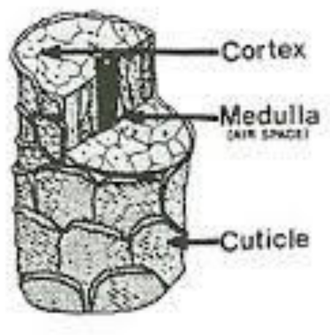
POLYESTER	Polyethylene Terephthalate	Chemical	Terephthalic acid and Diol ethylene glycol	Dacron, Diolen, Fortrel etc
Viscose rayon	Viscose	Natural Regenerated	Regenerated Cellulose	Swicofil, Viscose etc
ACRYLIC	Polyacrylonitrile	Chemical	Acrylonitrile	Acrilan, Biofresh, Creslan etc

Fiber Diagrams









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Textile Yarns

Spinning –

(a) The process of making yarns or cordage from fibres or tow.

(b) The formation of a yarn by a combination drawing or drafting and twisting operation applied to prepared fibre masses, such as roving.

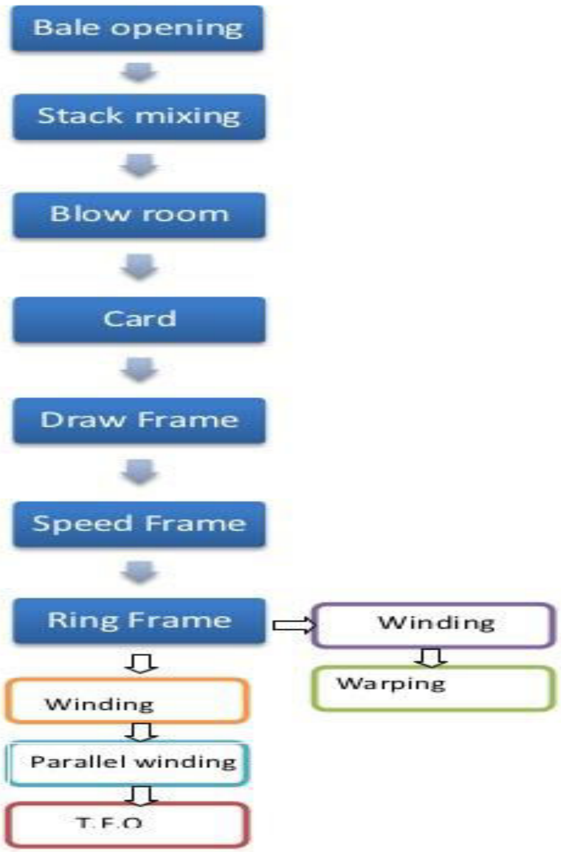
Elementary knowledge of spinning of cotton –

The spinning of cotton can be best understand through a flowchart of various processes involved in converting cotton fibers into cotton yarn. It can be carded yarn (normal count) or combed yarn (fine count)

Input	manufacturing process	output
Cotton bale →	Blow-room →	Lap
Lap →	Carding →	Carded sliver
Carded sliver →	Drawing →	Drawn sliver
Drawn sliver →	Simplex →	Roving
Roving →	Ring-spinning (Spinning Frame) →	Yarn (Spinning bobbin)
Spinning bobbin →	Winding (Auto coner) →	Cone

SPINNING DEPARTMENT

Process Flowchart: Carded



Process Flowchart: Combed

BLOWROOM –

Cotton is opened up, blended and mixed with cotton from other bales

The fibers are separated and loosened from each other.

Trash is removed from the fibers

Fibers are more randomly mixed to assure greater uniformity.

Fibers are formed into thin partially oriented continuous web of intertwined fibers called lap.

CARDING –

Carding involves pulling, separating, and orienting the fibers by passing the lap between successive cylinders moving at different speeds and containing fine bent wire bristles that catch the fibers.

The lap in turn undergoes carding to remove short fibers and remaining trash.

It provides additional orientation to the fibers.

The carded lap is removed by a doffer cylinder in the form of sliver (a rope-like fiber mass) and coiled into a rotating can.

DRAWING AND COMBING –

The sliver may undergo additional blending to improve its uniformity and density so that it may be more effectively drawn and spun into yarn.

The sliver is suitable for drawing and spinning into medium and coarse yarns.

Before drawing and spinning into fine yarns, the cotton sliver must first be combed to further straighten and orient the fibers and to remove additional short tangled fibers.

SIMPLEX AND RINGFRAME–

The drawing and spinning process involves passing the sliver between and through a series of rollers moving at progressively higher speeds to draw the sliver to a finer, more oriented, and uniform structure followed by twisting as the sliver is played onto a turning spindle.

The drawing portion of the operation is referred to as the drafting process.

The degree of twist will depend on the speed of the turning spindle with each complete turn of the spindle providing a single complete twist in the yarn .

SIMPLEX AND RINGFRAME–

In the initial stages where 1ittle twist is present in the drawn sliver, the sliver is fed through a tube and onto the spindle. This process is called roving. The machine is simplex or speed frame.

Subsequent drawing and high speed twisting is carried out by ring spinning in which the drafted, lightly twisted sliver (roving) is fed from the drafting unit onto a high speed spindle via a traveller holding the spun yarn to a ring surrounding the reciprocating spindle.

The traveller can move easily around the ring and provides a slight drag on the yarn as it is fed onto the spindle. Ring spinning proceeds at 5,000 to 10,000 revolutions per minute.

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Textile Yarns

Types of Yarns –

Continuous strand of textile fibres of filaments with **or** without twist, suitable for plying, knitting, braiding, weaving or otherwise inter twining to form a textile end product.

Yarn occurs in the following forms:

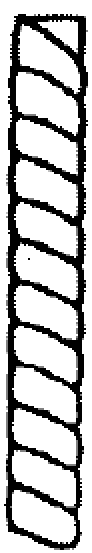
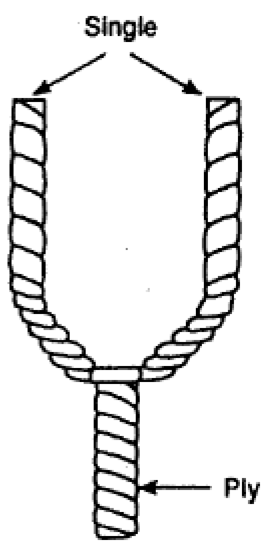
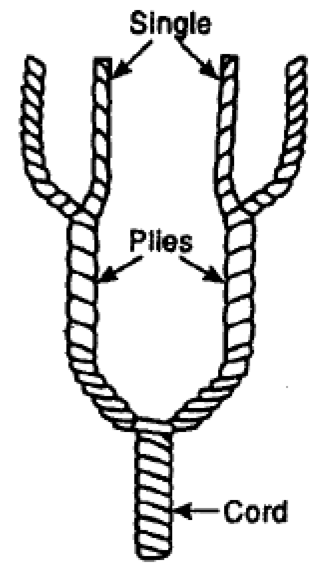
Spun Yarn - A yarn composed of fibres (short length or staple) twisted together.

Filament Yarn -. A yarn composed of "continuous filaments assembled with or without twist.

Monofilament - A single filament with or without twist.

Note - Varieties include single yarn, plied yarn, cabled yarn, cord, thread, fancy yarn etc.

Single, Ply and Cord Yarns

Single Yarn	Ply Yarn	Cord Yarn
A single yarn is made directly from fibers.	A ply yarn is made by second twisting operation which combines two or more singles. Each part of the yarn called a ply. The twist is inserted by a machine called “twister. The ply yarn is also known as folded yarn.	Cord yarns are composed of two or more ply yarns combined for is simple cord yarns, the singles used to make the ply yarns and the ply yarns used to make the cord are simple yarns.
		

Novelty Yarns –

Yarns produced for special effects; usually uneven in size or colour. Flakes, nubs and slubs are typical of novelty yarn.

A yarn that differs significantly from the normal appearance of a single or plied yarn due to the presence of irregularities, deliberately produced during its formation. In single yarns, the irregularities may be due to the inclusion of knots, loops, curls, slubs and the like. In plied yarns, the irregularities may be due to a -variable delivery of one or more of its components or to twisting together dissimilar single yarns.

Slub Yarn - It is a type of fancy yarn having siubs at intervals.

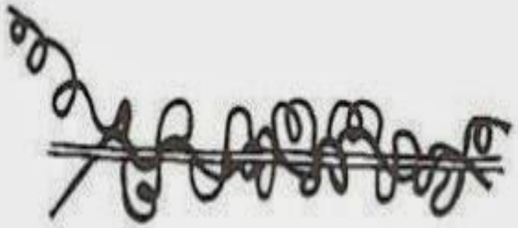
Boucle Yarn - Boucle yarn is a specialized type of yarn that is usually made of three plies. Among the three plies used to create this yarn, one thread is usually looser than the others. The looser thread causes the yarn to have a rough feeling and a bulky look.

Chenille Yarn - **Chenille** is the French word for caterpillar whose fur the **yarn** is supposed to resemble.

Nub Yarn - Also known as knot or spot **yarns**, this novelty **yarn** is made by twisting the ply around the core ply many times within a very short space. This twisting process causes bumps or **nubs** to appear at intervals along the length of the twisted **yarn**.

Corkscrew Yarn - A two ply yarn in which a soft-twisted thick thread is wound spirally round a hard-twisted one.

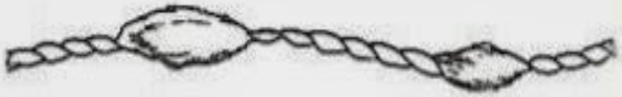
Grindelle Yarn - A two-ply special effect **yarn** made of two colors.



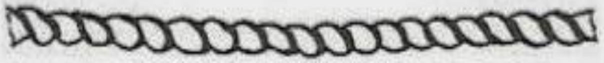
a. BOUCLÉ YARN[1]

b. FLAKE, FLOCK, OR SEED YARN[1]

c. NUB, SPOT, OR KNOP YARN[1]



d. SLUBYARN[1]



e. SPIRAL OR CORKSCREW YARN[1]

f. CHENILLE YARNS[1]

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Textile Yarns

Yarn Properties

Yarn Construction - Construction which indicates the material, count of single yarn, number of turns per unit length, number of plies and the direction of twist in the plies.

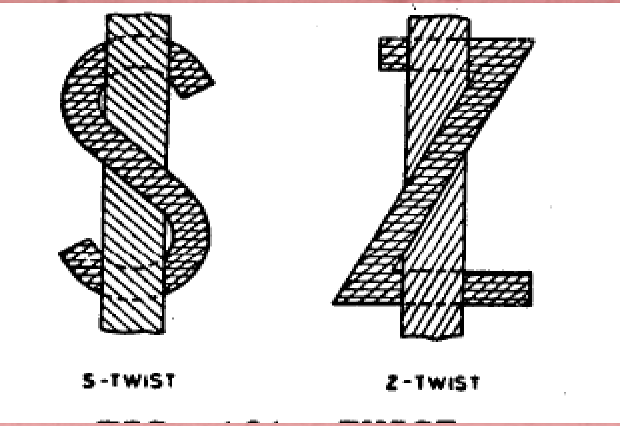
Yarn Twist –

(a) The spiral disposition of the components of a yarn which is usually the result of relative rotation of the two ends.

(b) The number of turns per unit length of a yarn expressed as turns per metre (tpm) or turns per inch (tpi).

(c) S-Twist - The twist in yarn due to which its spirals are in line with central portion of letter S, when the yarn is held in vertical position.

(d) Z-Twist - The twist in yarn due to which its spirals are in line with central portion of letter Z, when the yarn is held in a vertical position.



Twist Factor, Twist Multiplier - A measure of the 'twist hardness' of yarn determined by the multiplication of the' turns per unit length by the square root of the linear density on a direct system, or the division of the turns per unit length by the square root of the count on an indirect system. Typical examples of units of twist factor are:

(a) Turns/cm multiplied by the square root of linear density of yarn in tex;

(b) Turns/in. divided by the square root of cotton count of yarn

Count of Yarn, Yarn Count, Yarn Number, Yarn Linear Density –

A number indicating the mass per unit length or the length per unit mass of a yarn.

Note - Various counting systems, using different units of mass and length, have been in use, so the system used must be stated.The recommended system is tex.

