Sonargaon University (SU)

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Sonargaon University (SU)
সোনারগাঁও ইউনিভার্সিটি (এসইউ)

We will rise up, we will shine

INDUSTRIAL ATTACHMENT

DENIM ATTIRES LIMIED
Nimtoli, Shilmon, Tongi, Gazipur-1710, Bangladesh

ACADEMIC SUPERVISOR :

MD. KAMRUL HASSAN VHUIAN
Lecturer & Co-ordinate
Department of Textile Engineering
Sonargaon University (SU),Dhaka.

INDUSTRIAL SUPERVISOR :

MD. MUNTACHIR VHUIAN SHUVO
IE Manager
Denim Attires Ltd.

PREPARED BY :

MD. RASEL KHANDAKER- TEX-1802014061
MD. JONY HOSSAIN- TEX-1701010069

Date:.....

INTERNSHIP CERTIFICATE

This is to certify that **Md. Rasel Khandaker**, ID No#1802014061, **Md. Jony Hossain**, ID No#1701010069, B.Sc. In Textile Engineering (Major in Apparel Manufacturing), **SONARGAON UNIVERSITY (SU)** has done his Internship Training at **DENIM ATTIRES LTD**. He worked on different types of production related activities especially on industrial Engineering.

We found him sincere and hard-working during this tenure.

I wish him all the best for future endeavors.

(Toybur Rashid)
Manager (HR)
Denim Attires
Nimtoli, Shilmon, Tongi,
Gazipur-1710, Bangladesh

DENIM ATTIRES LTD
Nimtoli, Shilmon, Tongi, Gazipur-1710, Bangladesh

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(Md. Rashed Alam)
Executive Director
Denim Attires
Nimtoli, Shilmon, Tongi,
Gazipur-1710, Bangladesh

ACKNOWLEDGEMENT

first of all we express our gratitude from heart to Almighty Allah, The most merciful and beneficent, who blesses us with the knowledge , gave us the courage and allowed to accomplish this task.

As a part of our B.Sc. program, we have completed our internship program at that's It Denim Attires Ltd. In which we learned about RMG, Embroidery, Printing, Washing , supply industrial sewing thread in the garment sector where we learned about of Garments section which is directly related to our B.Sc. program.

In preparing this report the biggest support comes from out beloved Md. Kamrul Hassan(Department head) Department of textile engineering and out internship supervisor Md Rasedul Islam Rumi, Lecturer, Department of Textile Engineering at Sonargaon University (SU). Without their supervision , suggestion and help we didn't have the ability to complete this report at all.

We are also very thankful to some other people of Denim Attires Ltd Muntachir vhuyan Shuvo (IE Manager) with whom help we got the opportunity for completing our Internship program in Garments section who worked IE Department in Denim Attires Ltd and also to Md. Rashed ALam (Director) the benevolent parson who helps us for completing our internship program in Garments section.

We would also like take this opportunity to express our wholehearted gratitude to some of my friends who offered encouragement , information, inspiration and assistance during the course of preparing this report.

This report may suffer from many shortcomings; nevertheless we have exerted our best efforts in preparing this report. We seek excuse for the errors that might have occurred in spite of our best effort.

ABSTRAT

We have done our study and practices it in practically at **Denim Attires Ltd.** The report gives us an overall idea about the activities of **Denim Attires Ltd** and specially their export and import activities based on Quality.

Denim Attires Ltd is a leading RMG company of Bangladesh. They started their journey in Bangladesh in 1984. Since then it has been dominating in its own business sector. The main products of the company are Men's Jeans wear, women's Jeans Wear, child Jeans wear and Jacket wear etc.

This report has enriched with the Product processing and credit control activity of **Denim Attires Ltd**. When the order is recorded and updated to the documentary copy that is sales report. Every day the sales report is updated and the data is used by the credit control department. According to the Product processing division, when order is arrived from Buying or foreign company, some criteria should have to fill like Product Design, Fabric Selection and Inspection, Pattern making, Grading, Marking, Spreading, Cutting, Bundling, Sewing, Pressing or Folding, Finishing and Detailing, dyeing and Washing QC etc. When product are finished it send for final inspection by Buying house or Retailer company's agent. When inspection is completed the product disputes for shipment.

Thus the **Denim Attires Ltd** operating their Business successfully in Bangladesh and contributing in our economy.

8.11	Introduction:
8.11.1	Process Flow Chart of Industrial Engineering (IE):
8.11.2	Line Balancing in Apparel Production
8.11.3	Objectives of Line Balancing
8.11.4	Importance of Line Balancing
8.11.5	Example of Line Balancing
9.11.6	Limitations of Line Balancing
9.11.7	Role of Industrial Engineer in Garment Industry
9.11.8	Obligations of an executive
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10	**Printing**
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8.2	Process of Embroidery in AMI
8.3	What is embroidery
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CHAPTER- 01
INRODUCTION

1.1 INTRODUCTION:

Knowledge is power But not for all. It is necessary for all the people who wants to work in any sector of production As a Engineer. He must have the knowledge of practical work & also have to solve the problem during production when he face. So he must have to take his practical knowledge by practicing it in Industry. As a Textile Engineer, A student should have to practice his bookish knowledge by taking part in Internship program. Practical knowledge is essential in every sphere of life. A student must have the practical knowledge. As a Textile Engineer we need also have practical knowledge which we have learnt about in our textile Prescribed books. We have had to face

difficulties if we did not have practical knowledge. So Industrial Training is essential for all Textile Engineers. Without having training, A Engineer can not take part in Higher Position of Industrial Production Activities. It is just like a mirror ,Where a Engineer can see His Bookish Reading Knowledge Practically & can Understand Clearly. Because Learning with seeing is better than the Learning without seeing. It helps a Textile Engineer to be an old person in Textile Knowledge with His sincerity and practicing with kith & kin for his better future.

We have learned our **B.Sc. In Textile Engineering program from growing Sonargaon University** and completed our Internship program from **Denim Attires Ltd** for Garments section.

Textile is a world wide demanding section. Bangladesh is most valuable to the World for Textile & most desirable dresses produce and also export to EU, Arab & America. Bangladesh can produces dress with low cost which makes us famous in the world. Dying is a term by which we can understand about coloring matter on textile related product, which makes a dress or cloth more attractive & more preferable to the customer and Garments is a term by which a dress can be made.

1.2 Objective The main objective is to prepare of our report in such a manner so that we can equip with the practical field as well as grow our ability to know the different aspect of the Dyeing and RMG to evaluate how the factory is performing with and maintaining their activities with competition. In addition, the study seeks to achieve the following objectives:

- To be acquainted with the activity of the Dyeing and RMG in an organization.
- To assess the company‘s production process.
- To evaluate how much the company successful to achieve target collection.

1.3 Methodology Different data and information are required to meet the goal of this report. Those data and information were collected from various sources. Such as Primary and Secondary which is showed below:

Primary data:

- Personal observation
- Face to face conversation of officers, experts and understand from workplace
- Relevant file study provided by the officers concerned
- Working at different desks

Secondary data:
Internet

To fulfill the objectives of the internship program and the completion of the report we had to search from various Sites to collect the information of RMG sector, change in export-import trend, interested activity of Dyeing & RMG.

1.4. Scope It requires reasonably a long time to acquire through knowledge about the activities of any particular business organization. An internship program designed for 3 months is not enough to know the details of an organization. But, it is possible to acquire working knowledge about an organization.

1.5. Limitation To prepare a report on the achieved practical experience in a short duration (only three months) is not an easy task. From the beginning to end, the study has been conducted with the intention of making it as a complete and truthful one. However, many problems appeared in the way of conducting the study. During the study we have faced the following limitations:
 One of the major limitations was lack of access of information considered confidential by employees of Head Office due to strategies.
 Large-scale research was not possible due to constraints.
 The information regarding the competitors is difficult to get.

CHAPTER- 02
ORGANIZATION OVERVIEW OF DENIM ATTIRES

2.1 Overview of Denim Attires Ltd.

2.2 Denim attires Ltd. Details at a Glance Company Profile	
Factory Name	**Denim Attires Ltd.**
Company Established	2012
Name Of The Owner	Helal Uddin Ahmed
Company affiliated to:	BKMEA
Head Office	House # 1, Road # 13/C, Sector # 6 Dhaka Uttara
Factory (Dyeing Unit) Address	Nimtoli, Shilmon, Gazipur Tongi, phone: 29815072
Bank Address	
Product	Trousers ,Pants
Production Capacity	60000 yearly in dozen
Main Client	
Factory Size	
Factory Type	
Total Nos. of Workers & Staff	
Annual Turnover	
Certification	
Number	
Market	
Number of employees	
No. Dying Machine	
Web Site	www.logosapparels.com

2.3 Associate Organizations of Denim Attires Ltd.

1. Logos Apparel; Ltd. (Dyeing Unit)
2. Logos Apparel Ltd. (Garments)
3. Logos Printing & Design.
4. Logos Embroidery Ltd.

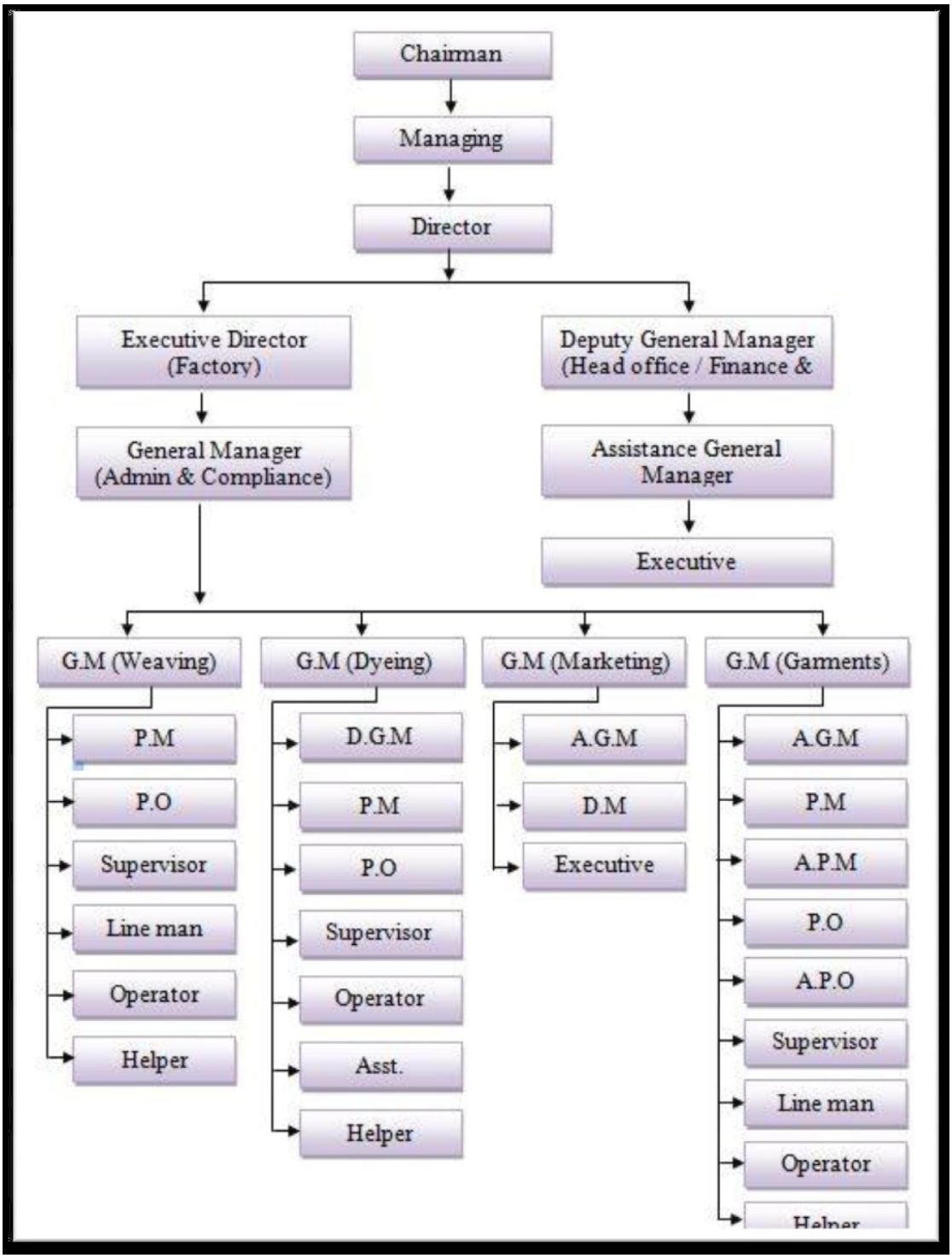
2.4 Objectives :

- ✓ To ensure 100% Security.
- ✓ To Ensure 100% delivery in just time.
- ✓ To ensure 100% product quality at first time.
- ✓ To maintain 100% commitment.
- ✓ To ensure 100% utilization of wealth and recourses.
- ✓ To ensure 100% transference.
- ✓ To ensure 100% honesty, discipline and sincerity.