Conversions

a) Direct Systems - To find the count in tex, given that in another system, multiply the given count by the conversion factor. To find the count in any system, given that in tex, divide the count in text by the conversion factor.

b) Indirect Systems - To find the count in tex, given that in another systems divide the conversion factor by the given count. To find the count in any other system, given that in tex, divide the conversion factor by the tex value.

c) Genera. Conversions - To convert the count in one system to that in another, convert to tex and then convert to the second system by means of the above rules.

a) **Direct Systems**

System	Unit of mass	Unit of Length	Conversion Factor to Tex
Tex	gram	kilogram	1
Denier	gram	9 000 metres	0.111 11

b) **Indirect System**

System	Unit of Length	Unit of Mass	Conversion Factor to Tex
Cotton (British)	840 yards (hank)	pound	590.5

$$Ne_c = \frac{590.5}{Tt} \qquad Tt = \frac{590.5}{Ne_c}$$

$$Td = 9\ Tt \qquad Tt = 0.1111\ Td$$

$$Tex = \frac{590.5}{Ne} \text{ and } Denier = \frac{5315}{Ne}$$

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Fabric Manufacturing

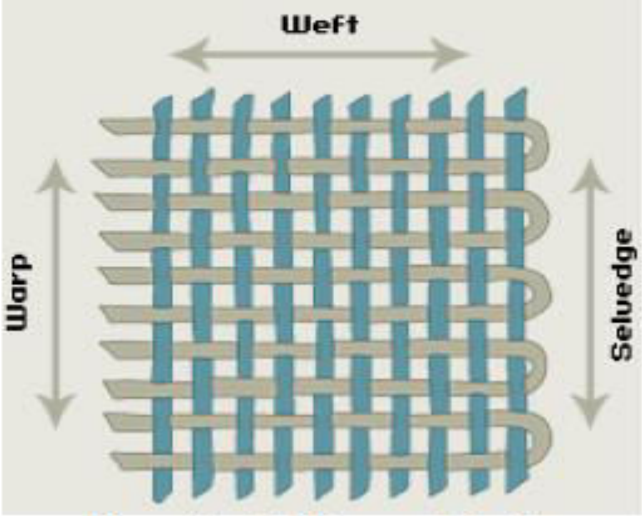
Different techniques of fabric manufacture, definition of weaving, knitting, non-wovens

Fabric - A manufactured assembly of fibres and/or yarns which has substantial surface area in relation to its thickness and sufficient mechanical strength to give assembly inherent cohesion.

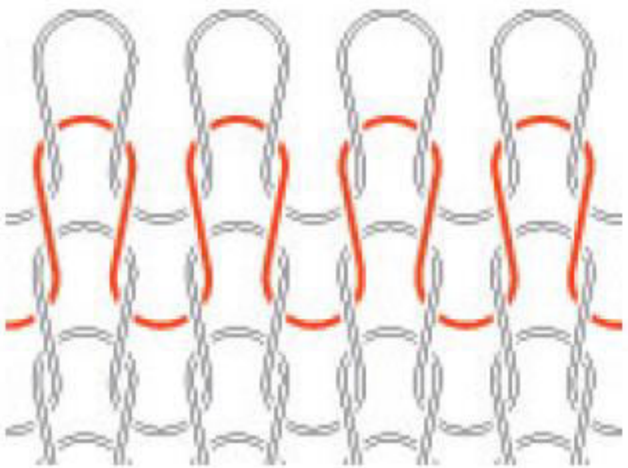
Note - Fabrics are most commonly woven or knitted, but the term includes assemblies produced by lace making, tufting, felting, knot making and the so-called non-woven processes.

Weaving - The interlacing of warp and weft with one another to form a fabric.

Weaving is interlacing of two sets of yarns –warp and weft at 90° angles to each other. Straight yarns in fabric are known as **warp** yarns. Horizontal yarns are known as **weft** yarns. Along the length of the woven fabric, on both sides, end yarns are woven very densely and the portion is named as **selvedge**. It does not allow the fabric yarns to come out from the lengthwise edge. The portion between the two selvedges is the body of the fabric.



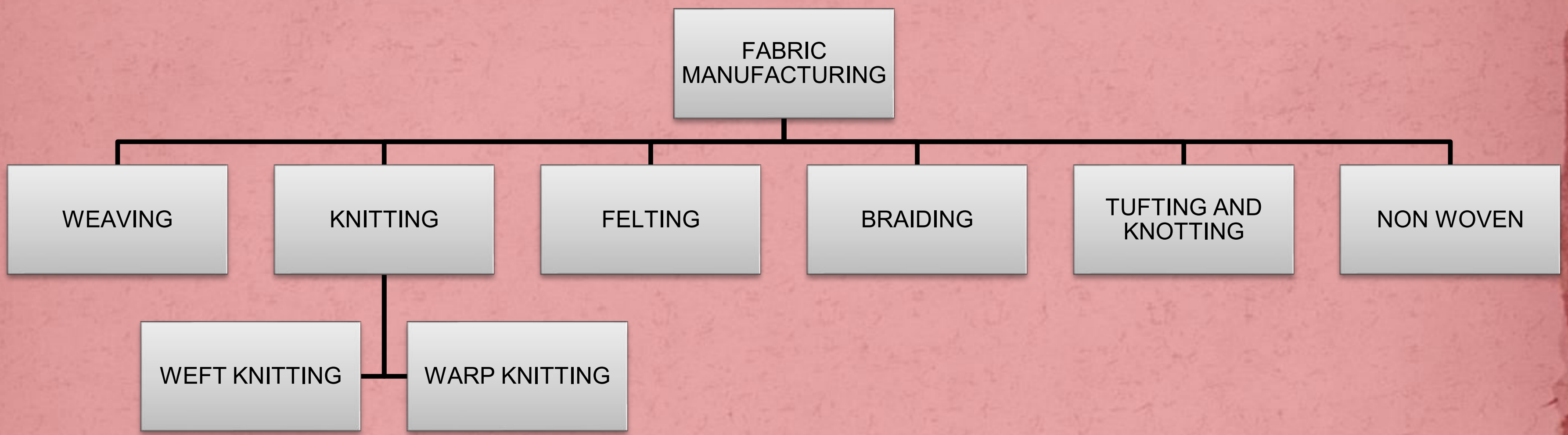
Knitting – The process of producing a fabric with the aid of needles by the interlooping of one or more yarns.

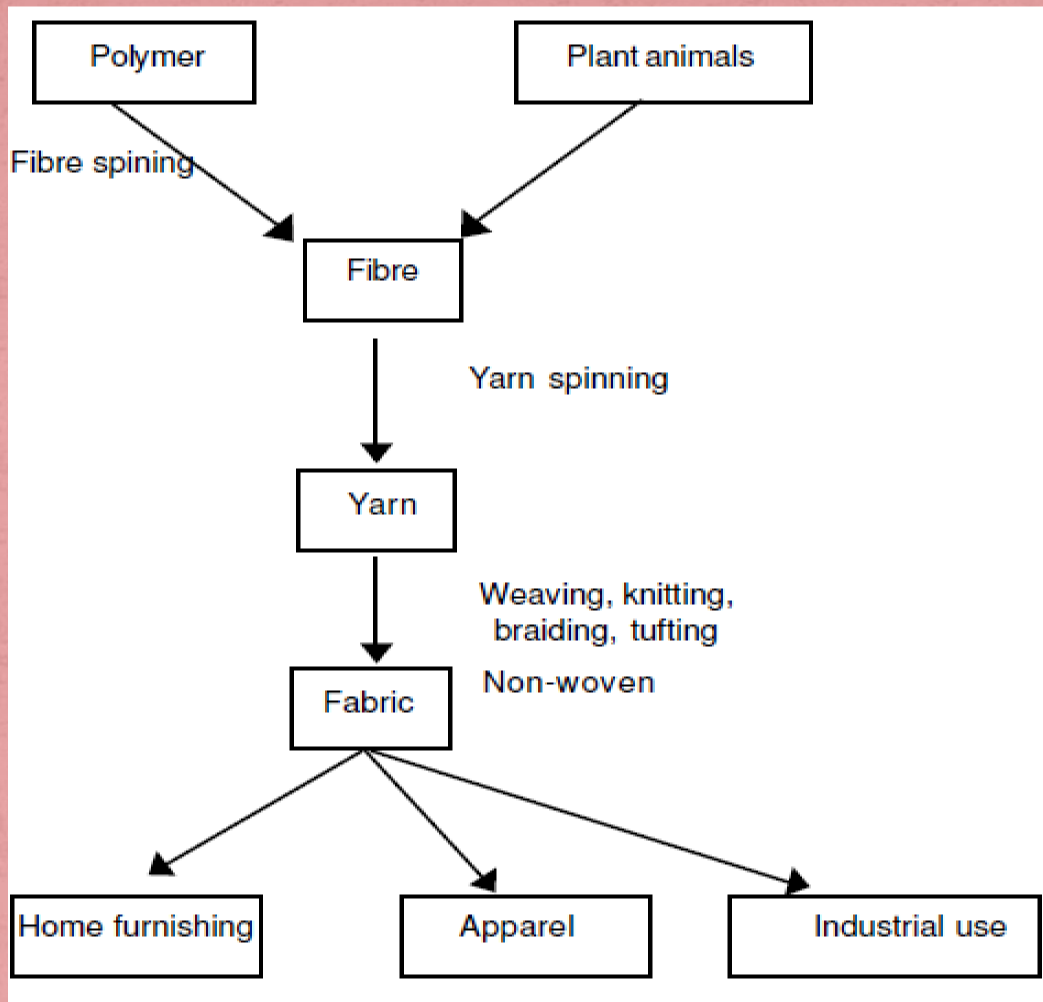


Knitting is the process of formation of loops of yarns and drawing of new loops through those formed previously (interlooping). Depending on the types of knitting, it either moves right to left or left to right (weft knitting) or the yarns run lengthwise (warp knitting). Hand knitting is the most common example of weft knitting, though it is also done on machines to make many types of sweaters, T-shirts, and socks, etc. Warp knitting is only possible on machines. Knitted fabrics are used to make casual wear, party wear, sportswear, undergarments as well as household articles such as bed sheets, bed covers, blankets, etc. See figure

Knitted fabrics are well known for their fit, comfort, stretchability, warmth, absorbency, and wrinkle resistance.

Non-Woven - A non-woven is manufactured sheet, web or batt or directionally or randomly orientated fibres, bonded by friction, and/or cohesion and/or adhesion, excluding paper and products which are woven, knitted, tufted, stitch-bonded incorporting binding yarns or filaments or felted by wet-milling whether additinally needled or not. The fibres may be of natural or man-made origin. They may be staple or continuous filaments or be formed *in situ*.