2.5 Raw Materials Raw materials which are used for production purposes are as follow:

- ➢ 100% Fabric Dyeing.
- ➢ Color
- ➢ Thread
- ➢ Label
- ➢ Lining Paper
- ➢ Dice
- ➢ Buttons
- ➢ Tabs
- ➢ Tags
- ➢ Polybags
- ➢ Cartoons
- ➢ Chemicals

2.6: Management system of Denim Attires,



CHAPTER- 03
INTRODUCTION TO TEXTILE

3.1 Definition of Textile :

The word ‖textile‖ originally applied only to woven fabrics, now generally applied to fibers, yarns, or fabrics or products made offers, yarns or fabrics. The term textile originates from the Latin verb texere to weave but, as the Textile Institute‘s Terms and Definitions Glossary explains, it is now ‖a general term applied to any manufacture from fibers, filaments or yarns characterized by flexibility, fineness and high ratio of Length to thickness‖

3.1.1 Textile is a very widly used term which includes:

1. All kinds of fibers(e.g: Cotton, Jute,Wool, Polyester, Viscose etc)
2. All kinds of Process(e.g: Spinning, Weaving, Knitting, Dyeing, Printing, Finishing etc.)
3. All kinds of machineries(e.g: Spinning machineries, Weaving machineries, Knitting machineries, Dyeing machineries, Testing machineries etc.)
4. To convert textile fiber into finished or end use products(e.g: Garments, Technical textiles, Geo textiles, Medical textiles, E-textiles etc.)

3.1.2 Flow Chart of Textile Processing

Input/Raw Materials →→ Processing Steps → →→→→→ Output

Textile Fibers →→→→→→→ Yarn Manufacturing →→→→→→→→→→→→→ Yarn (Spinning Mill)

↓↓

Yarn→→→→→→→→→ Fabric Manufacturing→→→→→→Grey Fabrics (Weaving/Knitting Industry)

↓↓

Grey Fabrics→→→→→→→Wet Processing →→→Finished Fabrics (Dyeing, Printing &FinishingIndustry)

↓↓

Finished Fabrics→→→→ →Garment Manufacturing→→→→→→ Garments (Garment Industry)

3.1.3 Definition of Textile Industry : The textile industry is the industry which involves the sections like research, design, development, manufacturing and distribution of textiles, fabrics and clothing.

3.1.4 Departments of Textile Industry : Now we are going to discuss about the departments of textile industry in brief as follows –

1. Spinning
2. Fabric Manufacturing
3. Wet processing
4. Garments Manufacturing

FIBER

3.2 Definition Fiber: It is defined as one of the delicate, hair portions of the tissues of a plant or animal or other substances that are very small in diameter in relation to there length. A fiber is a material which is several hundred times as long as its thick. **3.2.1 Textile Fiber:** Textile fiber has some characteristics which differ between fiber to Textile fiber. Textile fiber can be spun into a yarn or made into a fabric by various methods including weaving, knitting, braiding, felting, and twisting. The essential requirements for fibers to be spun into yarn include a length of at least 5 millimeters, flexibility, cohesiveness, and sufficient strength. Other important properties include elasticity, fineness, uniformity, durability, and luster. Banana fiber is one kind of fiber but it is not a textile fiber. Because it can not fill up the above properties. So we can say that all fiber are not textile fiber.

3.2.2 The characteristics of textile fiber are given below:

1. It must have fibrous formation.
2. It Length is thousand times longer than its diameter.
3. It should have spun able ability.
4. It should have sufficient strength and spinning ability.
5. It should have contained elasticity and flexibility characteristics.
6. It must be Fineness.
7. It must have special color.
8. It should have affinity to dye stuff.

3.2.3 Fibers are commonly produced in the following way :

1. Staple fibers
2. Filaments
3. Filaments Tow

1. Staple Fibers: A staple fiber is a fiber of relatively short length, as is the case with most natural fibers, which range from a few millimeters (e.g. the shortest cotton fibers, known as linters) to around a meter (e.g. fibers from bast plants). Staple fibers are typically between 3 and 20 cm in length. Given the differences in average fiber length, cotton fibers (2–3 cm) and wool fibers (5 cm or more) are, for example, sometimes referred to as _short staple‘ and _long staple‘ fibers, respectively.

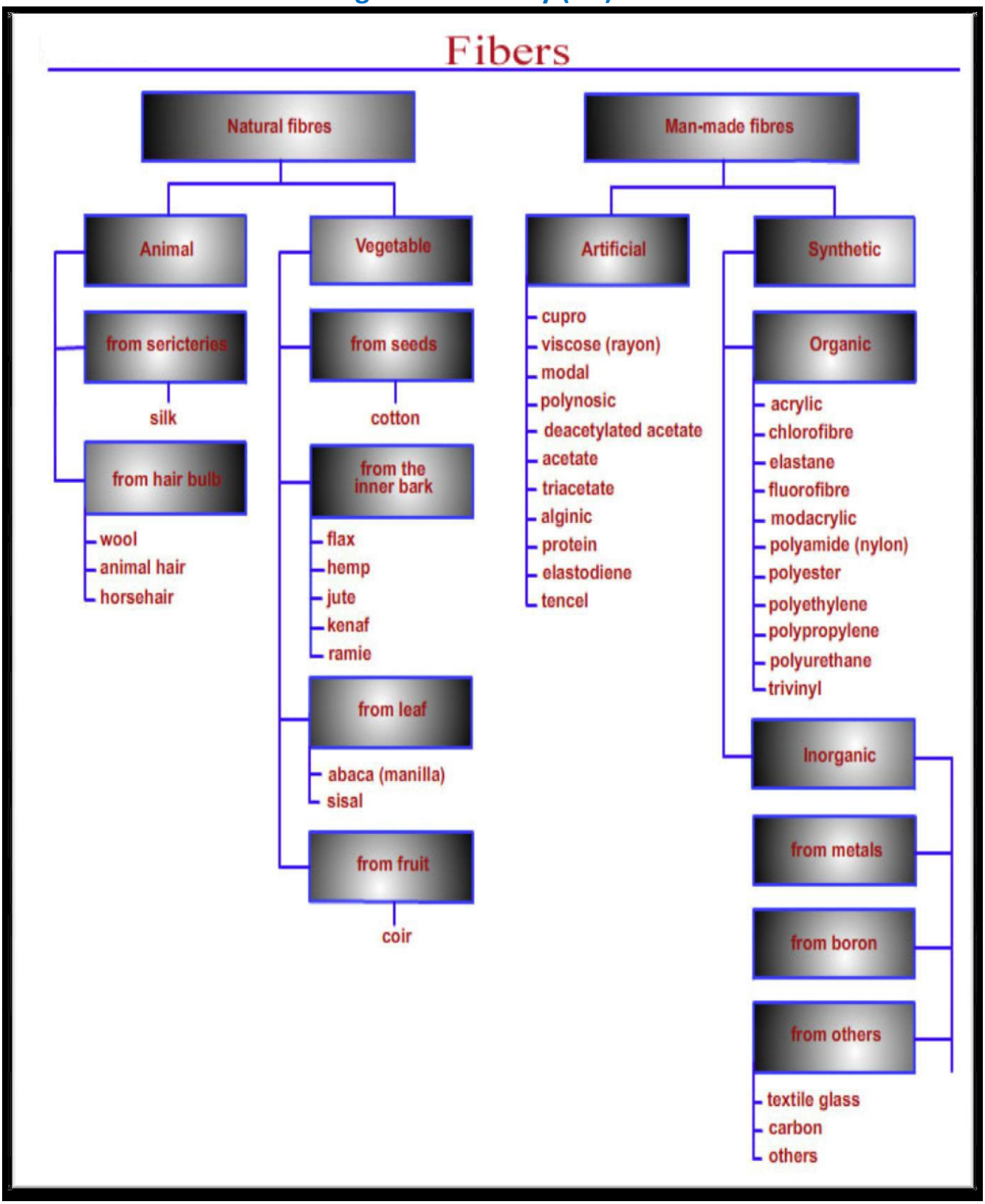
2. Filaments: A filament is a fiber of indefinite length. The various silks are the only natural filament fibers. Most regenerated and synthetic fibers are produced as filaments. These can be used in single or multifilament form. Some of these are also assembled to produce a _tow‘ which is then cut or broken into required short lengths to produce staple fibers suitable for blending with other fibers, in particular with cotton or wool.

3. Filaments Tow:
A tow can mean two different things:

In the synthetic fiber industry, a tow is a large assembly of filaments that is destined to be cut into shorter (staple) fibers. In the processing of natural fibers (flax), tow is the shorter fiber produced when the stalks are processed to extract the fibers (the long fibers are called line flax).

3.2.4 Classification of Textile Fibers*:*

According to the properties and characteristics, textile fibers are classified into two main parts which are natural fiber and man-made fiber or artificial fiber. Now I would like to discuss the general classification of textile fibers as below.



3.2.5 Process Flow Chart of Man Made Fiber Production:

Fiber forming polymer/Raw materials

Spinning (conversion to polymer to fiber)

Generic calis
Drawing/Stretching (To increase strength and crystallinity of molecules)
Texturing (To achieve bulk and grater absorbency)
Intermingling (For thrusting out protruding filament ends)
Heat setting (To improve dimensional stability)
Finished filament

3.2.6 Properties of Fibers:

A Fibers has to the following physical and chemical properties to meet some specific requirements and these are :

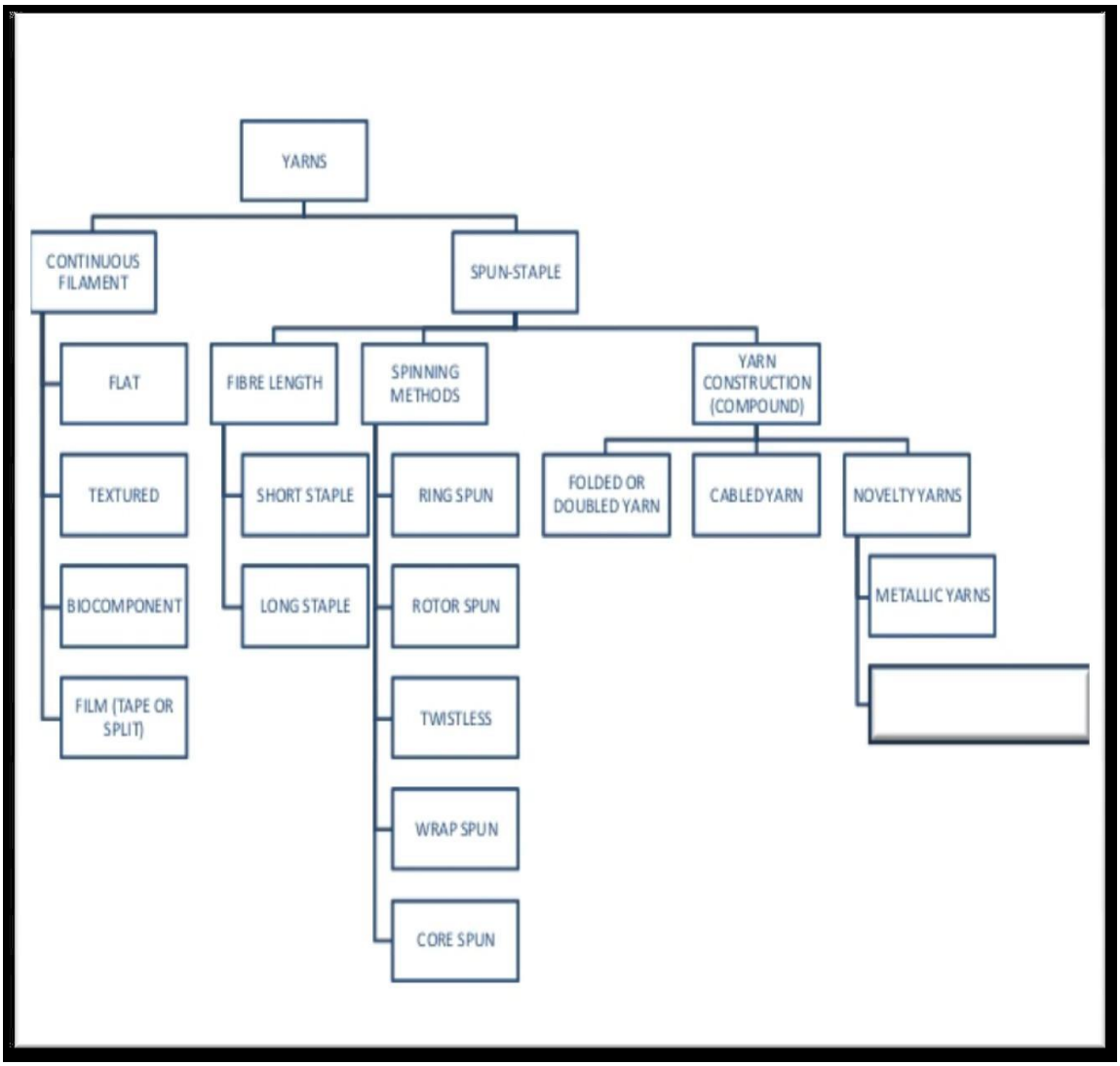
- Fiber Length : Resiliency
- Length to width ratio : Toughness
- Tensile Properties : Work of rupture/ Fiber friction
- Elasticity : Uniformity
- Flexibility : Crimp
- Elastic recovery from strain : Fineness
- Cohesiveness : Color/Luster
- Wet-ability : Maturity ratio/Index
- Dye-ability : High abrasion resistance
- Density : High abrasion resistance
- Comfort to human skin : Chemical resistance

YARN

3.3 Definition of Yarn:

Yarn may be defined as a linear assembles of fiber or filament that are twisted in order to make strong or laid together to form a continuous strand, which is suitable to manufacture fabric.

3.3.1 Classification of Yarn:



3.3.2 Flow Chart of Cotton Yarn Manufacturing:

There are two types of yarn manufacturing process are given bellow :
1. Carded Yarn Manucturing Processing
2. Combed Yarn Manucturing Processing

3.3.2.1 Flow chart of Carded Yarn Manucturing Processing Carded Yarn: Yarn produced from fibers that have been only cared but not combed. Carded yarn is also ring,rotor and vortex yarn.

Flow chart of Carded Yarn Manucturing Processing

Input or Feed product	Manufacturing process	Output or Delivery product
Fiber	Blow Room	Lap
Lap	Carding	Card Sliver
Card Sliver	1st Drawing Frame	Drawn Sliver
Drawn Sliver	2nd Drawing Frame Drawn	Sliver Drawn
Sliver	Simplex	Roving
Roving	Ring Frame	Yarn
Yarn	Cone winding	Cone
Cone	Reeling	Hank
Hank	Bundling	Bundle
Bundle	Baling	Bale

3.3.2.2 Flow chart of Combed Yarn Manucturing Processing Combed Yarn: Yarn produced from fibers that have been both carded and combed. Normally combed yarn is manufactured by ring spinning system. The combing pricess is an additional step beyond carding. In this process the fibers are arranged in a highly parallel form, and additional short fibers,neps and trash are removed producing high quality yarns with excellent stength and evenness. Normally combing is necessry to manufacture goof quality ine yarn.

Flow chart of Combed Yarn Manucturing Processing

Input or Feed product	Manufacturing process	Output or Delivery product
Fiber	Blow	Room Lap
Lap	Carding Card	Sliver
Card Sliver	Pre-Comber Drawing	Sliver (Pre-Drawing)
Sliver	Sliver Lap Forming	Lap
Lap	Combing	Comb Sliver
Comb Sliver	Post-Comb Drawing (1)	Drawn Comb Sliver
Drawn Comb Sliver	Post-Comb Drawing (2)	Drawn Comb Sliver
Drawn Comb Sliver	Simplex	Roving
Roving	Ring Frame	Yarn
Yarn	Cone winding	Cone
Cone	Reeling	Hank
Hank	Bundling	Bundle
Bundle	Baling	Bale

3.3.2.3 List of M/c used for cotton Yarn Manufacturing :

List of M/c are given below :

1. Blow Room‘s M/c : Following M/c are used in blow room line for making yarns :

- Mixing or Blending M/c
- Hopper bale breaker or hopper bale opener.
- Axo flow cleaner
- Crighton opener or Vertical opener
- Step cleaner or Ultra cleaner
- S.R.L.L cleaner
- R.N beater
- Porcupine opener
- Mono cylinder
- Hopper feeder
- Bladed beater
- Krishner beater
- Scutcher or Lab former.

2. Carding M/C
3. Draw Frame
4. Lab Former
5. Comber
6. Roving Frame or Simplex
7. Spinning Frame
8. Winding M/c

FIBER

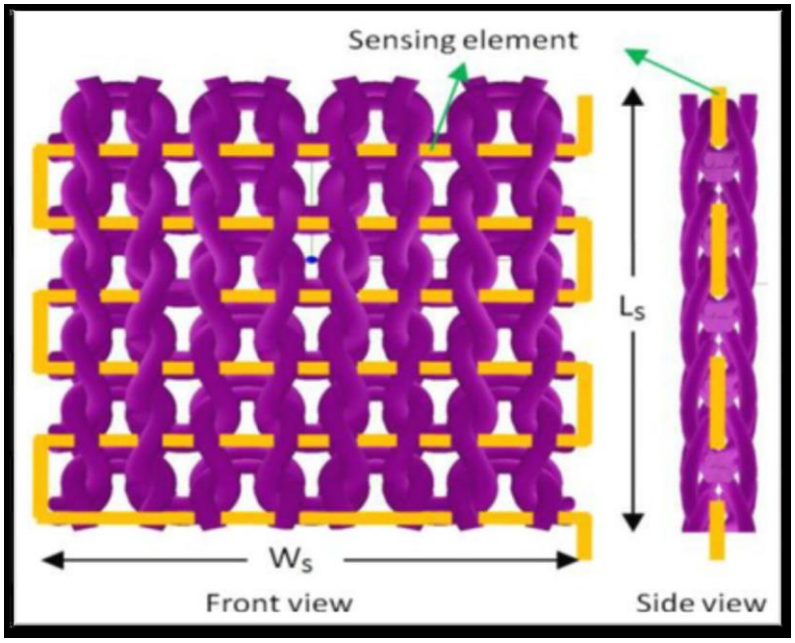
Fabric is cloth or other material produced by weaving together cotton, nylon, wool, silk, or other threads. Fabrics are used for making things such as clothes, curtains, and sheets
.

3.4.1 Classification of Fabric There are mainly three types of fabric, which are in the below:
1. Woven fabric,
2. Knit or knitted fabric,
3. Non-woven fabric.

3.4.1.1 Woven fabric: The fabrics which are produced by interlacing two sets of yarn i.e. war yarn and weft yarn by in is termed as woven fabric.

3.4.1.2 Flow Chart of Weaving
Yarn From Spinning Section
Doubling and Twisting
Winding
Creeling
Warping
Sizing
Winding on Weaves beam
Weaving

3.4.1.3 Types of Woven Fabric There are various types of woven fabrics produced in textile weaving sector which are mentioned in the following:



1. Poplin fabric or broad cloth,
2. Denim fabric, Pinpoint oxford fabric,
3. Corduroy fabric,
4. Chambray fabric,
5. Crepe fabric,
6. Oxford fabric,
7. Melange fabric,
8. Flannel fabric,
9. Royal oxford cloth,
10. Dobby fabric,
11. Herringbone fabric Kashmir silk,
12. Khadi fabric,
13. Gabardine fabric.

3.4.1.4 Uses of Woven Fabric Woven fabric is used for the below purposes:
1. Jackets,
2. Dress or blouses,
3. Bridal satins,
4. Lining fabrics,
5. Stretch fabrics,
6. Blanket binders,
7. Shower curtain,
8. Umbrellas.

3.4.2 Knit or Knitted Fabric The fabrics which are produced by interlacing one set of yarn are known as knit of knitted fabric. It should be noted here that, knit fabric and knitted fabric are same.

3.4.2.1 Production Flow chart of Knitting Section

Executive director takes order from Buyer

Merchandiser estimates total amount of yarn of production

Knitting manager gets production order sheet

Senior Production Officer ordered by K.M. and orders Production officer and Technical in-charge.

Production officer fixes up stitch length and GSM with mechanical fitter.

Definite operator operates machine in his full conscious and Attention.
Mechanical fitter fixes machine if there is any m/c fault.
Supervisors keep daily production report and assure m/c is OK.
Fabric roll is checked by a troop of inspectors in inspection unit and weighted.
Final product to the required amount is delivered to dyeing unit.

3.4.2.2 Types of Knit of Knitted Fabric:

There are so many knit fabrics produced in today‘s modern textile knitting sector which are presented in the below:

1. 100% cotton single jersey fabric,
2. Burn out single jersey fabrics,
3. 100% cotton double jersey fabrics,
4. Lycra or spandex single jersey fabrics,
5. Slub single jersey fabrics,
6. Grey melange slub fabrics,
7. Fleece fabrics,
8. French terry fabrics,
9. French terry slub fabrics,
10. Grey melange fabrics,
11. Micro or baby terry fabrics,
12. Lacoste fabrics,
13. Sequence fabrics
14. French terry fabrics (inside brushed),
15. Design terry fabrics,
16. Pique fabrics,
17. Pique slub fabrics,
18. 1×1 Rib fabrics,
19. 2×1 Rib fabrics.

3.4.2.3 Uses of Knit or Knitted Fabric: Knit or knitted fabric is used for the following g purposes:
1. Jersey fabric used for making T-shirt, Soft jacket and Coats.
2. Interlock knits are suitable for evening wear and lingerie.
3. Tricot fabric is used for bathing suits.
4. Sweater knits can be used to make tops, sweater dresses and skirts.

3.4.3.1 Non-woven Fabric:
This type of fabric is produced by connecting yarn with gummy or bonded materials.

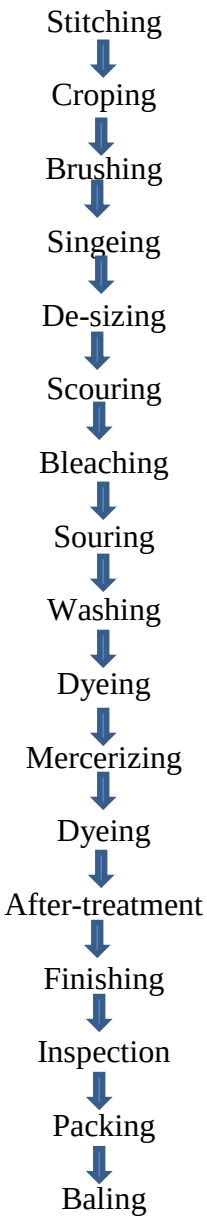
3.4.3.2 Types of Non-Woven Fabric Non-woven fabric has different types depending on its technology of raw materials, method of production, end use of materials and its properties.
a. According to the technology of raw materials:
1. Staple fibre non-woven,
2. Filament fibre non-woven.
b. According to the method of production:
1. Weft bonded,
2. Dry bonded,
3. Spun bonded.
c. According to the end use of materials:
1. Durable,
2. Semi-durable,
3. Disposable.
d. According to their properties:
1. Water repellent,
2. Flame retardant,
3. Water absorbent.

3.4.3.3 Uses of Non-woven Fabric Non-woven fabric is used for the below purposes:
1. Coating substrates,
2. Wipes,
3. Filtration,
4. Medical,
5. Interlinings,
6. Footwear,
7. Garments,
8. Hygiene etc.

CHAPTER- 04
WET PROCESSING

4.1 Flow Chart of Wet Processing :

Inspection of Grey Cloth



4.2 Functions of Wet Processing

❖ **Grey Cloth :**

The undyed and unfinished cloth is called grey cloth.

➢ **Objectives :**

✓ Assessment of different types of Faults.

❖ **Stitching**

Sometimes the woven fabric from loom is not of enough length as required & in such cases the fabrics are joined to make it larger through stitching.

➢ **Objectives :**

✓ Adding two or more than two fabric together.

❖ Cropping

The excess warp or weft yarn on fabric edges are removed by cutting with blade or scissors, this process is called cropping.

➢ **Objectives :**

✓ Removal of excess thread from the fabric.

❖ singeing

The verb `singe‘ literally means `to burn superficially‘. Technically , singeing refers to the burning-off of. Loose fibers not firmly bound into the yarn and or fabric structure. Singeing is an important part of pre-treatment. This is the burning off of protruding fiber ends from the surface of the fabric. If not done properly, unclear print patterns, mottled fabric surface and pilling results.

➢ **Objectives :**

✓ Singeing of a fabric is done in order to obtain a clean fabric surface which allows the structure of the fabric to be clearly seen.

✓ Fabrics, which have been singed, soil less easily than un-singed fabrics.

✓ The risk of pilling, especially with synthetics and their blends, is reduced in case of singed fabrics.

✓ Singed fabrics allow printing of dine intricate patterns with high clarity and detail.

❖ De-sizing

Desizing is the process of removing the size material from the warp yarns in woven fabrics. Sizing agents are selected on the basis of types of fabric, environmental friendliness, case of removal cost considerations, effluent treatment etc. Desizing, irrespective of what the desizing agent is, involves impregnation of the fabric with the desizing agent, allowing the desizing agent to degrade or solubilize the size material and finally to wash out the degradation products.

✓ No damage to the fiber.

✓ No usage of aggressive chemicals.

✓ Wide variety of application processes.

✓ High biodegradability.

➢ **Methods of De-Sizing:**

☐ Hydrolyric method: Enzymatic, Washing with hot water, Acid-desizing.

 Oxidative desizing : Chlorite, Chlorite, Bromite & Peroxy de-sizing.

❖ Scouring

The term ` Scouring‘ applies to the removal of impurities such as oils, was gums, soluble impurities and sold dirt commonly found in textile material and produce a hydrophilic and clean cloth.