FABRIC MANUFACTURING
WEAVING
KNITTING
FELTING
BRAIDING
TUFTING AND KNOTTING
NON WOVEN
WEFT KNITTING
WARP KNITTING


Polymer
Plant animals
Fibre spining
Fibre
Yarn spinning
Yarn
Weaving, knitting,
braiding, tufting
Non-woven
Fabric
Home furnishing
Apparel
Industrial use

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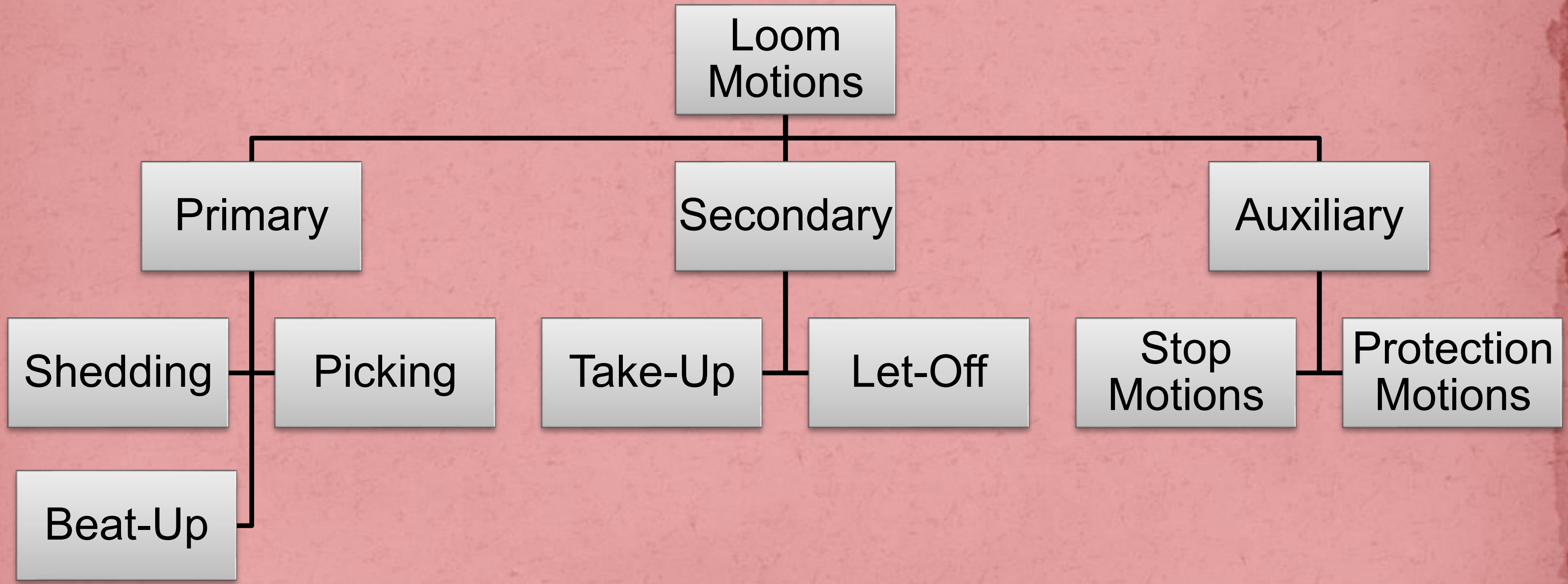
Fabric Manufacturing

Weaving

Working of looms-primary, secondary and auxiliary motions



Primary motions

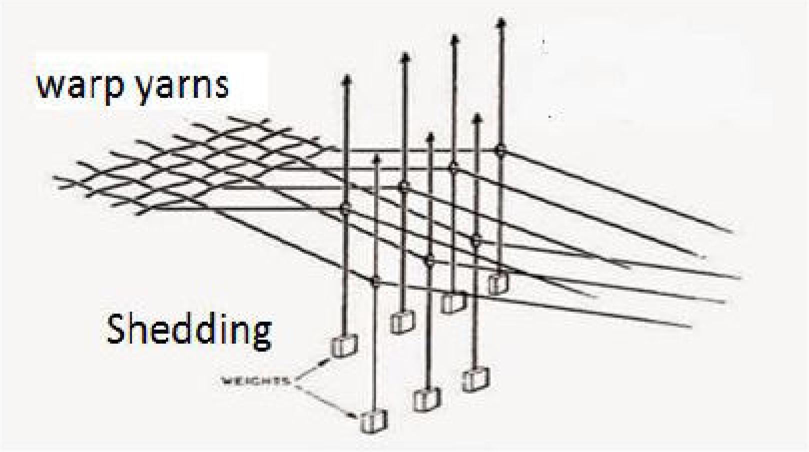
These are the mechanisms which are essentially required on a weaving machine for the operation to be carried out.

Shedding

This process refers to separate the warp threads into two layers. One layer is raised and other lowered.

Shedding motion:

Shedding separates the warp yarns into two layers for the insertion of a pick. The function of shedding mechanism is to raise & lower the heald frames. Which carry a group warp ends drawn through heald eye. There are three kinds of shedding mechanism namely Tappet, Dobby & Jacquard.



Primary motions

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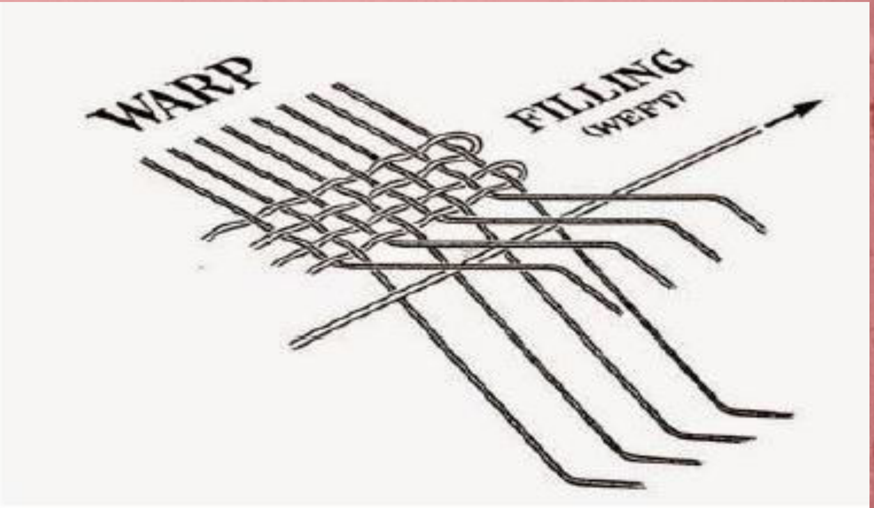
Picking

This process refers to insert a weft thread across the warp ends through the shed.

Picking motion:

Picking motion inserts a pick (weft) from one side to the other side of the fabric.

In **conventional** looms, pick is inserted with the help of a shuttle through the shed opened by the shedding mechanism. i.e. between the two layers of warp shed.



Primary motions

These are the mechanisms which are essentially required on a weaving machine for the operation to be carried out.

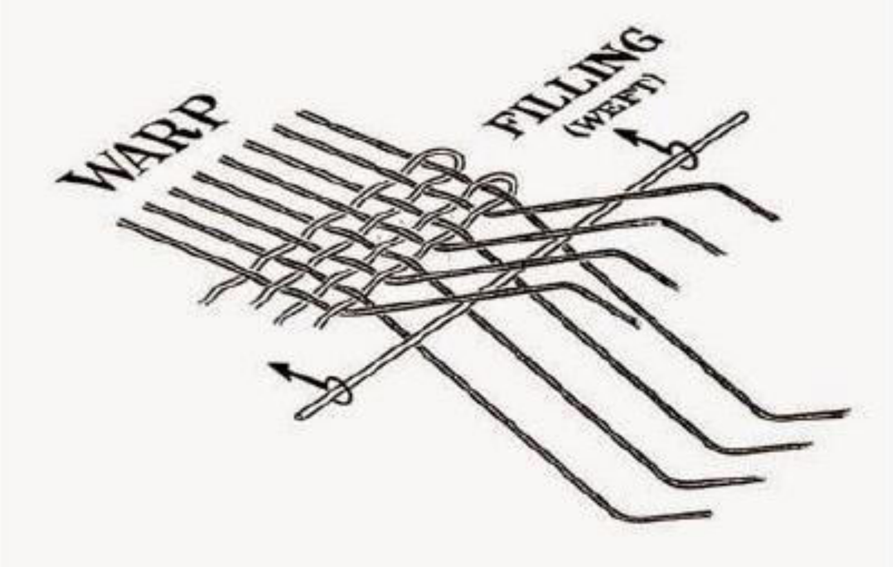
Beat-up

This process referes to push the weft thread that has been inserted across the warp ends upto the cloth fell.

Besides the three main basic motions in weaving, there are other two subsidiary motions necessary for continuous weaving which are termed as secondary motion.

Beating-up:

The function of beat up mechanism is to push the weft thread that has been inserted across the warp threads in a shed, up to the fell of cloth. Fell of the cloth is the position of the last pick in cloth woven on the loom. The beating-up of the weft to the fell of cloth is carried out by the reed, which is fixed on the sley by means of a reed cap.



Secondary motions

These mechanisms are needed for a continuous weaving operation. They cause the material to move forward on the weaving machine.

Take Up

This is the motion to pull the cloth forward after the beat-up of weft, maintaining the same pick density and spacing throughout weaving of a cloth and winding the woven cloth on to a roller.

Take-up motion :

Take- up motion winds the fabric as being manufactured.

It means after the beat up of the weft, woven cloth is drawn away from the reed at the regular rate with the help of emery roller and this rate is decided by the number of picks (picks per inch / picks per 10 centimetre).

In conventional looms a set of seven / five gear wheels and a ratchet wheel are used.

Secondary motions

These mechanisms are needed for a continuous weaving operation. They cause the material to move forward on the weaving machine.

Let-off

This motion allow the warp to unwind from the warp beam during weaving and also maintain an average constant tension of warp as it weaves down.

In order to produce a good quality of cloth and to prevent damages, it is necessary to have some stop motions provided on the loom. which are termed as auxiliary motions.

Let-off motion

Let- off controls the amounts of warp delivered and maintained the regional tension during weaving. It is classified as Negative/Semi Positive let off.

This motion delivers warp to weaving area at the required rate and at a suitable constant tension by unwinding it from a flanged tube known as the weaver's beam

Let-off (warp control) controls the amounts of warp delivered and maintain the regional tension of the warp during weaving.

The weaver has to manually adjust the weight on the tension lever to maintain the tension of warp sheet.

In semi positive let-off motions the attention of weaver to adjust the tension of the warp sheet is reduced to the large extent as the mechanism itself takes care of it.

Auxiliary motions

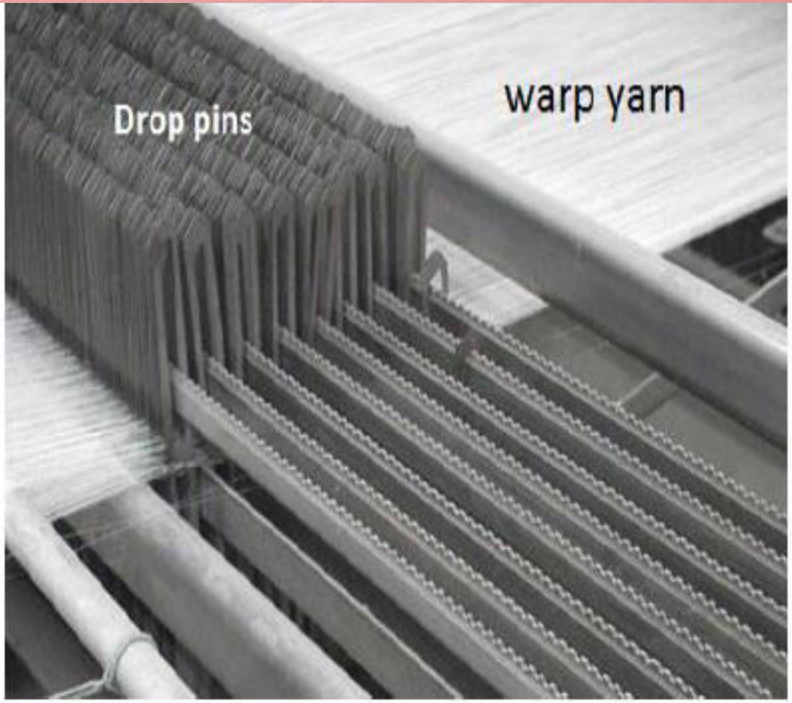
These mechanisms are required for defect-free weaving operation and to stop the machine automatically when such a fault occurs. Without these, the process will continue, but there will be occurrence of faults due to warp breakage, weft breakage etc. the machine has to be stopped manually for attending these faults and a substantial length of defective fabric would be produced by that time.

Warp stop motion

To stop the machine even when a single warp breaks and to facilitate detection of broken end. Warp stop motion detect warp (End) breaks and stop the loom preventing missing end in the cloth.

There are two types of warp stop motions in use i.e. Mechanical & Electrical / Electronic.

Each & every warp ends are drawn through an independent **drop pin**, which are suspended, on the warp yarn.



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Warp Protector

This motion protect the warp threads by stopping the loom when the shuttle fails to reach, the selvedge side and box properly into either the shuttle box during picking.