➢ **Objectives :**

✓ To remove natural as well as added impurities of essentially hydrophobic character as completely as possible.

✓ To increase absorbency of textile material.

✓ To leave the fabric in a highly hydrophilic condition without undergoing chemical or physical damage significantly.

➢ **Chemical Used:**

Caustic Soda & Soda ash are mainly used for scouring of cotton fabric.

❖ Bleaching

Bleaching is chemical treatment employed for the removal of natural coloring matter from the substrate. The source of natural color is organic compounds with conjugated double bonds, by doing chemical bleaching the discoloration takes place by the breaking the chromospheres, most likely destroying the one or more double bonds with in this conjugated system. The material appears whiter after the bleaching.

➢ **Objectives :**

✓ Removal of colored impurities.
✓ Removal of the seed coats.
✓ Minimum tendering of fiber.
✓ Technically reliable & simple mode of operation.
✓ Low chemical & energy consumption.
✓ Increasing the degree of whiteness.

➢ **Type of Bleaching Agents**

1. Oxidative Bleaching Agents (Chlorine gas

- Bleaching powder {Ca(OCl)Cl
- Sodium hypo-chloride (Na2OCl)
- Calcium hypo-chloride {Ca(OCl)2}
- Potassium di-cromate (K2Cr2O7)
- Sodium di-cromate (Na2Cr2)
- Potassium permanganate (KMnO4)
- Potassium Chlorate (KClO3)
- Sodium peroxide (Na2O2)

2. Reductive Bleaching Agents

- Hydrogen (H2)
- Carbon (C)
- Carbon mono oxide
- Hydrogen sulphide (H2S)
- Sulphur dioxide(SO2)
- Ferrous sulphate (FeSO4)
- Titenous chloride(TiCl2)
- Zinc dust (Zn)
- Sodium Sulphate (Na2SO4)

3. Enzymatic Bleaching Agents

❖ Mercerizing

A treatment of cotton yarn or fabric to increase its luster and affinity for dyes. The material is immersed under tension in a cold sodium hydroxide (caustic soda) solution in warp or skein form or in the piece, and is later neutralized in acid. The process causes a permanent swelling of the fiber and thus increase its luster. It is the process of treatment of cellulosic material with cold or hot caustic conditions under specific conditions to improve its appearance and physical as well as chemical properties.

Objectives :

- ✓ To improve the luster.
- ✓ To improve the strength.
- ✓ To improve the dye uptake and moisture regain.

❖ Washing

The process to wash the textile materials is called washing.

❖ Heat Setting

The process of conferring stability of form upon fibers, yarns or garments usually by means of successive heating and cooling in dry or moist condition is called heat setting.

❖ Calendaring

Calendaring is a temporary mechanical finishing process. It gives a smooth surface of the cloth.

❖ Packing

To pack the textile materials treated by polyethylene bag.

❖ Fixing

To fix up the dyestuff into the textile materials is called fixing.

❖ After-Treatment

The process which is used for used for proper and perfect dyeing action. As for example, Incase of direct dye, after treatment is performed for increasing light fastness and wash fastness of dyed of dyed materials. Dye particle is done insoluble into the fiber after treatment.

❖ Inspection

Activity Singeing: Such as measuring, examine, texting, gauging, or more characteristics of a product or service and comparing those with specified requirement to determine conformably is called inspection.

❖ Finishing

Finishing is a process to give the proper quality of textile materials at the end of the wet processing depending of the customers.

❖ Rinsing

The process of washing something with clean water to remove soap, detergebt, dirt or impurities from fabric is called rinsing.

❖ Baling

To bail the textile material. **4.3 Chemical Used in Textile Industry :** The process of conversion of natural and man made textile fibers according to end uses and attractive qualities as per need of customer who involving the uses of a large number of organic and inorganic chemicals known as textile chemicals. Theses are given below :

❖ Wetting Agent

The chemical which is used for quickly moisten or watering the textile materials is called wetting agent. Example: Sudasol - EXC

❖ Detergent

Detergent are nothing but a chemical which is used for clearing the textile materials or to remove fats, oil and wax.

❖ Emulsifier
The chemical which is used to mix up the oil and water is called emulsifier.

❖ Sizing Components
The components which are used for sizing is called sizing components.

❖ Desizing Agents
The chemicals which are used to remove the size materials of a fabric in wet processing is called desizing. Example : Enzyme.

❖ Dye Retarding/Leveling Agents
The chemicals which are used for dyeing just to give level shade or even dyeing is called leveling agent.

❖ Dye Carrier
The carrier is not a chemical that will help to transfer the dye particle towards the outer surface or curiosity of the fiber.

❖ Dye Fixing Agent
Dye fixing agent is not nothing but a chemical that helps to fix up the dye particle into inner position of the fiber with the boundage.

❖ Rubbing Fastness Agent
Rubbing fastness agent is a chemical that will help to improve rubbing resistance power, this types of agents are used. It is nothing but color permanency agents. It is three types, Such as-
(a) **Washing fastness:** When we use water, detergents or soap it bears its precious color shade without feeding color after dyeing the fabric is called washing or wet fastness.
(b) **Light fastness:** We preserve the sunlight or light if the color shade is not changed. The light fastness is better.
(c) **Rubbing Fastness Improver :** If dyed material when faced more abrasions, the color of the materials is not fed is called rubbing fastness. Example: T.R.O

❖ Hygroscopic Agents
The materials which absorbs water from the moisture is called hydroscopic agent. It is one kind of electrolytic which suck up the water and being soluble. Example : NaCl.

❖ Oxidizing and Reducing Agents
The chemicals which helps to increase oxygen or electronegative part release the hydrogen is known as oxidizing and reducing agents respectively. Example: Hydrogen. Ozone etc.

❖ Defoaming Agents
The chemicals which are used to be soften the textile materials is called softening agents. Example- Catrol oil, paraffin.

❖ Stiffing Agents
The chemicals which helps to increase the soft materials into the hander one is called stiffing agents. Example- Resin

❖ Water Repellent/Proofing Agents
The chemicals which has the ability for fully resistant to penetration by water. Example: Rubber.

❖ Fire Proofing Agents

The chemicals which has more resistance to burn out is called fire proofing agents.

❖ Anti-midew agents

The agents which are used to protect the fiber like cellulosic fiber is called anti-midew agents. Example: ZnCl2

❖ Moth Proofing Agents

The chemicals which help to resist the moth is called moth proofing agents. Example: naphthalene type chemicals.

❖ Weighting Agents

Some chemicals which gives the some weight to the fabric is known as weightiness agents. Example: Chalk, CaCO3 etc.

CHAPTER- 05
WET PROCESSING

5.1 Introduction of Dyeing Machine:

Dyeing is a process of coloring textile materials for giving attractive look. In broadly we can explain, dyeing is a process by which a yarn, fabric, garments and any other materials that come to contact of dye by presence of auxiliaries that create the condition of dyeing environment. Dyeing operation is done by different types of dyeing machine. The machine which is used to dyeing or coloring of materials like yarn, fabric, garments or any other materials is called dyeing machine. Dyeing machines come in all shapes and sizes to accommodate the various forms and quantities of textile materials. Actually it is the device that is used by different industries for imparting colors. Various types of dyeing machineries are used to dye the textile materials.

5.2 Different Types of Dyeing Machine:

We can classify dyeing machine in the following way. Types of dyeing machine according to textile material:

A. Fiber dyeing machine B. Yarn dyeing machine C. Fabric dyeing machine A. Fiber dyeing machine

1. Conical pan loose stock dyeing machine
2. Annual case for loose stock dyeing machine
3. Hussong loose cotton dyeing machine
4. Jagen barg dyeing machine
5. Simplex dyeing machine
6. Dreze dyeing machine
7. Ober maier dyeing machine
8. Long close loose cotton dyeing machine

B. Yarn dyeing machine a. Hank form:

1. Hussong hank dyeing machine
2. Pulsatur hank dyeing machine
3. G.H.S. hank dyeing machine
4. Clauder Weldon hank dyeing machine

b. Package form:

1. Cop dyeing machine
2. Cheese dyeing machine
3. Warp dyeing machine

C. Fabric dyeing machine Jet dyeing machine
1. Jigger dyeing machine
2. Pad/padding mangle dyeing machine
3. Beam dyeing machine
4. Winch dyeing machine
5. High temperature winch dyeing machine
6. Molter metal stand fast dyeing machine
7. Solvent dyeing machine.

1. Jet dyeing machine
- Special temperature winches
- Jet dyeing machine with additional winches
- Partially folded jet dyeing machine
- Fully folded jet dyeing machine

2. Jigger dyeing machine
- Mather and plat jigger dyeing machine
- Closed jigger dyeing machine
- Cyclotric high performance jigger dyeing machine

3. Padding mangle dyeing machine
- Two bowl padding mangle dyeing machine
- Three bowl padding mangle dyeing machine
- Fiber bowl padding mangle dyeing machine
- Houbold bowl padding mangle dyeing machine
- Zittau bowl padding mangle dyeing machine

5.3 Describe of Dyeing Machine

New generation of TEC series High Temperature Dyeing Machine, the state-of-the-art design achieved the above aspects. It is suitable for different dyeing process with various types of natural, synthetic, blended fibers. Aiming to provide complete solutions: —Efficiency, Energy Saving, Environmental Friendly .

Main Features Efficiency (Versatile Application): TEC series is specially designed for fabric which is having tight and crease marks sensitive structure, such as 40S/2, 26S/1, 20S/1, tightly knitted fabric, and sensitive shade (E.g. Turquose).

Energy Saving: With various new functions, cotton reactive dyeing process takes about approximately 248 minutes for light color.

Environmental Friendly: The water consumption for reactive dyeing cotton fabric is lowered to 27.5, 37.8 & 47.6 L/Kg for light, medium & dark shade respectively.

Capacity: The new TEC Series offers at loading capacity of 300kg, 250kg 200kg per tube. Customer can choose in range of 1-12 tube.FC30 color multi-function controller: By the Fuzzy Logic temperature control function, the dye liquid temperature deviation can be minimized at + / -0.3 ° C.

Patented design - —Lint Collector : Specially designed for loose structure type such as terry towel and fleece; the collector can accumulate lint at the bottom and discharge it during draining.

Technical Data Design Temperature : 140 ° C Design Pressure : 3.0bar Heating gradient : 25 ° C ~ 100 ° C approx. 5 ° C/min 100 ° C ~ 130 ° C approx. 2.5 ° C/min (dry saturated steam pressure at 7bar) Cooling gradient : 130 ° C - 100 ° C approx. 3 ° C/min 100 ° C ~ 80 ° C approx. 2 ° C/min (cooling water at 3bar, 25 ° C)

2. FONG'S JUMBOTOWEL

➢ **Type of Fibres**

Cotton, cotton/man-made fibre blends, Woven and knitted, from medium to very heavy weight fabrics.

➢ **Capacity**

🕐 360 to 400 kg/tube

 Up to 2400 kg/batch

➢ **Application**

For the pretreatment, dyeing and after-treatment of towel, high pile fabric, heavy curtain and decorative fabric for both home and automobile industry.

➢ **General Description and Main Features**

Jumbo Towel is designed for the pre-treatment, dyeing and after-treatment of high pile terry and towel. The circulation system is chosen for an overflow and gentle treatment of the heavy fabric. It is a high temperature Towel dyeing machine which can be totally sealed up for the application of vat dye. Nozzle is sized for smooth passing through by the fabric and extensive exchange with the dyeing liquid. An automatic filter is recommended to ensure the running of the machine throughout the whole process. Suitable Nozzle size can be selected according to the characteristics of fabric.

➢ **Advantages**

✓ Designed for large quantities production with increased efficiency.
✓ Large nozzle for smooth running of fabric.
✓ Optimum lifting height and therefore lower tension on fabric.
✓ Piles are retained in its proper shape after treatment.
✓ Min. liquor raito to run the machine as low as 1:5

3. Slitter Machine:

Slitter machine is used for tubular knit fabric to make it in open form. In open form fabric finishing line; slitter machine is used after hydro-extractor, de-watering and drying machine.

Slitting is a process that is applied for cutting the tubular fabric through the intended break Wales line on lengthwise direction prior to stenter processing. During slitting, it is required to be aware about the cutting line otherwise, fabric faults can be occurred there.

➢ **Objectives of Slitting :**

Following objectives are achieved by the slitting machine.

1. To open tube fabric according to specific needle mark.
2. To prepare the fabric for next stentering process.

➢ **Function of the Slitting Machine:**

1. Used to remove excess water after pretreatment and dyeing.
2. To slit the tube fabric by the knife for opening of the fabric and ready for stentering.
3. Delivered fabric in crease free state.
4. Before squeezing balloon is formed with the help of compressed air passing by a nozzle or air sprayer.
5. It can control the diameter of fabric and GSM and shrinkage by over feeding mechanism.

➢ **Main Parts of Slitter Machine and their Functions:**

Following are the main machine parts and their functions.

1. Rotary Blade: Rotary blade is used for cutting the fabric through break Wales line.
2. Ring: Ring is use to help the cutting process.
3. Guide Roller: After slitting, plaiting of the fabric is done. Guide roller guides the fabric to plaiting.
4. Plaiting: Open fabric is make plait by plaiting.
5. Sensor: Sensor is used for identify the specific Wales line. It makes sense for cutting through break Wales‘s line.

➢ **Checking Parameters Slitter:**

Following parameters are checked after slitting.

1. **Cutting Line Check:** Fabric cutting line is checked by the operator of the slitting machine. Operator checks that the rotary blade cut fabric through break Wales‘s line or not.
2. **Bow and Slant check:** Bow and slant is checked in the delivery side of the machine by the operator.
3. **Fabric Faults:** Various fabric faults also checked in slitting process.

➢ **Working Principle of Slitter Machine:**

The slitting m/c has 4 units - initial squeezer, de-twisting, slitter and padder. After dyeing completed and falling of water from fabric the fabric is fed in slitting m/c. So it is necessary to remove some water initially for the case of further processing in this m/c. The initial squeezer does this work. The de-twisting unit removes twists that may present in tubular rope form fabric. This unit has 3 de-twisting rollers, one rotation drum and 2 feeler rollers with sensors. By these rollers it detects twist in fabric and removes by rotating rope fabric in opposite direction. Before slitting there is a blower which blows air to open the tubular fabric & makes it easy to pass over cigger. The cigger can be extended in circumference and opens the tubular fabric in full circumference. Slitting is done by using open mark detecting golden eye by around knife. Then the fabric passes through the padder where washing or chemical treatment is done. Squeezer is used to remove 60-70% of water. After removing water width is controlled by stretcher and fabric is delivered by folding device.

➢ **Operational Parameter:**

1. Set the padder pressure as required (3-7bar)
2. Set the speed as much as possible (30-80m/min).

4. Dryer:

Drying is done after de-watering of fabric. In textile finishing unit; dryer uses for dry the knit, woven fabrics and dyed yarn. But the drying process and drying mechanism of yarn and fabrics is different from one to another. The main functions of a textile dryer is to dry the textile fabrics. Drying is defined as a process where the liquid portion of the solution is evaporated from the fabric.

➢ **Considering points for selecting a dryer:**

Following points should consider during buy a dryer.

1. Heating methods: The textile fabrics may be heated by gas burner or steam.
2. Chamber: Number of chamber.
3. Burner: Number of burner.

➢ **Working Principle of Dryer :**

After de-watering then the fabric through the dryer. The main function of the dryer is given below,

1. To dry the fabric.
2. To control the overfeed system.
3. To control the vibration which increase the G.S.M.

This machine contains two chambers. Two mesh endless conveyors are placed lengthwise to the chamber named conveyor net and filter net, each chamber contain a burner, which supply hot air .This hot air is guided through the ducting line by suction fan .There are nozzles placed in between filter net and conveyor net. When the fabric pass on the conveyor net, hot air is supplied to the wet fabric to dry it. There are exhaust fan which such the wet air and deliver to the atmosphere through the ducting line.

The speed of the dryer depends on the temperature of the m/c & the G.S.M of the fabric . If the m/c temp. is high then m/c speed also high and the m/c temp. is low then m/c speed also low . The vibration speed of the m/c for heavy fabric is 730 m/min and normal fabric is 480 m/min

The temp. of different chambers according to the shade of the fabric:

➢ **Operating Parameters:**

1. Temperature:-Set the temperature between 1200C -1300C for white and 1500C -1700C for color fabric. GSM temperature Or, moisture content temperature
2. Set the over feed up to 10~20% or as required to get finish G.S.M.
3. Set the speed as much as possible (6~20m/min). GSM speed.

➢ **Special Feature of Dryer :**

1. Steam dryer (two chambers) .
2. Vibration occur in heating zone .
3. Process air pressure switch present .
4. Maximum temp. increase up to 1700C .
5. Steam control switch present .
6. Two burners present .
7. Two conveyor belt is present .

➢ **Parameters Used For Different Constructed Fabric:**

For Cotton Fabric:

Fabric Type	**Overfeed %**	**Temperature0 C**		**Speed (m/min)**	**Folder Speed (m/min)**
Light Color	Deep Color		High G.S.M		Low G.S.M
Single Jersey	-15 % to-20%	1450C	1650C	6.5~7	8~9	2~3
Single Lacoste	-20 % to-25%	1450C	1650C	6.0~7	8~9	2~3
Polo Pique	-20 % to-25%	1450C	1650C	6.0~7	8~9	2~3
Interlock	-20 % to-25%	1550C	1700C	5~6.5	7~8	2~3
Rib	-5%	1450C	1650C	4~4.5	5~5.5	3~4
Grey Mélange	-20 %	1500C	1650C	4~4.5	5~5.5	3~4

For Polyester Fabric:

Fabric Type	**Overfeed %**	**Temperature0 C**		**Speed (m/min)**	**Folder Speed (m/min)**
Light Color	**Deep Color**		**High G.S.M**		**Low G.S.M**
Single Jersey	-5%	1350C	1150C	10~12	8~10	4~6
Single Lacoste	-5%	1350C	1150C	10~12	8~10	5~6
Polo Pique	-5%	1400C	1150C	10~12	8~10	5~6
Interlock	-5%	1350C	1100C	6~8	8~9	4~5
Rib	-5%	1450C	1150C	4~4.5	4.5~6.0	5~6
Grey Mélange	-5%	1300C	1150C	6~8	5~5.5	5~6

N.B: For Polyamide: Temp range is 1100C~ 1150C.Speed range16~18;Overfeed range- 5%. This Data‘s are varied depending upon the Gray G.S.M and Finished G.S.M and also on the dia of the fabric. All this parameters are suitable for G.G.S.M range 140~160 to get Fin.G.S.M 170~185 without Lycra Fabric.

➢ **Following things are also considered in case of Dryer machine:**

- If fabric is more Redder than the standard one, then reduce the temperature.
- If fabric is more Yellower than the standard one, then increase the temperature.
- If fabric is more Bluer than the standard one, then increase the temperature.

All This data's are practiced in mills which may varied factory to factory.

➢ **Machine Specification:**

- Brand Name : Santex ag
- Year of Manufacture : 1998
- Company : Santex ag
- Type : Santastretch 2K/240,GM,IR,GFI
- Origin : Switzerland
- Max. Working Speed : 30 m/min
- Model : CH-9555,Tobel
- Min. working Speed : 5~15 m/min
- Overfeed Range : 0% to -25%
- Max. Temperature : 1850C
- No of Chamber : Two
- No of Burner : 2

5. Stenter Machine: A machine or apparatus for stretching or stentering fabrics. The purpose of the stenter machine is to bringing the length and width to pre determine dimensions and also for heat setting and it is used for applying finishing chemicals and also shade variation is adjusted. The main function of the stenter is to stretch the fabric widthwise and to recover the uniform width.

➢ **Functions of Stenter Machines:**

1. Heat setting is done by the stenter for lycra fabric, synthetic and blended fabric.
2. Width of the fabric is controlled by the stenter.
3. Finishing chemical apply on fabric by the stenter.
4. Loop of the knit fabric is controlled.
5. Moisture of the fabric is controlled by the stenter.
6. Spirility controlled by the stenter.
7. GSM of the fabric is controlled by stenter.
8. Fabric is dried by the stentering process.
9. Shrinkage property of the fabric is controlled.
10. Curing treatment for resin, water repellent fabric is done by the stenter.

➢ **Components of Stenter Machine:**

1. Paders
2. Weft straightner (Mahlo)
3. Burners 10
4. Heat recovery
5. Attraction rollers
6. Circulating fans 10,8
7. Exhaust fans 2
8. Winder 2
9. Clips
10. Pins
11. I.R
12. Cooling drums

➢ **Working Procedure of Stenter Machine:**

The fabric is collected from the batcher to the scray and then it is passed through the padders where the finishes are applied and some times shade variation is corrected.The fabric is entered into the mahlo (weft straigtner) the function of the mahlo is to set the bow and also weave of the fabric is griped by the clips and pins are also provided but the pins has a disadvantage that they pins make holes at the selvedge but the stretchning of the pins are greater than the clips.these clips and pins are joined to endless chain.there are 8 to 10 chambers provided on the machine each chamber contains a burner and filters are provided to separate dust from air.the circulating fans blow air from the base to the upper side and exhaust fans sucks all the hot air within the chambers. Attraction rollers ar provided to stretch the warp yarn. After stentering we can increase the width of the fabric up to 1.5-2 inch.The speed of the machine is about 7-150 m/min.3 meters fabric can run in each chamber.temperature is adjusted that according to the fabric as for,

1. PC 210 c
2. Cotton 110-130 c

After dyeing 160-170c and after print 130-140c.

6. Compactor Machine:

Compactor is a textile finishing machine which is designed specially for compacting 100% cotton knitted fabric like jersey, pique, interlock, plush, rib and sinker etc. as well as cotton blended fabric in rope form, changing the loft and dimensional stability of the fabric and presenting it to plaited form. Fitted with two felt compacting units which makes it to obtain top quality fabric, with minimized shrinking nature and a soft fluffy hand.

➢ **Function of Compactor Machine:**

Compactor is important machine in knit fabric finishing process. There are a lot of technical work which are done by compactor machine. The works are done by compactor machine are pointed out below:

1. GSM control of the knitted fabric. For high GSM, overfeed is increased and fabric width is decreased. For low GSM, overfeed is decreased and fabric width is increased.

2. Control shrinkage 3. Twisting control 4. Increase smoothness of fabric
5. Heat setting is done of fabric etc.

➢ **Checking Parameters of Compactor Machine:**

Following parameters check in compactor machine.

1. **Shade Check:** Shade of the compacting fabric is checked in the delivery side of the machine. The operator collects the fabric and compare the shade of the fabric with the buyer‘s approved swatch.

2. **Width Check:** Operator measures the width of the fabric with the measuring tape and compares it with the buyer‘s requirement.

3. **Weight Check:** Weight of the fabric is determined by GSM check. Operator checks the GSM of the fabric by GSM cutter and electric balance.

4. **Edge Line Checking:** Two edges of the fabric is check in delivery side. If any fix line is identified, which normally occurs from the expander it should be connected.

5. **Design and Slanting:** Operator checks design and slanting of the fabric in the delivery side of the machine.
6. **Fabric Faults:** Various types of fabric quality are measured in the delivery side of the fabric.

➢ **Types of Compactor Machine:**

Compactor machines are two types. They are-
1. Tubular compactor
2. Open compactor

➢ **Tubular Compactor:**

Tubular compactor is used after hydro-extractor, de-watering and dryer. By the compactor machine, compacting is done for control the shrinkage of the fabric. Here, different types of off line quality of the fabric are measured.

➢ **Functions of Tubular Compactor:**

Following objectives are achieved by the tubular compactor. They are-
1. Shrinkage of the fabric is controlled by the compactor.
2. Fabric width is controlled by the compactor.
3. GSM of the fabric is adjusted by the compacting.
4. Fabric smoothness is achieved by the compactor.
5. Heat setting of fabric for Lycra is done by tubular compactor.

➢ **Working Procedure of Tubular Compactor:**

The treatment of knit fabrics in tubular form on the Tubular compactor meets the exacting standards set by customers so that garment stitched from the fabric finished on this machine will yield the lowest residual shrinkage values. 1. Width control through a stepless adjustable special tubular fabric spreader driven by variable speed motor for distortion-free fabric guidance. 2. Steamping with a condensate-free steam box which is easily operated and completely made from stainless stell. 3. Compacting through two Nomex felt belts. 4. Calendaring while passing between the felt belt and the heated shrinking rollers. 5. Precision plaiting with automatic platform level adjustment controlled by folded fabric height. Alternatively, a fabric rolling system can be provided. The fabric is fed through the guiding system and stretcher which then takes the fabric through the steam box onto the felt of the twin compacting units. At the fabric delivery, the machine is equipped with a precision plaiting device with its platform. The height of the platform is controlled automatically and is adjustable according to the plaited fabric height. An optical fabric density measuring sensor can provide the means to automatically control the compaction of a tubular compactor to achieve the desired course count. An automatic compaction control system based on density measurement and control will:

- Eliminate over- and under-weight fabric.
- Reduce or eliminate punch-weight measurements.
- Provide consistent results from all operators.
- Result in uniform fabric, seam-to-seam.
- Yield predictable residual shrinkage.

➢ **Specification of Tubular Compactor Machine:**

Brand name	Ferraro
Model no.	Comptex/Fv200
Manufacturing country	Italy
Speed range	13-22 m/min
Temperature	110-140C
Used utilities	Electricity,Compress air,Steam
Production capacity	4 ton/day
Maximum width	86‖
Minimum width	36‖
Applied for	Open width

➢ **Open Width Compactor:**

Open compactor is used for compacting the open form fabric. Here, slitting machine is used for open the fabric from the tubular form.