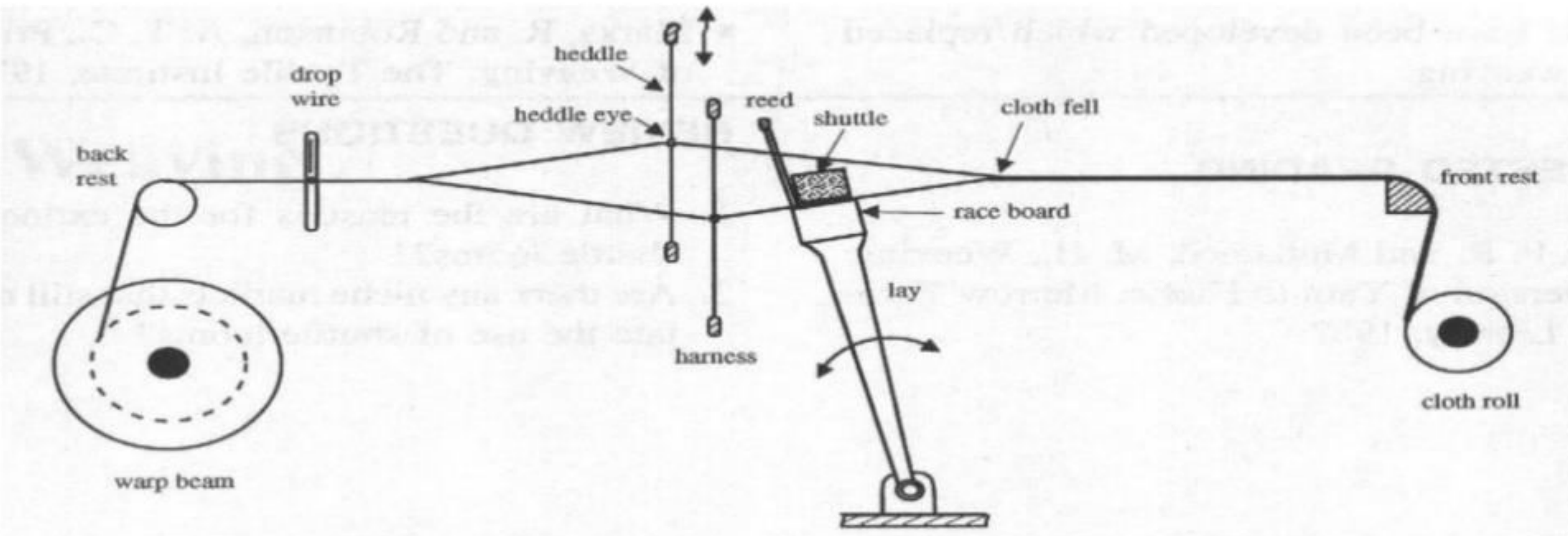
Weft Stop

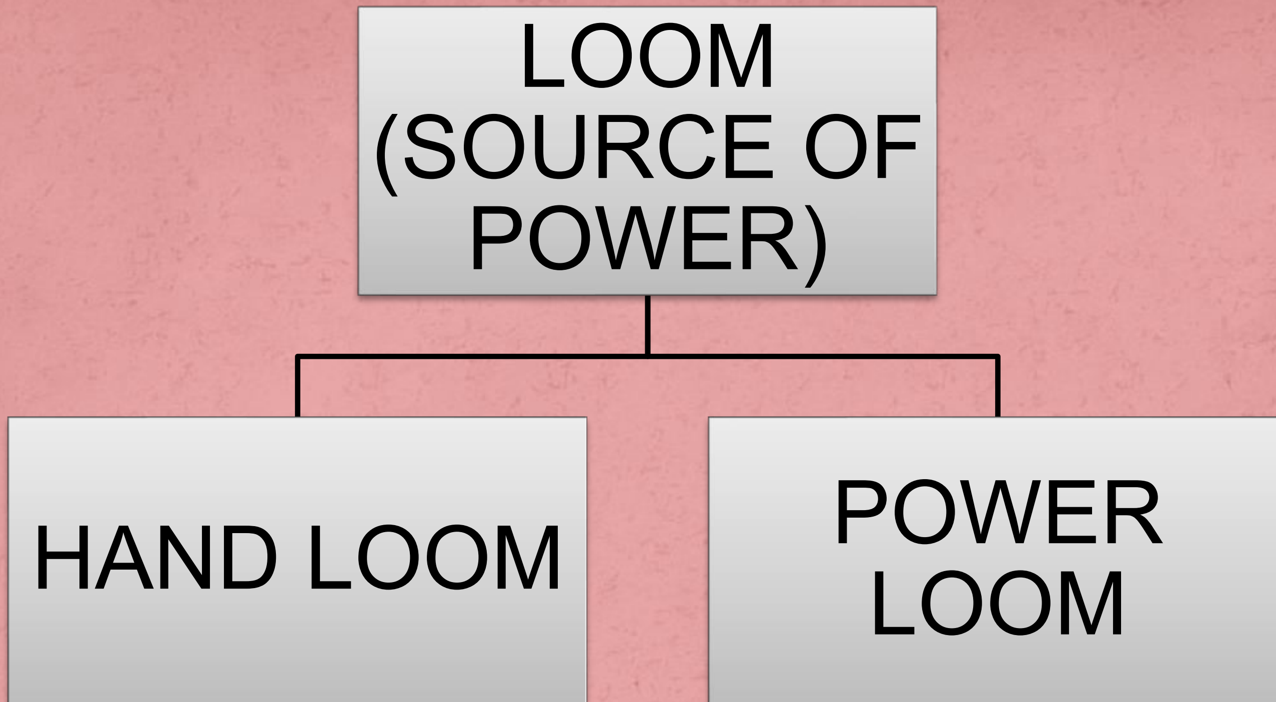
This motion able to stop the loom when a weft breaks or the weft runs out of the pirn (weft package).

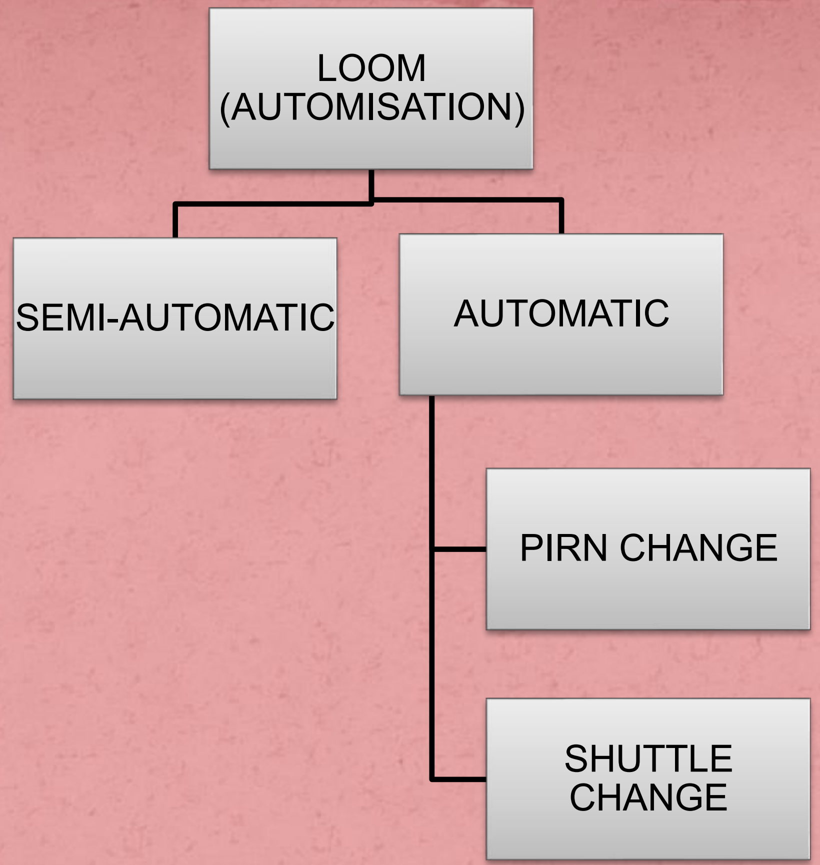
Temple

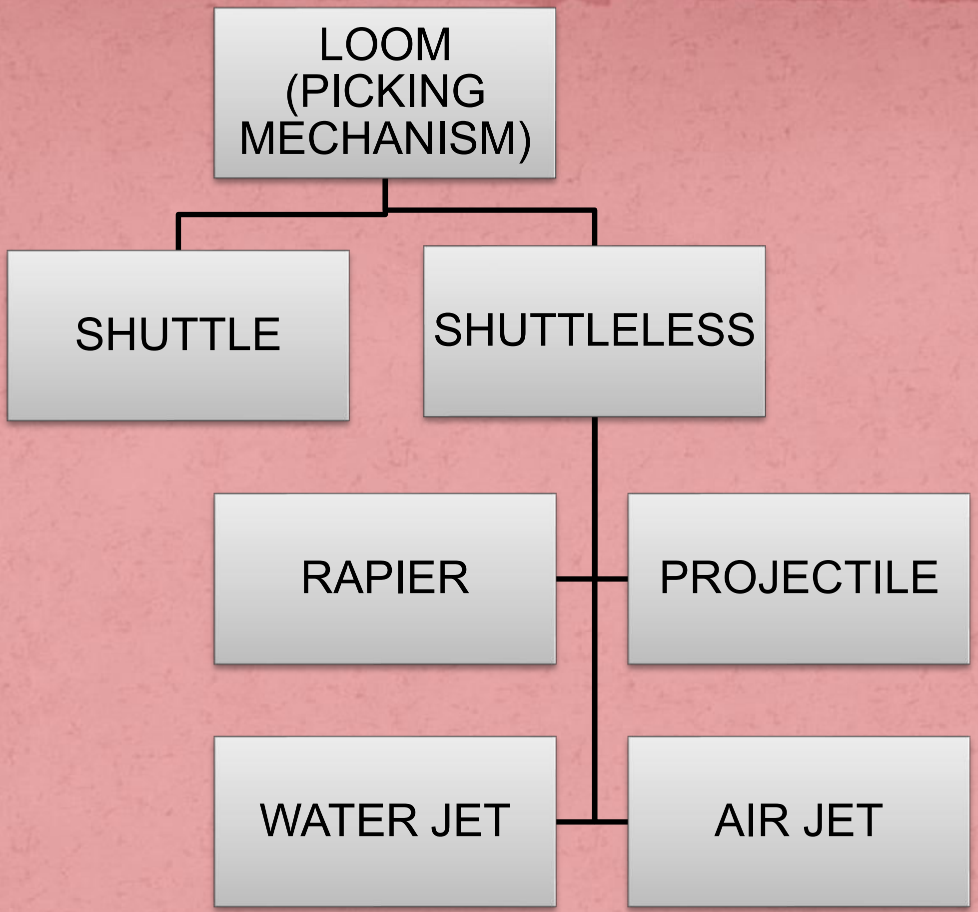
This motion holds the cloth firmly at the fell to assist the formation of a uniform width cloth.

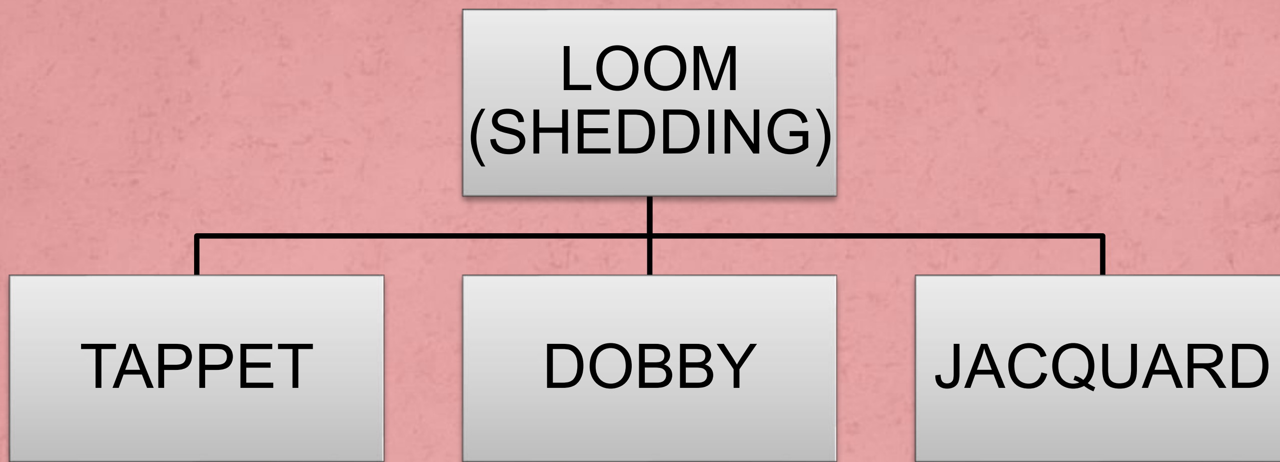
Cross section of loom

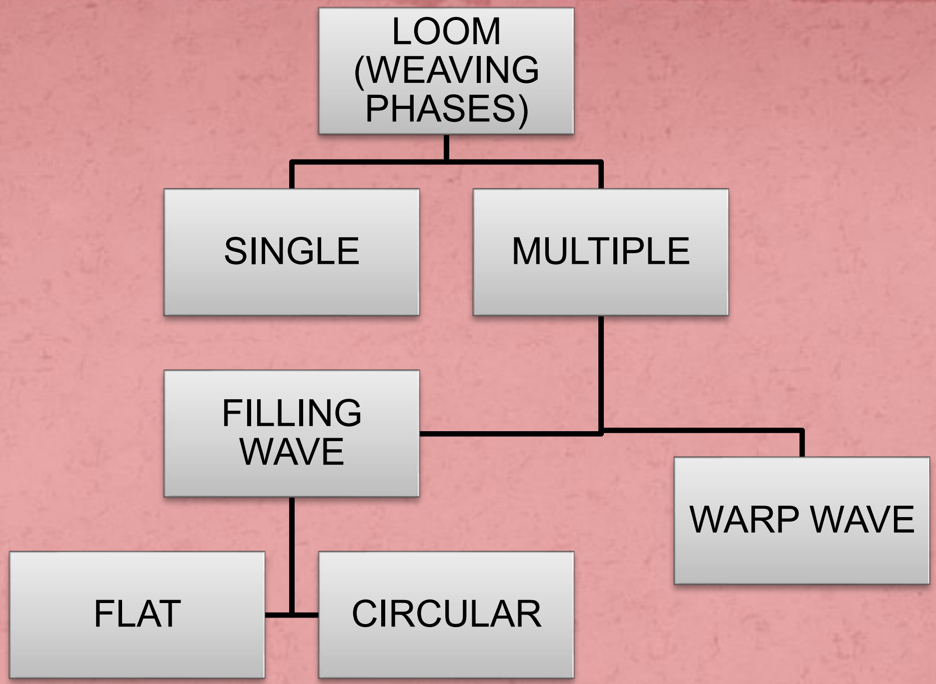



LOOM (SOURCE OF POWER)
HAND LOOM
POWER LOOM


LOOM (AUTOMISATION)
SEMI-AUTOMATIC
AUTOMATIC
PIRN CHANGE
SHUTTLE CHANGE


LOOM (PICKING MECHANISM)
SHUTTLE
SHUTTLELESS
RAPIER
PROJECTILE
WATER JET
AIR JET


LOOM
(SHEDDING)
TAPPET
DOBBY
JACQUARD


LOOM (WEAVING PHASES)
SINGLE
MULTIPLE
FILLING WAVE
WARP WAVE
FLAT
CIRCULAR

BASIS	TYPES
POWER	HANDLOOM AND POWER LOOM
FUNCTIONS	SEMI AND FULLY AUTOMATIC
PICKING	SHUTTLE AND SHUTTLELESS
PHASE	SINGLE AND MULTIPLE
SHEDDING	TAPPET, DOBBY AND JACQUARD

Plain Weave - The type of weave in a cloth in which each warp thread or a pair of warp threads passes alternately over and under each weft thread.

PLAIN WEAVES

- ✓ The plain weave is variously known as "calico" or "tabby" weave
- ✓ It is the simplest of all weaves having a repeat size of 2

CHARACTERISTICS

(i) It has the maximum number of binding points

(ii) The threads interlace on alternate order of 1 up and 1 down.

(iii) The thread density is limited

(iv) Cloth thickness and mass per unit area are limited

(v) It produces a relatively stronger fabric that is obtained by any other simple combination of threads, excepting that of "gauze"or "cross weaving"

- ✓ **Principle of construction** - interlacement of any two continuous threads either warp or weft in an exactly contrary manner to each other, with every thread in each series passing alternately under and over consecutive threads of other series interlaces uniformly throughout the fabric
- ✓ By this plan of interlacement, every thread in each series interlaces with every thread in the other series to the maximum extent, thereby producing a comparatively firm and strong texture of cloth

TEXTURAL STABILITY OF PLAIN WEAVE IN RELATION TO OTHER WEAVES

- The firmness of any woven structure depends on the frequency of interlacing between the warp and weft threads
- The greater the number of intersections the better will be the firmness of the cloth
- Let us consider the case of two fabrics woven with identical warp and weft counts and thread settings
- Consider - one is woven as plain weave and other - weave such as twill, sateen, ..
- It will be seen that the latter will be less firm, and therefore of weaker texture than the former, *because the threads composing it would be bent in a lesser degree than those of the plain weave, thereby causing them to be less firmly compacted*

END USES

Finds extensive uses. It is used in cambric, muslin, blanket, canvas, dhothi, saree, shirting, suiting, etc.

Twill Weave – The weave that produces diagonal patterns on the surface of the cloth. In the jute industry, generally 2 x 1 simple twill weave is used.

TWILL WEAVES

- ✓ They can be constructed in a variety of ways
- ✓ The main feature of these weaves that distinguishes from other types is the presence of pronounced diagonal lines that run along the width of the fabric

CHARACTERISTICS

(i) They form diagonal lines from one selvedge to another

(ii) More ends per unit area and picks per unit area than plain cloth

(iii) Less binding points than plain cloth

(iv) Better cover than plain weave

(v) More cloth thickness and mass per unit area

END USES

Twill weaves find a wide range of application such as drill cloth, khakhi uniforms, denim cloth, blankets, shirtings, hangings and soft furnishings

The twill weaves are produced in a wide variety of forms. They are however classified broadly into important categories, namely :

(i) Ordinary or continuous twills

(ii) Zig zag , pointed or wavy twills

(iii) Rearranged twills such as satin/sateen weaves and corkscrew weaves

(iv) Combination twills

(v) Broken twills

(vi) Figured and other related twill weaves

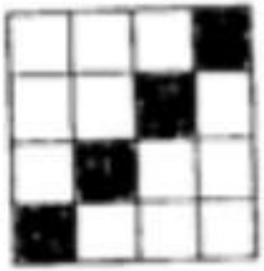
The above types of twills are further **sub-classified** as:

(a) Warp face twills

(b) Weft face twills

(c) Warp and weft face twills

- Right-hand twill,
- Left-hand twill



Satin – A fabric with a lustrous surface, obtained by a satin weave with higher warp sett and lower weft sett.

Sateen – A fabric with a lustrous surface, obtained by a sateen weave with lower warp sett and higher weft sett.

SATIN and SATEEN WEAVES

- ✓ **Satin** is a *warp faced* rearranged twill and **sateen** is a rearranged *weft faced twill*
- ✓ Thus satin is the reverse side of sateen weaves. These weaves form an important category of weaves. They are used in combination with other weaves, particularly in case of ornamented fabrics
- ✓ The striking feature of these weaves is their bright appearance and smooth feel

CHARACTERISTICS

(i) They are either warp or weft faced weaves

(ii) Have no prominent weave structures

(iii) No continuous twill lines

(iv) Have poor seam strength due to thread mobility

(v) More thread density is possible in warp and weft

(vi) More mass per unit area is possible

(vii) Have less binding points and more float lengths

(viii) Use of move numbers (intervals of selection) is necessary to construct these weaves

- ✓ In the construction of satin/sateen weaves, the stitching points of warp or weft for a given repeat size is done by the use of move numbers or stitch or float numbers.
- ✓ The move numbers are selected according to the repeat size of the weave.
- ✓ In choosing move numbers for the construction of satin/sateen weaves, the following rules are to be adopted:

  (a) The move number should not be equal to the repeat of the weave

  (b) It should not be one less than the repeat size

  (c) It should not be a factor of the repeat size, and

  (d) It should not be a multiple of the factor

Type of satin	*Suitable move number*
5 end	2
7 end	2,3
8 end	3
9 end	2,4
10 end	3
11 end	2,3,4,5
12 end	5
13 end	2,3,4,5,6
14 end	3,5
15 end	2,4,7

Table showing suitable move numbers for the construction of satin weaves

END USES

Satin weaves find a wide range of application such as denim, interlining cloth, ribbons, dress materials (lustrous), children's dress materials etc.

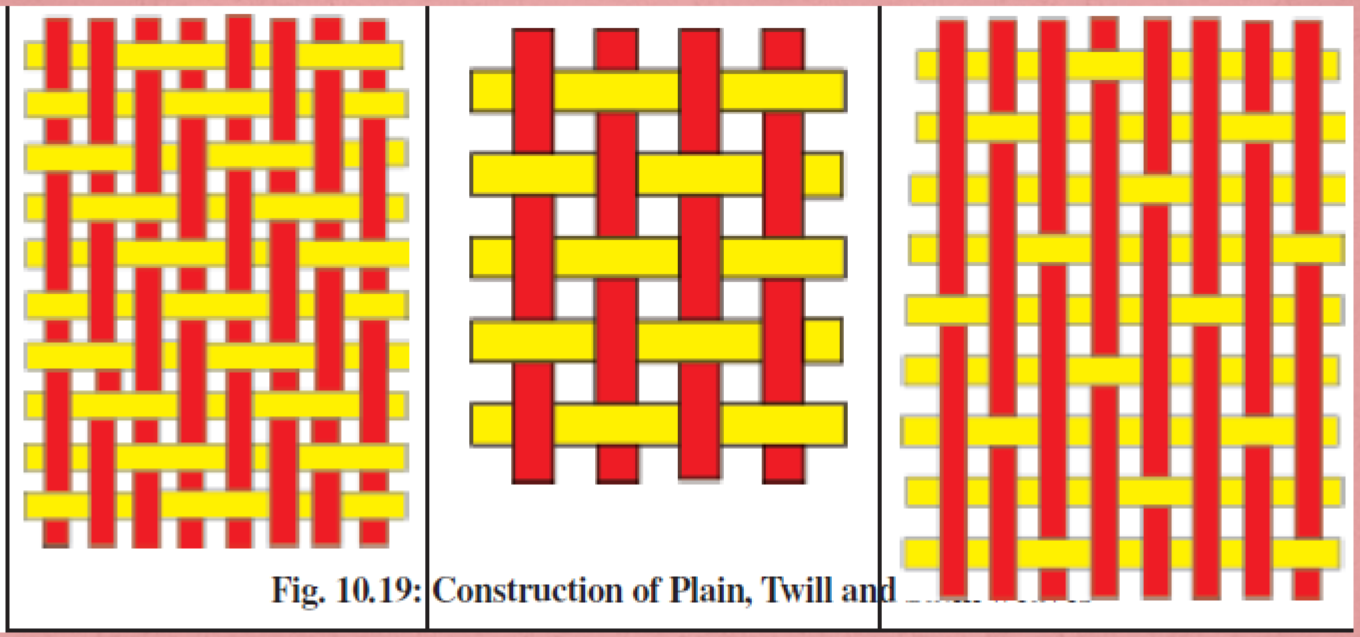


Fig. 10.19: Construction of Plain, Twill and

a) **Plain weave** - Plain weave is also known as homespun, tabby or taffeta weave. It is the easiest to weave where one weft yarn alternatively moves over one and under another warp yarn. Maximum production of fabric is done in plain weave. It is inexpensive weave, most suitable for printing and embroideries. To see the variations of the weave, note the fabrics like muslin, cambric, hand spun and hand woven khaddar, organdy, poplin, voile, etc.

b) **Twill weave -** It is woven on three to four harness loom. In this, one weft yarn moves over two and under one warp yarn. Twill woven fabric is distinguished by a continuous diagonal line called wale. Variation in diagonal lines produces various designs of twill. Twill weave is woven tightly, that is why it is suitable for work clothes and for men's clothes. Examples of Twill woven fabrics are gabardine, tweed, denim, jean, etc.

c) **Satin weave -** It is woven on five to twelve harness loom. If woven on a five harness loom, one weft yarn passes under 4 warp yarns and goes over one warp yarn. It differs from Twill weave as it has long yarns floating on the surface. There is no design visible on the face of the fabric but it has a smooth and shiny surface. Satin fabric is an example of satin weave. Fabrics woven in this weave are suitable for making formal wear garments.