➢ **Feature of Open Width Compactor:**

Perfect sanforising finishing of knit fabrics.
1. Ideally suitable for in-line with stenter machines.
2. Effective shrinkage control
3. A.C. Inverter drives, PLC with touch screen used.
4. Equipped with modem connectivity and online troubleshooting system.
5. Metal detector.

➢ **Working Procedure of Open Width Compactor:**

Open Width Compactor is suitable for open width knit fabrics to achieve exact dimensional stability and a soft feel. The machine generally consists of a feeding frame with centering device and driven scroll rollers, an equalizing stenter frame with overfeed roller and brush pinning arrangement. The entry section of Pin Frame is provided with edge spreaders IR In-Feed device, an S.S. fabricated steaming unit for uniform moistening of the fabric. The Steaming Device has stainless steel sliding shutters that allow steam to flow only as per the width of the fabric. A low contact Glueing and Drying unit is provided with a stainless steel trough. Four selvedge drying units with infra-Red emitters are placed on either side of the machine. The delivery side section consists of edge dryer, Selvedge trimmer and a suction device, Exit roller, Width Adjustment device and the drive to the chain are housed in a exit box. The compacting unit consists of 2 felt compacting units, each of them consisting of a Nomex felt approx. 20 mm thick, a steam heated chrome-plated center roller of dia. 400 mm, a rubber covered roller driven by variable frequency drive, a compacting pressure roller, a felt tensioning roller and a felt centering roller. Each unit is provided with a special anti-fiction sheet type shoe controlled by an electrical actuator to control the compressive shrinkage. A fabric cooling roller is provided after second felt to cool the fabric by means of chilled water circulation. Fabric Tension through the machine is controlled with the help of sensitive load cells and variable frequency drive with PLC and touch screen.

➢ **Specification of Open Width Compactor Machine:**

Brand name	Ferraro
Model no.	Comptex/Fv200
Manufacturing country	Italy
Speed range	13-22 m/min
Temperature	110-140C
Used utilities	Electricity,Compress air,Steam
Production capacity	4 ton/day
Maximum width	86‖
Minimum width	36‖
Applied for	Open width

7. DL-600 Plus (Starlet-Dose-3) Lab Machine:

DL-6000 Plus (Starlet-Dose3)

➢ **Overview**

Quick Details Place of Origin : Seoul, South Korea Brand Name : STL Model Number : DL-6000

➢ **Packaging & Delivery**

Packaging Details 1 Box with Wooden Packaging (250Kgs/1.50CBM) Delivery Time 2 weeks from Order confirmation

➢ **Specifications**

Infrared Ray Laboratory Dyeing Machine Number of Pot : 16 or 24 ea Pot Size : 150ml, 300ml, 500ml, 1,000ml, 2,000ml available

➢ **Specification**

1. ` Temp.- controller: Graphic program(LCD)
i. CPU : 16Bit Micro Processor
2. ` Temperature range : 25 ~ 140°C
3. ` Temperature accuracy : ±0.5°C at 130°C
4. ` Temperature sensor : PT 100
5. ` Cooling system : Fan air circulation
6. ` Rotating speed : 0 ~ 60 rpm/min
7. ` Material : Interior - SUS 304 polishing
8. Exterior - SS#41 powder coating
9. Pot - SUS#316L
10. ` Heater : 3600 W (infrared heater)
11. ` Circulation fan : 0.2 kw AC 1 ø
12. ` Drive motor : 0.2kw AC inverter motor
13. ` Door safety device : Auto stop sensor
14. ` Power source : AC 220V 50/60Hz 1 ø
15. ` Net Weight(approx.) : 200 kg
16. ` Dimensions : 850(W) X 760(D) X 1000(H) mm

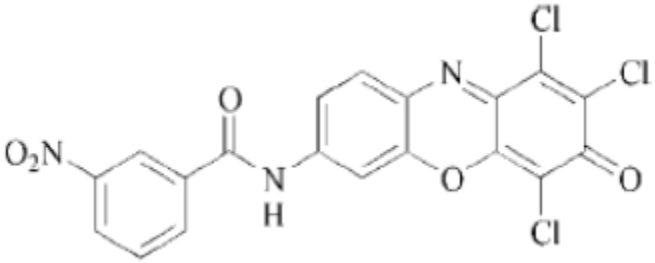
CHAPTER- 06
DYES & DYEING

6.1 Definition of Dyes : The dye is a complex compound which is applied in the textile materials represents color and contains chromophore and auxochromophome groups in its chemical Structure. Substances that add color to textiles. They are incorporated into the fiber by chemical reaction, absorption, or dispersion. Dyes differ in their resistance to sunlight, perspiration, washing, gas, alkalies, and other agents; their affinity for different fibers; their reaction to cleaning agents and methods; and their solubility and method of application.

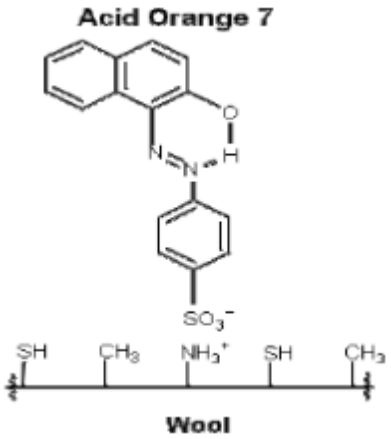
6.2 Various classes and types of dyes are listed below:

1. Acid Dyes
2. Natural Dyes
3. Basic (Cationic) Dyes
4. Synthetic Dyes
5. Direct (substantive) Dyes
6. Disperse Dyes
7. Sulfur Dyes
8. Pigment Dyes
9. Mordant Dyes
10. Vat Dyes
11. Reactive Dyes
12. Macromolecular Dyes
13. Metallized Dyes
14. Naphthol Dyes
15. Premetallized Dyes
16. Gel Dyeing
17. Developed Dyes
18. Azo Dyes
19. Aniline Dyes
20. Anthraquinone Dyes

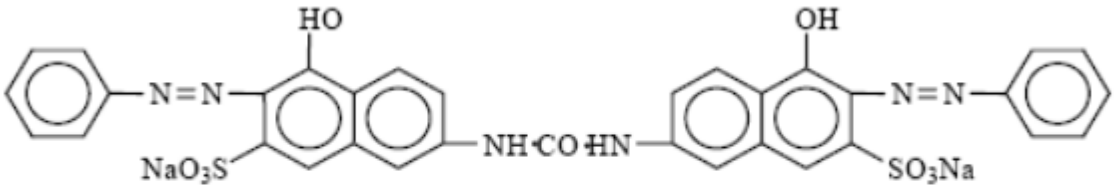
1. **Acid Dyes** A class of dyes used on wool, other animal fibers, and some manufactured fibers. Acid dyes are seldom used on cotton or linen since this process requires a mordant. Acid dyes are widely used on nylon when high wash fastness is required. In some cases, even higher wash fastness can be obtained by after-treatment with fixatives.
2. **Natural Dyes** Direct Printing, it is the most common approach to apply a color pattern onto a fabric. If done on colored fabric, it is known as overprinting. The desired pattern is produced by pressing dye on the fabric in a paste form. To prepare the print paste, a thickening agent is added to a limited amount of water and dye is dissolved in it. Earlier starch was preferred as a thickening agent for printing. Nowadays gums or alginates derived from seaweed are preferred as they allow better penetration of color and are easier to wash out. Most pigment printing is done without thickeners because the mixing up of resins, solvents and water produces thickening anyway.
3. **Basic (Cationic) Dyes** Basic dyes are water-soluble and are mainly used to dye acrylic fibers. They are mostly used with a mordant. A mordant is a chemical agent which is used to set dyes on fabrics by forming an insoluble compound with the dye. With mordant, basic dyes are used for cotton, linen, acetate, nylon, polyesters, acrylics and modacrylics. Other than acrylic, basic dyes are not very suitable for any other fiber as they are not fast to light, washing or perspiration. Thus, they are generally used for giving an after treatment to the fabrics that have already been dyed with acid dyes.



4. **Synthetic Dyes** Synthetic dyes are classified based upon their chemical composition and the method of their application in the dyeing process.



5. **Direct (substantive) Dyes** Direct dyes color cellulose fibers directly without the use of mordants. They are used for dyeing wool, silk, nylon, cotton, rayon etc. These dyes are not very bright and have poor fastness to washing although they are fairly fast to light.

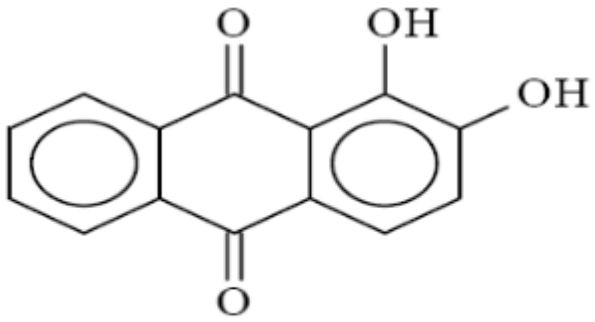


Direct Orange 26

6. **Disperse Dyes** Disperse dyes are water insoluble. These dyes are finely ground and are available as a paste or a powder that gets dispersed in water. These particles dissolve in the fibers and impart color to them. These dyes were originally developed for the dyeing of cellulose acetate but now they are used to dye nylon, cellulose triacetate, and acrylic fibers too.
7. **Sulfur Dyes** Sulfur Dyes are insoluble and made soluble by the help of caustic soda and sodium sulfide. Dyeing is done at high temperature with large quantities of salt so that the color penetrates into the fiber. After dyeing the fabric is oxidized for getting desired shades by exposure to air or by using chemicals. Excess dyes and chemicals are removed by thorough washing. These dyes are fast to light, washing and perspiration and are mostly used for cotton and linen.

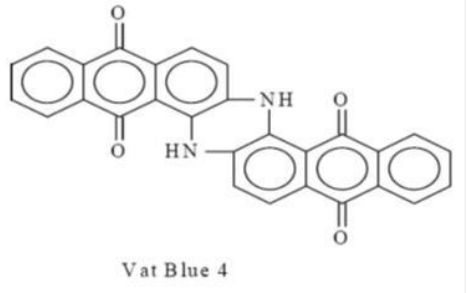
8. Pigment Dyes Although pigments are not dyes in a true sense, they are extensively used for coloring fabrics like cotton,wool and other manmade fibers due to their excellent light fastness. They do not have any affinity to the fibers and are affixed to the fabric with the help of resins. After dyeing, the fabrics are subjected to high temperatures.

9. Mordant Dyes The mordant or chrome dyes are acidic in character. Sodium or potassium bichromate is used with them in the dyebath or after the process of dyeing is completed. This is done for getting the binding action of the chrome. They are mostly used for wool which gets a good color fastness after treatment with mordant dyes. They are also used for cotton, linen, silk, rayon and nylon but are less effective for them.



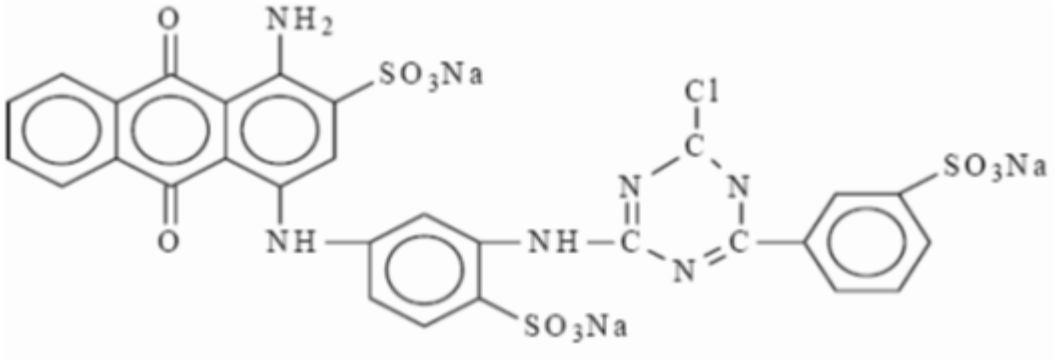
Mordant Red 11

10. Vat Dyes Vat dyes are insoluble in water and cannot dye fibers directly. However, They can be made soluble by reduction in alkaline solution which allows them to affix to the textile fibers. Subsequent oxidation or exposure to air restore the dye to its insoluble form. Indigo is the original vat dye. These dyes are the fastest dyes for cotton, linen and rayon. They are used with mordants to dye other fabrics such as wool, nylon, polyesters, acrylics and modacrylics.



Vat Blue 4

11. Reactive Dyes Reactive dyes react with fiber molecules to form a chemical compound. These dyes, they are either applied from alkaline solution or from neutral solutions which are then alkalized in a separate process. Sometimes heat treatment is also used for developing different shades. After dyeing, the fabric is washed well with soap so as to remove any unfixed dye. Reactive dyes were originally used for cellulose fibers only but now their various types are used for wool, silk, nylon, acrylics and their blends as well.