Name	Appearance	Cause
Thick Place in weft Direction.	Bars of denser woven fabric across cloth	Faulty let-off or take-up motion.
Weaving Without Weft.	Strings of warp yarn only.	1. Faulty weft sensor 2. Electrical fault
Slack End.	A warp end gathering in the cloth.	1. End run out on the warp beam. 2. End not in drop wire.
End out.	Thin gap in warp	1. Warp stop motion not working. 2. Electrical fault. 3. Fluff build up in drop wires.
Floating End.	Un-woven warp end	1. End not drawn into heald. 2. Broken heald.

Starting Place.	Light gap weft way in the cloth	1. Incorrect machine setting. 2. Not shed levelling when machine stopped
Slubs.	Thick lumps of yarn weft way	1. Faulty weft yarn. 2. Not removing broken weft correctly.
Wrong Dent.	thin line warp way in the cloth.	End or ends drawn into the wrong dent.
Wrong Draft.	Irregular pattern warp way in the cloth.	End or ends drawn into the wrong heald.

Broken Pick.	Visible line weft way in the cloth.	1. Broken weft not completely removed. 2. Loose pick not found. 3. Faulty weft detector.
Thin Place	Light bar across the cloth due to low weft density.	1. Faulty let-off or take-up motion. 2. Cloth wrapped around rollers. 3. Faulty weft yarn.
Double Pick.	Thick line running across the cloth.	1. Not having found the loosing pick. 2. Reserve cone caught and running in.

Thick Place weft way	Thick bar in weft way	1. Double weft running in. 2. Thick/wrong weft yarn. 3. Double weft from winding department.
Warp Way Stitching	Unwoven ends warp way in the cloth.	1. Fluff or knot behind the reed. 2. Spare end weaving in. 3. Not removing broken warp end from shed. 4. Too long tails on weaver' knot.

Tuck in Fault/long tails.	Fringe of tails close to or on the selvedge.	1. Fluff under weft brake. 2. Fluff under weft gripper. 3. Leno ends drawn incorrectly. 4. Weft threading incorrect. 5. Weft cutter not working. 6. Incorrect machine settings.

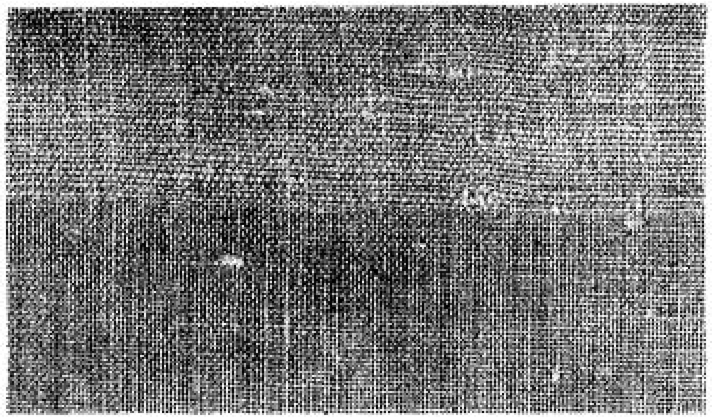


FIG. 7 WEFT BAR (P. 20)

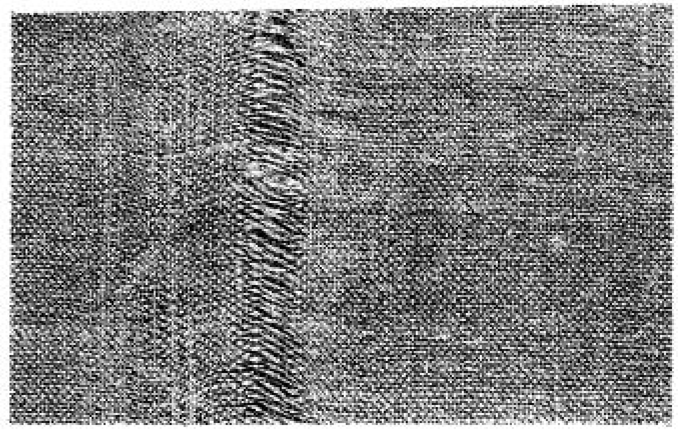


FIG. 13 BROKEN END (MISSING END) (P. 36)

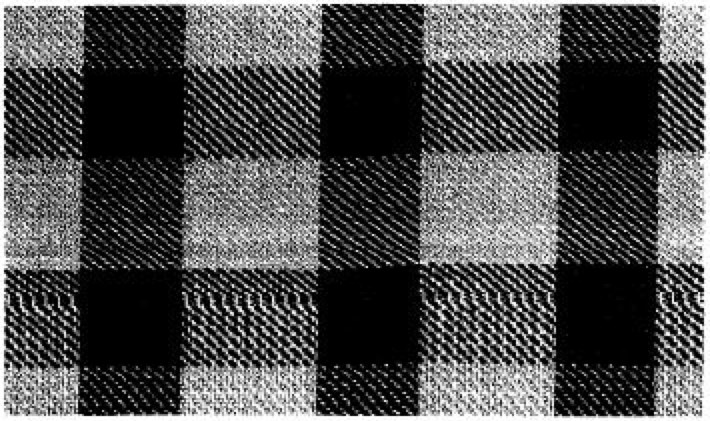


FIG. 14 BROKEN PATTERN (P. 36)

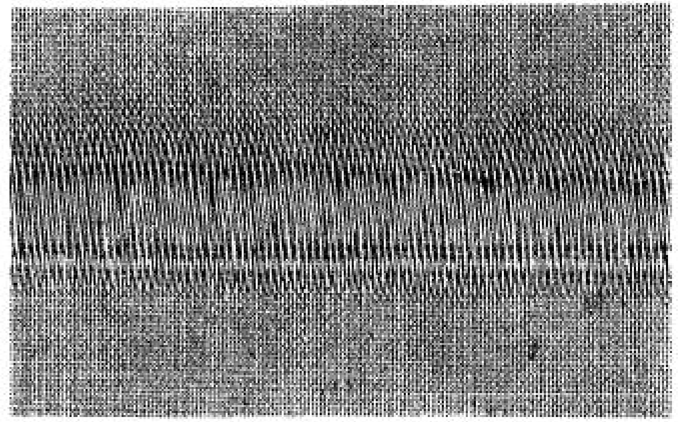


FIG. 19 CRACK (P. 66)

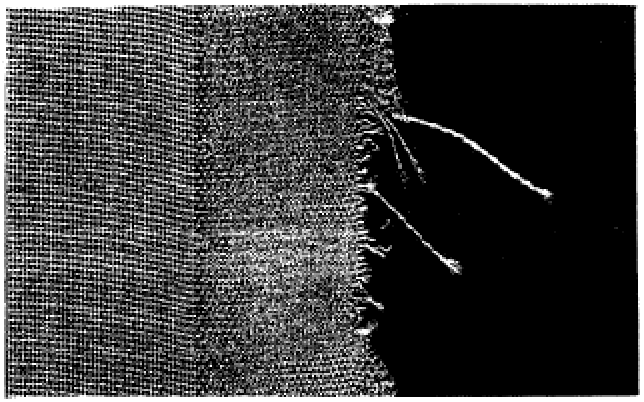


FIG. 22 TORN SELVEDGE (P. 76)

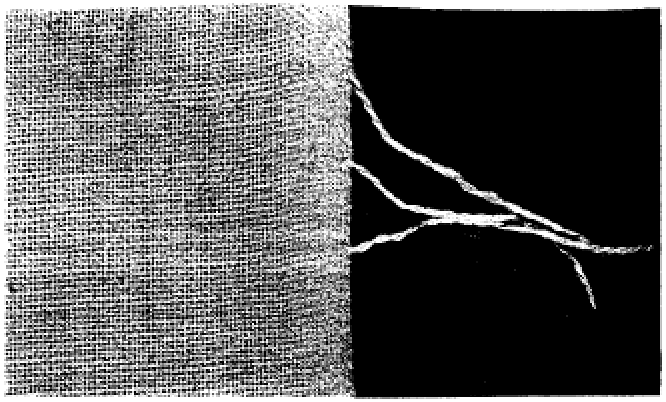


FIG. 23 LOOPY SELVEDGE (P. 76)

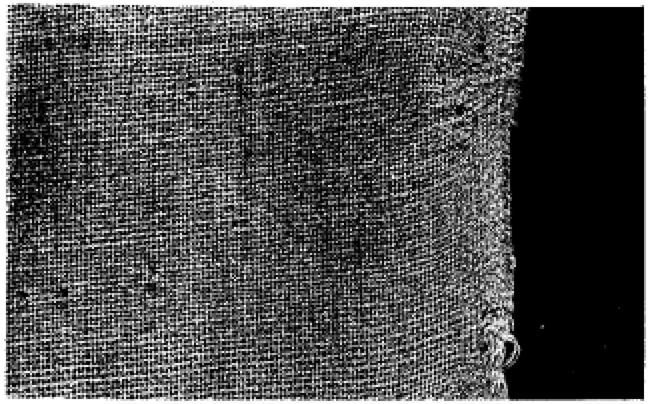


FIG. 24 SLACK SELVEDGE (P. 77)

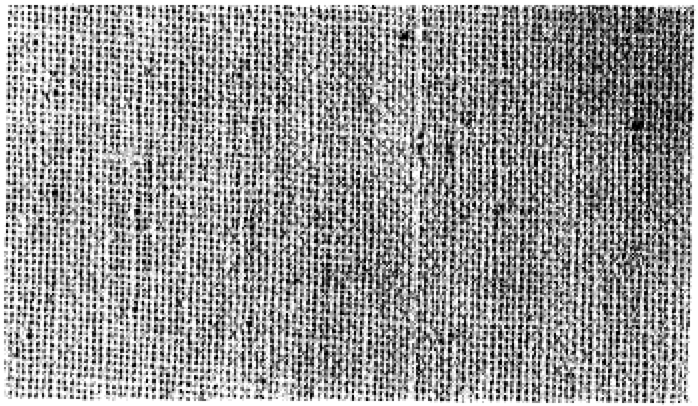


FIG. 27 DOUBLE ENDS (P. 83)

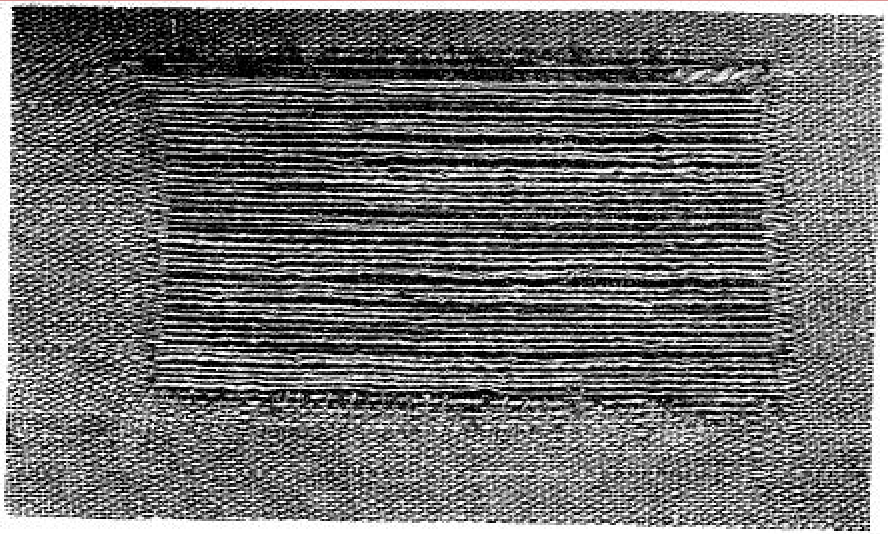


FIG. 32 FLOAT (P. 109)

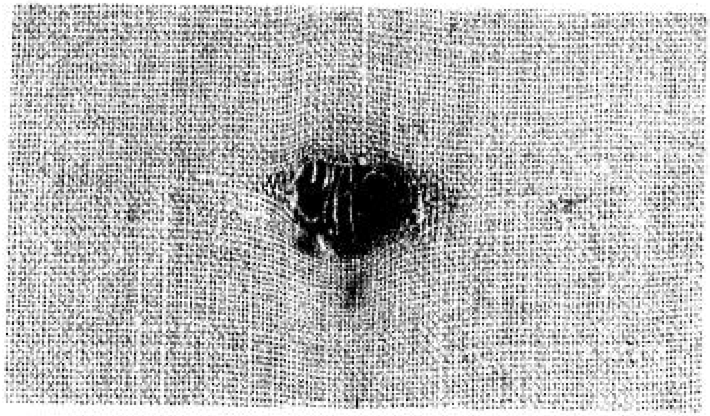


FIG. 35 GOUT (P. 119)

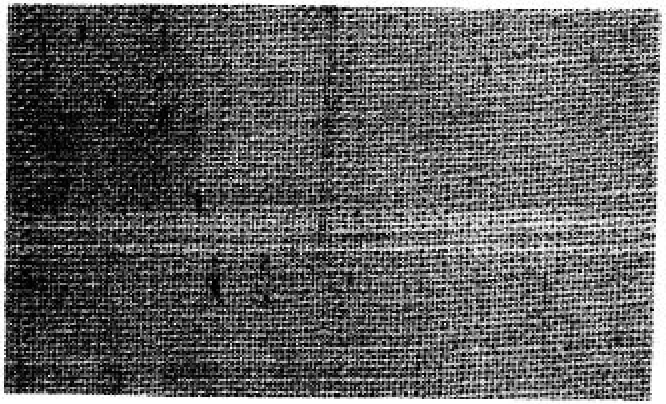


FIG. 72 REED MARK (P. 207)

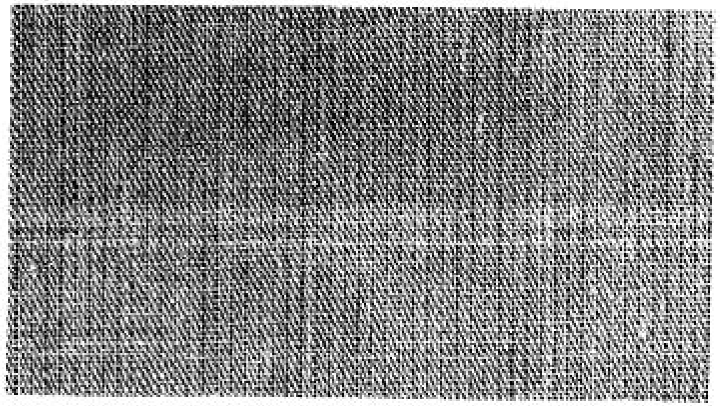


FIG. 73 REEDINESS (P. 208)

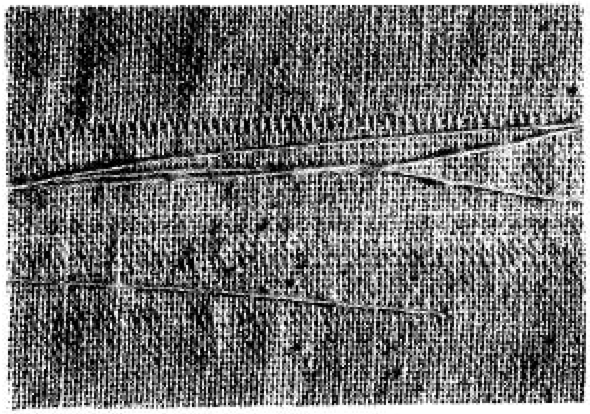


FIG. 93 SHUTTLE FLY (P. 231)

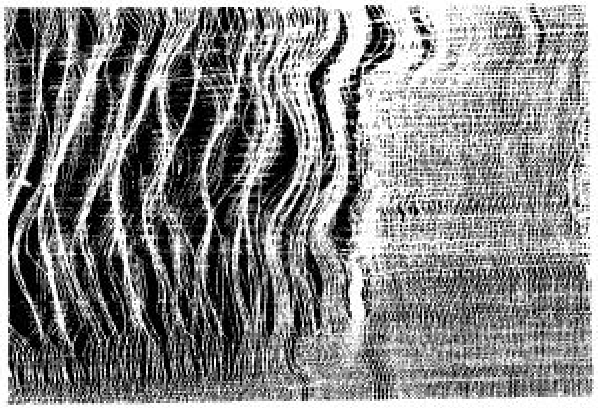


FIG. 99 SMASH (P. 239)

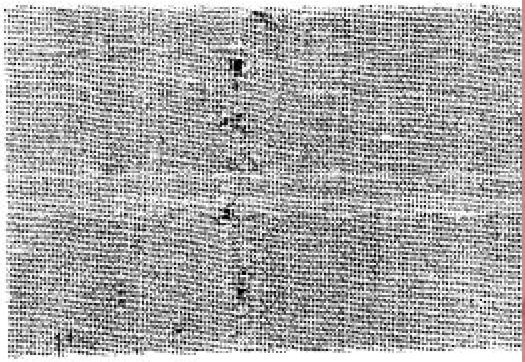


FIG. 111 TEMPLE MARK (P. 259)

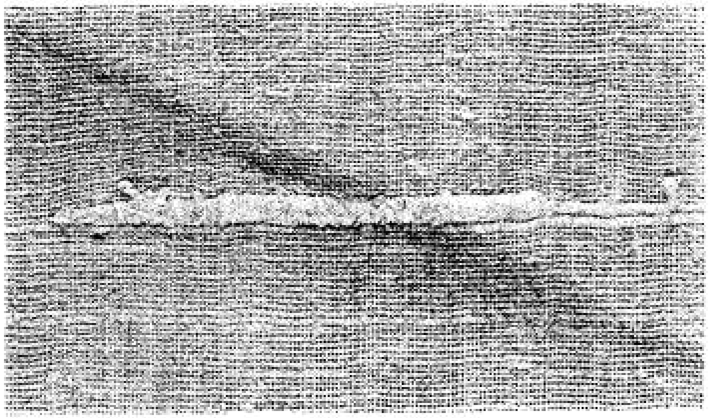


FIG. 124 WEFT SNARLS (P. 284)

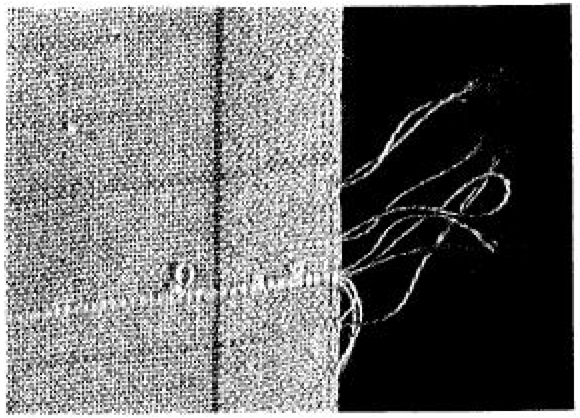


FIG. 125 WEFT TRAIL (P. 285)

TEXTILE FUNDAMENTALS

Fashion Technology
Govt Polytechnic Hisar
Sem-II

TEXTILE PROCESSING

- Textile processing, as defined by the Bureau of Indian Standards (BIS), encompasses a series of mechanical and chemical processes employed to convert raw textile fibers into finished products. These processes include:
- **Pre-treatment**: Preparation of raw fibers for subsequent processes. This can involve:
  - **Desizing**: Removal of size materials from yarns.
  - **Scouring**: Cleaning fibers to remove natural and added impurities.
  - **Bleaching**: Whitening fibers by removing natural pigments.
- **Dyeing**: Application of color to fibers, yarns, or fabrics. Dyeing methods vary based on the type of dye and fiber.

- **Printing**: Creating patterns on textiles. Techniques include screen printing, digital printing, and block printing.
- **Finishing**: Enhancing the properties and appearance of the textile. Finishing processes include:
  - **Mechanical finishes**: Calendering (smoothing), napping (raising fibers), and shearing (cutting excess fibers).
  - **Chemical finishes**: Adding water repellents, flame retardants, or softeners.

CLASSIFICATION OF TEXTILE PROCESSING

- The American Society for Testing and Materials (ASTM), now known as ASTM International, classifies textile processing into several key stages, with a focus on the standardization of methods for testing and ensuring quality in textiles. The ASTM standards cover a broad spectrum of textile processing activities, which can be broadly categorized as follows:
  - **Pre-treatment Processes**
  - **Dyeing**
  - **Printing**
  - **Finishing**
  - **Coating and Laminating**
  - **Quality Control and Testing**

```
Raw Material Preparation
         |
         v
   Pre-treatment
         |
  ------------------
 |       |       |
 v       v       v
Desizing Scouring Bleaching
         |
         v
      Dyeing
         |
  --------------------------
 |      |      |      |   |
 v      v      v      v   v
Batch Continuous Yarn   Piece
Dyeing  Dyeing    Dyeing Dyeing
         |
         v
     Printing
         |
  ------------------------------
 |       |       |          |
 v       v       v          v
Screen  Block   Rotary     Digital
Printing Printing Screen   Printing
                  Printing
         |
         v
     Finishing
         |
  -------------------------------------
 |            |              |
 v            v              v
Mechanical    Chemical     Special
Finishing    Finishing    Finishing
         |
         v
Coating and Laminating
         |
  -------------------
 |                |
 v                v
Coating        Laminating
         |
         v
Quality Control and Testing
         |
  ----------------------------
 |        |        |        |
 v        v        v        v
Colorfast Tensile  Dimensional Abrasion
Testing  Strength Stability  Resistance
         Testing  Testing    Testing
         |
         v
Finished Textile Product
```

OPERATION SEQUENCE IN CHEMICAL PROCESSING OF COTTON

Chemical processing of cotton involves a series of steps to transform raw cotton into a finished textile product with desired properties as follows:

- **Preparation**
  - **Fiber Selection**: Choosing the appropriate type of cotton fiber.
  - **Yarn Formation (Spinning)**: Converting fibers into yarn through spinning.
- **Pre-treatment**
  - **Desizing**: Removing size materials (starch, gelatin) from fabrics to improve dye and finish penetration.
  - **Scouring**: Cleaning the cotton fibers to remove natural impurities (wax, pectin) and added substances.
  - **Bleaching**: Whitening the cotton fibers by removing natural pigments and preparing them for dyeing.

- **Mercerization:** Treating the cotton with a caustic soda solution to improve dye uptake, increase strength, and enhance luster.
- **Dyeing**
  - **Batch Dyeing**: Dyeing a set quantity of cotton in one go, typically in a dye bath.
  - **Continuous Dyeing**: Dyeing the cotton continuously as it passes through the dyeing machinery.
- **Printing**
  - **Screen Printing**: Applying patterns using a stencil and a mesh screen.
  - **Rotary Printing**: A continuous printing process using cylindrical screens.
  - **Digital Printing**: Printing patterns directly onto the fabric using digital technology.

- **Finishing**
  - **Softening**: Adding softeners to improve the hand (feel) of the fabric.
  - **Wrinkle Resistance**: Applying chemical treatments to reduce wrinkling.
  - **Water Repellency**: Adding water-repellent chemicals to the fabric.
- **Quality Control and Testing**
  - **Colorfastness Testing**: Ensuring that the color remains stable under various conditions.
  - **Tensile Strength Testing**: Measuring the strength of the fabric.
  - **Dimensional Stability Testing**: Checking if the fabric retains its dimensions after washing and drying.
  - **Abrasion Resistance Testing**: Evaluating the fabric's resistance to wear and friction.

BRIEF INTRODUCTION TO DESIZING

- **Desizing** is an essential preparatory process in textile manufacturing that involves removing the size materials applied to yarns before weaving. These size materials, such as starch, gelatin, or synthetic polymers, are used to strengthen the yarns and reduce breakage during the weaving process. However, before further processing like scouring, bleaching, dyeing, and finishing, it is crucial to remove these materials to ensure uniform treatment and high-quality final products.
- Desizing can be performed using various methods, including enzymatic (using enzymes), oxidative (using oxidizing agents), acid (using dilute acids), and solvent (using organic solvents) treatments. The choice of method depends on the type of size material used. Proper desizing ensures that the fabric is clean and ready for subsequent processing steps, contributing to the overall quality and appearance of the finished textile product.