Reactive Blue 5

12. Macromolecular Dyes A group of inherently colored polymers. They are useful both as polymers and as dyes with high color yield. The chromophores fit the recognized CI classes, i.e., azo, anthraquinone, etc., although not all CI classes are represented. Used for mass dyeing, hair dyes, writing inks, etc.

13. Metallized Dyes
A class of dyes that have metals in their molecular structure. They are applied from an acid bath.

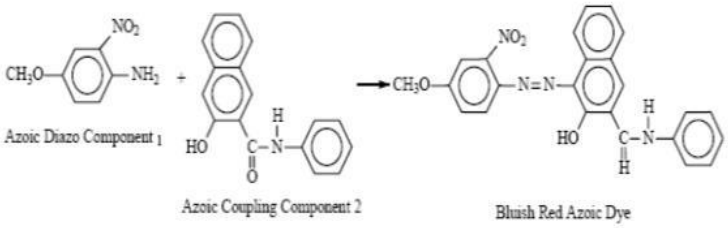
14. Naphthol Dyes A type of azo compound formed on the fiber by first treating the fiber with a phenolic compound. The fiber is then immersed in a second solution containing a diazonuim salt that reacts with the phenilic compound to produce a colored azo compound. Since the phenolic compound is dissolved in caustic solution, these dyes are mainly used for cellulose fiber, although other fibers can be dyed by modifying the process. (Also see DYES, Developed Dyes.)

12. Premetallized Dyes
Acid dyes that are treated with coordinating metals such as chromium. This type of dye has much better wetfastness than regular acid dye. Premetallized dyes are used on nylon, silk, and wool.

13. Gel Dyeing Passing a wet-spun fiber that is in the gel state (not yet at full crystallinity or orientation) through a dyebath containing dye with affinity for the fiber. This process provides good accessibility of the dye sites.

14. Developed Dyes Dyes that are formed by the use of a developer. The substrate is first dyed in a neutral solution with a dye base, usually colorless. The dye is then diazotized with sodium nitrate and an acid and afterwards treated with a solution of B-naphthol, or a similar substance, which is the developer. Direct dyes are developed to produce a different shade or to improve wash fastness or light fastness.

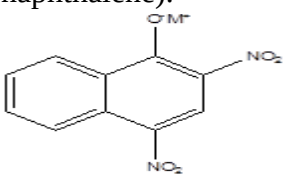
15.Azo Dyes Dyes characterized by the presence of an azo group (-N=N-) as the chromophore. Azo dyes are found in many of the synthetic dye classes.



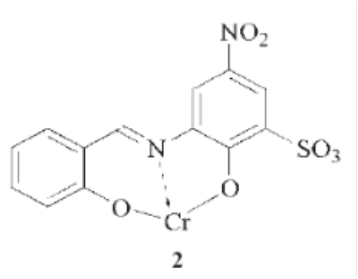
16. Aniline Dyes Dyes derived chemically from aniline or other coal tar derivatives.

17. Anthraquinone Dyes Dyes that have anthraquinone as their base and the carbonyl group (>C=O) as the chromophore. Anthraquinone-based dyes are found in most of the synthetic dye classes.

18.Nitro Dye: Nitro dyes are polynitro derivatives of phenols containing at least one nitro group ortho or para to the hydroxyl group.It is used to dye wool.It Consist of two or more aromatic rings (benzene, naphthalene).



19. Solvent Dye: These dyes are water-insoluble but soluble in alcohols, chlorinated hydrocarbons, or liquid ammonia. These colours are applied by dissolving in the target, which is invariably a lipid or non-polar solvent. The Colour Index uses this as a classification and naming system. Each dye is named according to the pattern: – solvent + base colour + number They are used for coloring synthetics, plastics, gasoline, oils and waxes.



2

6.3 Properties of dyes:

✓ These dyes are economical dyes and are generally used to produce dark shades such as dark greens , dark blues and blacks.

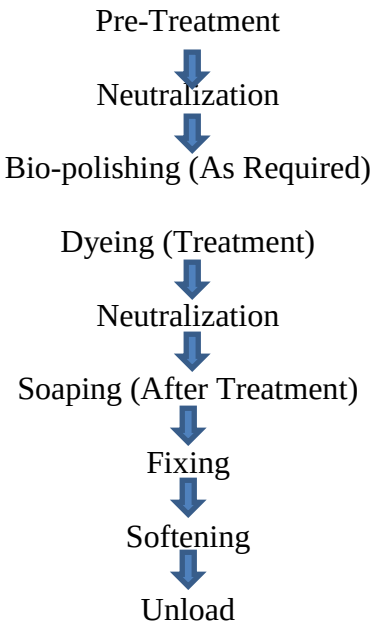
✓ These dyes have good leveling and color fastness properties.

✓ The interaction between fiber and dye is established through very strong ionic bonds , which are formed between the anionic groups of the colorant and ammonium cations on the fiber. Chromium or the metal ion acts as bridge between the dye and fiber , which gives rise to a very strong linkage , resulting into excellent fastness properties.

6.4 Application of Dyestuff: However the most popular classification is the one that is advocated by the US International Trade Commission. This system classifies dyes into 12 types.

Group	Application
Direct	Cotton, cellulosic and blended fibers
Vat dyes	Cotton, cellulosic and blended fibers
Sulphur	Cotton, cellulosic fiber
Organic pigments	Cotton, cellulosic, blended fabric, paper
Reactive	Cellulosic fiber and fabric
Disperse dyes	Synthetic fibers
Acid Dyes	Wool, silk, paper, synthetic fibers, leather
Azoic	Printing Inks and Pigments
Basic	Silk, wool, cotton

6.5 Dyeing Process Flow Chart Fabrics Loading



STORE HOUSE SECTION

6.6 Definition of Batching:

Batch section is a preparatory stage of dyeing. It is the receiving section of grey fabric and sending section of grey fabric to the dyeing section which will dye. Batching is the process to get ready the fabrics which should be dyed and processed for a particular lot of a particular order.

6.6.1 Flow Chart of Fabric Batching in Textile Industry

Store House Section

Receive batch card from Grey In-charge

↓

Make the priority as per dyeing plan

↓

Take one specific Batch card.

↓

Read the Batch Card for own understanding

↓

Check the availability of fabric

↓

Take required quantity of body fabric from ware-house.

↓

Make required no. of Rope maintaining equal length.

Take collar/cuff as per size, keep the total weight.

↓

Distribute the collar/cuff or Rib in each rope equally unsure equal length

↓

Stitch the fabric

↓

Write down the weight against roll no. in the back side of the Batch Card.

↓

Write the total weight in Batch card

↓

Put signature & date.

↓

Fill up the production report form.


6.6.2 Types of Knitted Fabrics in Store House:

Figure: Fabric Store House

There are so many knit fabrics produced in today‘s modern textile knitting sector which are presented in the below:

1. 100% cotton single jersey fabric,
2. Burn out single jersey fabrics,
3. 100% cotton double jersey fabrics,
4. Lycra or spandex single jersey fabrics,
5. Slub single jersey fabrics,
6. Grey melange slub fabrics,
7. Fleece fabrics,
8. French terry fabrics,
9. French terry slub fabrics,
10. Grey melange fabrics,
11. Micro or baby terry fabrics,
12. Lacoste fabrics,
13. Sequence fabrics
14. French terry fabrics (inside brushed),
15. Design terry fabrics,
16. Pique fabrics,
17. Pique slub fabrics,
18. 1×1 Rib fabrics,

6.6.3 Used different report of Batch Section
(Dyeing Section)

Date : 18-12-2017

Buyer : C-4 M/C : 01

Order No :63-C
Colour :Navy
G/G.S.M :100

Shift :A
Batch No :5858
F/G.S.M :155

Batch Card Fabric Type	M/Dia	F/Dia	Mark	Rolls	Wt.
S/J	36	73(op)	X	10	476
S/J (Pipin)/N. Tape	26	N.D	I	01	24.00
Total			500.00		

(Dyeing Section)

Date : 18-12-2017

Buyer : C-4 M/C : 01

Order No :63-C
Colour :Navy
G/G.S.M :100

Shift :A
Batch No :5858
F/G.S.M :155

Date	CH/GP	Particulars	Opening Stock	REVD Qty	Issued Qty	Balance Qty	Signature	Remarks

LAP DIP SECTION

6.7 Definition of Lab Dip:
A lab dip is a swatch of fabric test dyed to hit a color standard. It is a process by which buyer‘s supplied swatch is matched with the varying dyes percentage in the laboratory with or without help of spectrophotometer. Lab dip plays an important role in shade matching & this is an important task before bulk production. In previous article of this author we have to learn on flow chart on dyeing lab. Calculation of dyeing recipe are done by the dyeing master. The whole work process are done in lap dip. Lab dip is a process by which buyers supplied swatch is matched with the varying dyes percentage in the laboratory. Lab dip plays an important role in shade matching & and detaching the characteristics of the dyes and chemicals are to be used in the large scale of production. So this is an important task before bulk production.

6.7.1 There are different matching systems followed in Labs. They are : Tube light matching.
1. Sun light matching.
2. Ultra Violet matching.
3. Sodium light matching (show room).

6.7.2 Object of Lab Dip: The main objectives in lab dip are as follows:
1. To calculate the recipe for sample dyeing.
2. To compare dyed sample with swatch by light Box or Spectrophotometer.
3. To calculate revise recipe for sample dyeing.
4. Finally approved Lab Dip (Grade: A, B, C & D)

6.7.3 Spectrophotometer

Spectrophotometer is a photometric device that measures spectral transmittance, spectral reflectance relative spectral emitance. It compares light leaving from the object with that incident on it at each wavelength. According to Beer's law, the amount of light absorbed by a medium is proportional to the concentration of the absorbing material or solute present. Thus the concentration of a colored solute in a solution may be determined in the lab by measuring the absorbency of light at a given wavelength. Wavelength (often abbreviated as lambda) is measured in nm. The spectrophotometer allows selection of a wavelength pass through the solution. Usually, the wavelength chosen which corresponds to the absorption maximum of the solute . Absorption Spectroscopic methods of analysis are based upon the fact that compounds ABSORB light radiation of a specific wavelength. In the analysis, the amount of light radiation absorbed by a sample is measured. The light absorption is directly related to the concentration of the colored compound in the sample. The wavelength (l) of Maximum Absorption is known for different compounds. For example, the colored compound formed for analysis of Phosphate (molybdenum blue) has maximum light absorption at l= 640 nm. Conversely, a minimum amount of light is transmitted through the compound at l= 640 nm.

6.7.3.1 The Instrument of Spectrophotometer: All spectrophotometer instruments designed to measure the absorption of radiant energy have the basic components as follows : A stable source of radiant energy (Light);

1. A wavelength selector to isolate a desired wavelength from the source (filter or monochromator);
2. Transparent container (cuvette) for the sample and the blank;
3. A radiation detector (phototube) to convert the radiant energy received to a measurable signal; and a readout device that displays the signal from the detector.

The energy source is to provide a stable source of light radiation, whereas the wavelength selector permits separation of radiation of the desired wavelength from other radiation. Light radiation passes through a glass container with sample. The detector measures the energy after it has passed through the sample. The readout device calculates the amount of light absorbed by the sample displays the signal from the detector as absorbance or transmission. The spectrophotometers which are used for such measurements may vary from simple and relatively inexpensive colorimeters to highly sophisticated and expensive instruments that automatically scan the ability of a solution to absorb radiation over a wide range of wavelengths and record the results of these measurements. One instrument cannot be used to measure absorbance at all wavelengths because a given energy source and energy detector is suitable for use over only a limited range of wavelengths. True linearity between absorbance and concentration according to Beer-Lambert Law requires the use of monochromatic light. In addition, a narrow band of light ensures a greater selectivity since substance with absorption peaks in other close by wavelengths are less likely to interfere. Further, it increases sensitivity as there is a greatest change in absorbance per increment of change in concentration. Both filters and monochromators are used to restrict the radiation wavelength. Photometers make use of filters, which function by absorbing large portions of the spectrum while transmitting relatively limited wavelength regions. Spectrophotometers are instruments equipped with monochromators that permit the continuous variation and selection of wavelength. The effective bandwidth of a monochromator that is satisfactory for most applications is about from 1 to 5 nm. The sample containers, cells or cuvettes, must be fabricated from material that is transparent to radiation in the spectral region of interest. The commonly used materials for different wave length regions are:

- **Quartz or fused silica:** UV to 2 mm in I R
- **Silicate glass:** Above 350 nm to 2 mm in I R
- **Plastic:** visible region
- **Polished NaCI or AgCI:** Wave lengths longer than 2mm

Cuvettes or cells are provided in pairs that have been carefully matched to make possible the transmission through the solvent and the sample. Accurate spectrophotometric analysis requires the use of good quality, matched cells. These should be regularly checked against one another to detect differences that can arise from scratches, etching and wear. The most common cell path for UV-visible region is 1 cm. For reasons of economy, cylindrical cells are frequently used. Care must be taken to duplicate the position of such cells with respect to the light path; otherwise, variations in path length and in reflection losses will introduce errors.