BRIEF INTRODUCTION TO SCOURING

- **Scouring** is a crucial pre-treatment process in textile manufacturing aimed at removing natural impurities (such as waxes, pectins, and oils) and any residual processing chemicals from fibers, yarns, or fabrics. This cleaning process is essential for preparing the textile material for further treatments like bleaching, dyeing, and finishing.
- In scouring, the textile is typically treated with an alkaline solution (often caustic soda) under controlled conditions of temperature and agitation. The goal is to produce a hydrophilic (water-absorbent) fabric that can uniformly absorb dyes and finishes, resulting in a higher quality final product. Scouring ensures the removal of contaminants that could interfere with subsequent processing steps, thus enhancing the fabric's appearance, feel, and performance.

BRIEF INTRODUCTION TO BLEACHING

- **Bleaching** is a chemical process used in textile manufacturing to whiten or lighten the color of fabrics and remove impurities, stains, or natural colorants present in fibers or textiles. This process is essential for achieving uniformity in color and improving the overall appearance and quality of the textile product.
- During bleaching, various bleaching agents, such as hydrogen peroxide, sodium hypochlorite, or sodium chlorite, are applied to the fabric under controlled conditions of temperature, pH, and time. These agents oxidize or break down the chromophores (color-causing molecules) and other impurities present in the fibers, resulting in a lighter or whiter fabric.
- Bleaching can be performed as a separate step or integrated into the textile processing sequence after pre-treatment (such as desizing and scouring) and before dyeing or finishing. Proper bleaching ensures that the fabric is clean, bright, and ready for further processing, contributing to the overall quality and appearance of the final textile product.

BRIEF INTRODUCTION TO MERCERIZATION

- **Mercerization** is a chemical treatment applied to cellulosic fibers like cotton, hemp, or linen to improve their properties and appearance. Named after its inventor, John Mercer, this process involves treating the fibers with a strong alkaline solution, typically sodium hydroxide (caustic soda), under tension.
- During mercerization, the fiber swells, increasing in both diameter and length. This causes changes in its structure, resulting in improved strength, luster, and dye affinity. Mercerized fibers also exhibit increased absorbency and reduced shrinkage, making them ideal for high-quality textile applications.
- The mercerization process is often performed after scouring and before dyeing or finishing. It is widely used in the textile industry to enhance the characteristics and performance of cotton fibers, resulting in superior-quality fabrics with a smoother surface and brighter appearance.

DEFINITION OF DYEING

- The Bureau of Indian Standards (BIS) defines dyeing as a process of imparting color to textile materials such as fibers, yarns, fabrics, or garments by applying dyestuffs in an aqueous solution. This process involves the physical or chemical interaction between the dye molecules and the textile substrate, resulting in the absorption of the dye by the substrate and the formation of colored bonds.

  Key aspects of dyeing according to BIS may include:

- **Selection of Dyestuffs**: Choosing suitable dyestuffs based on the desired color, fiber type, and application method.
- **Preparation of Dye Bath**: Dissolving dyestuffs in water along with auxiliary chemicals such as leveling agents, dispersing agents, and pH modifiers to create an aqueous dye solution.

- **Application of Dye**: Immersing the textile material into the dye bath and ensuring even distribution of the dye solution through methods such as padding, jig dyeing, or winch dyeing.
- **Temperature and Time Control**: Maintaining specific temperature and time conditions during dyeing to optimize dye absorption and colorfastness.
- **Rinsing and Finishing**: Thoroughly rinsing the dyed textile to remove excess dye and auxiliary chemicals, followed by optional finishing processes to enhance properties such as softness, luster, or durability.
- **Quality Control**: Testing the dyed textile for colorfastness, shade consistency, and other performance parameters to ensure compliance with quality standards.

DYEING CLASSIFICATION

- **Based on How Dye is Applied:**
  - **Batch Dyeing**: Dyeing a fixed amount of fabric in a dye bath like soaking clothes in a tub.
  - **Continuous Dyeing**: Dyeing fabric as it moves through machines like a conveyor belt, ensuring a continuous flow of dyed fabric.
  - **Yarn Dyeing**: Dyeing yarns before they're woven or knitted, like coloring threads before knitting a sweater.
  - **Piece Dyeing**: Dyeing whole pieces of fabric after they're made, like coloring a finished T-shirt.

DYEING CLASSIFICATION

- **Based on Type of Dyes Used:**
  - **Direct Dyeing**: Dyeing directly without extra chemicals, like using a marker to color paper.
  - **Disperse Dyeing**: Dyeing synthetic fibers like polyester, where the dye disperses evenly, similar to how oil spreads in water.
  - **Reactive Dyeing**: Chemically bonding dye with fabric, like glue sticking two pieces of paper together.
  - **Acid Dyeing**: Dyeing protein fibers like wool, where acids help colors stick.
  - **Basic Dyeing**: Dyeing acrylic fibers using basic (alkaline) dyes, like coloring with markers on plastic.
  - **Vat Dyeing**: Dyeing cotton using a unique dyeing method, like soaking fabric in a special dye bath.

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DEFINITION OF PRINTING

- The Bureau of Indian Standards (BIS) defines printing in the context of textiles as a process of applying patterns, designs, or colors onto textile materials such as fabrics, yarns, or garments. Printing is a common method used to enhance the aesthetic appeal of textiles and can be achieved through various techniques and technologies.

  Key aspects of printing according to BIS may include:
- **Selection of Printing Method**: Choosing the appropriate printing technique based on factors such as the complexity of the design, the type of fabric, and the desired outcome.

- **Preparation of Printing Paste or Ink**: Formulating the printing paste or ink by mixing colorants (pigments or dyes) with appropriate binders, thickeners, and other additives to achieve the desired consistency and properties.
- **Application of Printing Paste or Ink**: Applying the printing paste or ink onto the textile material using methods such as screen printing, roller printing, digital printing, or block printing. Each method has its advantages and is suitable for different types of designs and fabrics.
- **Fixation or Curing**: Heat treatment or chemical processes may be required to fix or cure the printed design onto the textile material, ensuring durability and wash-fastness.
- **Finishing Processes**: Optional finishing processes such as washing, drying, and curing may be carried out to enhance the appearance, handle, and performance of the printed textile.
- **Quality Control**: Testing the printed textile for colorfastness, print sharpness, and durability to ensure compliance with quality standards and customer requirements.

PRINTING CLASSIFICATION

- **Based on Method of Application:**
  - **Screen Printing**: Using a stencil (screen) to apply ink onto the fabric through a mesh screen, creating a design layer by layer.
  - **Rotary Printing**: Utilizing cylindrical screens to print designs continuously onto fabric as it moves through the printing machine.
  - **Digital Printing**: Printing designs directly onto fabric using digital technology, allowing for intricate and detailed patterns.
  - **Block Printing**: Hand-carving designs onto wooden blocks and stamping them onto fabric, often used for artisanal and traditional prints.
  - **Heat Transfer Printing**: Transferring designs from a printed paper or film onto fabric using heat and pressure, commonly used for small-scale or custom printing.

PRINTING CLASSIFICATION

- **Based on Type of Printing Medium:**
  - **Pigment Printing**: Using pigments suspended in a binder to create designs on fabric, offering good colorfastness and opacity.
  - **Reactive Printing**: Applying reactive dyes that chemically bond with the fabric fibers, resulting in vibrant and wash-resistant prints.
  - **Discharge Printing**: Using chemicals to remove color from dyed fabric selectively, creating patterns or designs in negative space.
  - **Acid Printing**: Employing acid dyes for printing on protein-based fibers like silk and wool, offering excellent color vibrancy and clarity.
  - **Sublimation Printing**: Sublimating dyes onto polyester fabric using heat and pressure, resulting in vivid and long-lasting prints.

PRINTING CLASSIFICATION

- **Based on Desired Effect or Technique:**
  - **All-Over Printing**: Printing a design that covers the entire surface of the fabric, creating a seamless and continuous pattern.
  - **Placement Printing**: Printing a design in a specific location on the fabric, often used for motifs or logos on garments.
  - **Special Effect Printing**: Employing techniques such as foil printing, flocking, or metallic printing to create textured or embellished effects on fabric.
  - **Water-based Printing**: Using water-based inks for printing, offering eco-friendly and breathable prints suitable for natural fibers.

TEXTILE FUNDAMENTALS

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TEXTILE DEFECTS

- The Bureau of Indian Standards (BIS) defines textile defects as any deviation or flaw from the specified quality standards in textile materials or products that affect their appearance, performance, or functionality. Textile defects can occur at various stages of production, including weaving, processing, dyeing, printing, and finishing. These defects can be categorized based on their severity and impact on the quality of the textile as Major, Minor and Critical.

- **Major Defects**: Defects that significantly affect the appearance, functionality, or performance of the textile product, rendering it unacceptable for use or sale. Major defects often require corrective action or rejection of the affected material or product.
- **Minor Defects**: Defects that have a relatively minor impact on the appearance or performance of the textile product but may still affect its overall quality. Minor defects may be acceptable within specified tolerance limits but may require corrective measures to improve product quality.
- **Critical Defects**: Defects that pose a serious risk to the safety, integrity, or functionality of the textile product, rendering it unfit for its intended purpose. Critical defects often require immediate corrective action or rejection of the affected material or product to prevent potential harm or liability.

EXAMPLES OF TEXTILE DEFECTS

- **Weaving Defects**: Broken ends or picks, mis-picks, slubs, floaters, reed marks.
- **Processing Defects**: Fabric shrinkage, skewing, uneven dyeing, uneven finishing.
- **Dyeing Defects**: Streaking, off-color, color bleeding, fading.
- **Printing Defects**: Smudging, mis-registration, mottling, ghosting.
- **Finishing Defects**: Fabric stiffness, crease marks, fabric odor, delamination.

WEAVING DEFECTS

- **Major Defects**:
  - Broken Ends or Picks: Missing warp or weft threads affecting fabric strength and appearance.
  - Mis-picks: Incorrect insertion of warp or weft threads resulting in irregular patterns.
  - Slubs: Thick or thin areas caused by variations in yarn thickness, affecting fabric aesthetics.
- **Minor Defects**:
  - Floats: Warp or weft threads not properly interlaced, resulting in loose threads on the fabric surface.
  - Reed Marks: Indentations on the fabric caused by the reed during weaving, affecting fabric smoothness.
- **Critical Defects**:
  - Warp or Weft Stoppages: Complete stoppage of warp or weft yarns during weaving, leading to visible defects in the fabric structure.

PROCESSING DEFECTS

- **Major Defects**:
  - Fabric Shrinkage: Excessive shrinkage during processing, resulting in dimensional instability.
  - Fabric Skewing: Uneven tension causing distortion or misalignment in the fabric weave.
- **Minor Defects**:
  - Uneven Dyeing: Variations in color intensity across the fabric surface due to uneven dye penetration.
- **Critical Defects**:
  - Fabric Pilling: Formation of small balls or fuzz on the fabric surface due to abrasion during processing.

DYEING DEFECTS

- **Major Defects**:
  - Streaking: Uneven distribution of dye resulting in streaks or patches of uneven color.
  - Off-Color: Deviation from the desired color shade due to incorrect dye formulation or processing parameters.
- **Minor Defects**:
  - Color Bleeding: Transfer of dye from one part of the fabric to another, resulting in color migration.
- **Critical Defects**:
  - Fading: Loss of color intensity or brightness over time due to exposure to light, heat, or chemicals.

PRINTING DEFECTS

- **Major Defects**:
  - Smudging: Blurring or spreading of printed ink due to improper drying or curing.
  - Mis-registration: Misalignment of different colors or elements in the printed design.
- **Minor Defects**:
  - Mottling: Uneven distribution of color resulting in a blotchy appearance.
- **Critical Defects**:
  - Ghosting: Faint or shadowy images appearing in unintended areas of the printed fabric.

FINISHING DEFECTS

- **Major Defects**:
  - Fabric Stiffness: Excessive stiffness due to overuse of finishing agents.
  - Fabric Crease Marks: Permanent creases or wrinkles caused by improper finishing.
- **Minor Defects**:
  - Fabric Odor: Unpleasant smell due to residual chemicals from finishing.
- **Critical Defects**:
  - Fabric Delamination: Separation of fabric layers due to poor adhesion during finishing.

IMPORTANCE OF DEFECT CLASSIFICATION

The learning of defects classification helps in quality control and assurance throughout the textile production process.

Facilitates communication between manufacturers, suppliers, and customers regarding product quality.

Enables identification of root causes and implementation of corrective and preventive actions to minimize defects.

Ensures compliance with quality standards and regulations, thereby enhancing customer satisfaction and trust in textile products.