- **General Measurement Procedures :**

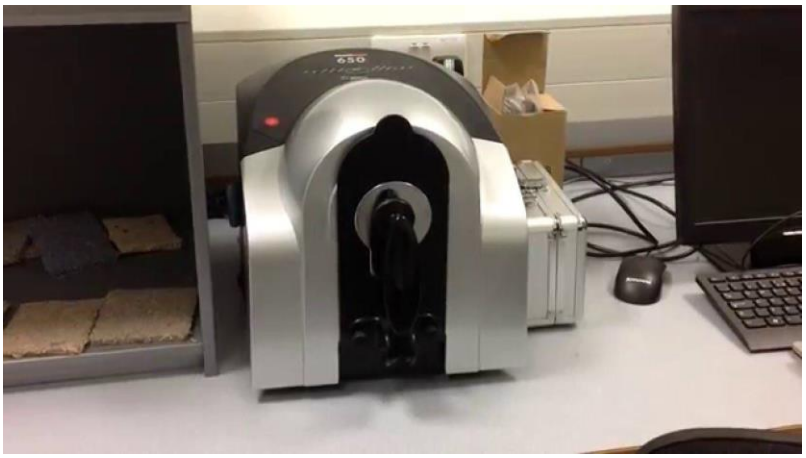
As explained above, the Beer-Lambert Law forms the basis of the measurement procedure. The amount of light radiation absorbed by a compound is directly related to the concentration of the compound.

The general measurement procedure consists of 5 steps:

1. Prepare samples to make colored compound
2. Make series of standard solutions of known concentrations and treat them in the same manner as the sample for making colored compounds
3. Set spectrophotometer to l of maximum light absorption
4. Measure light absorbance of standards
5. Plot standard curve: Absorbance vs. Concentration,

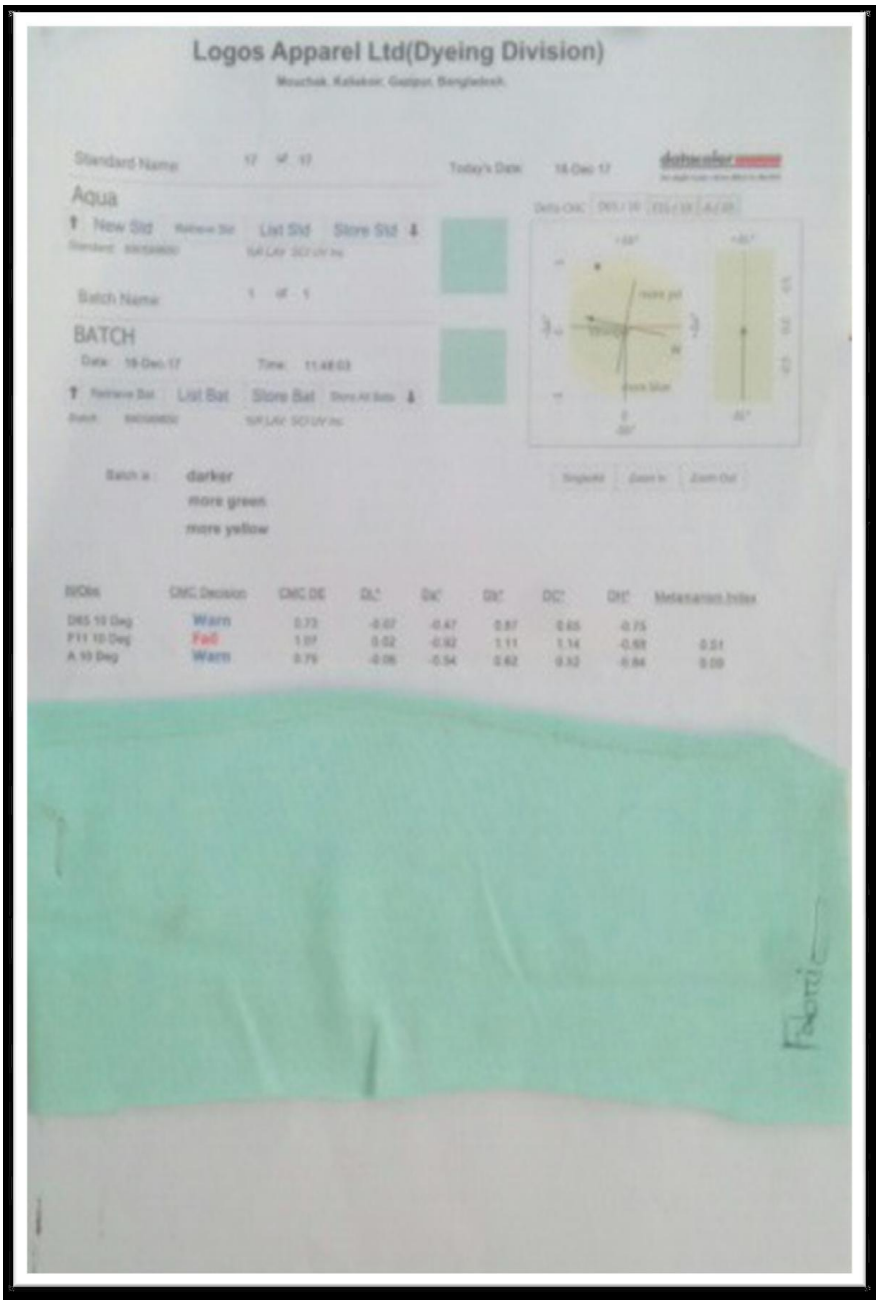
- **Uses of Spectrophotometer:**

The use of spectrophotometers spans various scientific fields, such as physics, materials science, chemistry, biochemistry, and molecular biology. They are widely used in many industries including semiconductors, laser and optical manufacturing, printing and forensic examination, as well in laboratories for the study of chemical substances. Ultimately, a spectrophotometer is able to determine, depending on the control or calibration, what substances are present in a target and exactly how much through calculations of observed wavelengths. **Note:** Minolta, Datacolor, Spectroflash, SF-650 are the examples of some Spectrophotometers. Portable Spectrophotometers are used in finishing dept.



Absorption Spectroscopic methods of analysis rank among the most widespread and powerful tools for quantitative analysis. The use of a spectrophotometer to determine the extent of absorption of various wavelengths of visible light by a given solution is commonly known as colorimetry. This method is used to determine concentrations of various chemicals which can give colors either directly or after addition of some other chemicals. As an example, in the analysis of phosphate, a reaction with orthophosphate is made, to form the highly coloured molybdenum blue compound. The light absorption of this compound can then be measured in a spectrophotometer. Some compounds absorb light in other than the visible range of the spectrum. For example, nitrates absorb radiation of 220 nm wave length in the UV region.

6.7.3.2 Datacolor repot of Spectrophotometer:



6.7.4 Materials used in the Textile Dyeing Process The materials that are used as inputs in textile dyeing and finishing process may include water, fiber, yarn or cloth. Examples are of wool, cotton, polyester, and a host of process chemicals that includes:

- ✓ Acids, e.g. acetic, formic.
- ✓ Alkalis- NaOH, potassium hydroxide, sodium carbonate.
- ✓ Bleaches- Hydrogen peroxide, sodium hypochlorite, sodium chlorite etc.
- ✓ Dyes, for example Reactive, disperse
- ✓ Salts, e.g. NaCl.
- ✓ Size, e.g. PVA, starch.
- ✓ Stabilisers from sodium silicate, sodium nitrate also organic stabilizers.
- ✓ Surfactants
- ✓ Auxiliary finishes, like fire retardant, softeners.

6.7.5 Salt & Soda Requirements in the Textile Dyeing Process

Process Shade%	Green Soda (g/l)	Soda Ash (g/l)	Caustic Soda (g/l)
0.0001%-0.10%	10g/l=1.75ml	5g/l=1.75ml	×
0.11%-0.50%	20g/l=3.5ml	8g/l=2.80ml	×
0.51%-1.00%	30g/l=5.25ml	12g/l=4.20ml	×
1.01%-2.00%	40g/l=7.00ml	15g/l=5.25ml	×
2.01-3.00%	50g/l=8.75ml	18g/l=6.30ml	×
3.01%-4.00%	60g/l=10.5ml	20g/l=7.00ml	×
4.01%-6.00%	70g/l=2.45gm	20g/l=7.00ml	×
6.01%- Above	80g/l=2.8gm	5g/l=1.75ml	1.5g/l=1.05ml

6.7.6 Shade% Requirements in the Textile Dyeing Process

Colour %	Shade%
0.0001-0.0099	0.01%
0.01-0.099	0.1%
0.1-0.99	0.5%
1-1.99	1%
2.00-2.99	2%
3.00-3.99	3%
4.00-4.99	4%
5.00-Above	Above

6.7.7 Process Sequence of Dyeing Lab:

Sample/Swatch/Panton no. / TCX no. / TPX no. from the buyer
Determination of sample‘s possible color combination by the help of Spectrometer or manual
Dispersion by autodoser
↓
Trial dyeing of first recipe
↓
Unload
↓
Normal wash
↓
Hot wash with detergent
↓
Oven drying
↓
Ironing
↓
Shade matching in light box (If Ok then send to buyer for approval)
↓
If not ok

↓

First correction takes from Spectrometer or manually

↓

Dispersion by auto-doser

↓

Trial dyeing of first recipe

↓

Unload

↓

Normal wash

↓

Hot wash with detergent

↓

Oven drying

↓

Ironing

↓

Shade matching in light box (If Ok then send to buyer for approval)

↓

If not ok

↓

Second correction takes from Spectrometer or manually

↓

Dispersion by auto doser

↓

Trial dyeing of first recipe

↓

Unload

↓

Normal wash

↓

Hot wash with detergent

↓

Oven drying

↓

Ironing

↓

Shade matching in light box

↓

If ok

↓

Send for buyer‘s approval

↓

Bulk production by considering the buyer‘s approved sample as standard

FINISHING SECTION

6.9 Definition of Finishing : Knit fabric has widely used in different segments such as hosiery, outerwear and underwear. To obtain a clean fabric appearance and smoothy attractive looks and feels different types of finishing process are done.
After dyeing , knit fabric is required to finish. During dyeing all knit fabrics are dyed in tubular form. According to buyers requirement knit fabrics are finished in open form or tubular form. In this article I will explain just process flow chart of knit fabric finishing. Here finishing flowchart are given for tubular fabric, open fabric and cuff and cololar separately.

6.9.1 Different types of Compacting Finishing M/c Require:
For Tubular Form Following M/Cs are Require:

Hydro-extractor
↓
De-watering
↓
Dryer
↓
Tubular compactor

For Open Form Following M/Cs are Require:

Hydro-extractor
↓
De-watering
↓
Dryer
↓
Slitter
↓
Stenter
↓
Open Compactor

For Collar & Cuff Finishing Following M/Cs are Require:

Hydro-extractor
↓
Softening Machine
↓
Dryer

6.9.2 Softening

As a general rule, each fibre has its specific softness value, which depends on its chemical composition and physical structure (less crystallinity = greater softness). The fineness of the fibre or of the filament directly affects the softness of the yarn (woollens, worsteds, microfibers etc.). The yarn twist ratio is inversely proportional to its softness. The weave also contributes to reducing (closer weave = cloth) or increasing (looser weave = satin) the fabric softness. Furthermore, a greater number of yarns per centimetre increase the stiffness of the fabric, thus reducing its softness.

Softening is carried out when the softness characteristics of a certain fabric must be improved, always carefully considering the composition and properties of the substrate. It is also worth underlining that no standard methods have been developed and established to determine exactly what the softness of a fabric is. This evaluation is therefore almost personal and carried out on the basis of operator.s experience. It is anyway possible to distinguish between many types of softness:
a) surface softness,
b) surface smoothness,
c) elasticity (to compression and stretching).

6.9.4 Fabric Softening Process:

To change the hand properties of a fabric, we can apply mechanical, physical, chemical or combined techniques; some of these methods (sueding, raising) have already been explained in detail in previous sections of this handbook, while some others refers to machines that give different degrees of softness, by means of high-speed rope processing in wet or dry conditions, with the drying stage carried out during the treatment (with or without softeners or enzymes.)

The functional core of these machines are the two tunnels where the fabric is fed through two Venturi tubes. The energy applied for drawing the material is produced only by air and pressure. The fabric flowing through the Venturi tubes is pushed at high speed against a grid on the machine rear side; the fabric then slides on Teflon-coated chutes and reaches the machine front side to start the cycle again; the fabric can reach a speed of 1000 m/min., depending on the type and weight of the different textiles to be processed and according to the desired results.

This unit applies physical and mechanical principles on fundamental elements such as:

- Air, which is the fabric propeller and drawing element;
- The mechanical stress exerted on the fabric inside the Venturi tubes and the stress due to the impact against the rear grid;
- The eventual action of heat.

It is also worth noticing that water is not a crucial element for the process; it is only a medium for carrying dissolved non biodegradable chemical additives (if required.) The combination of all these elements, almost free of polluting charge, cause the structural modification of the fibres making up the fabric.
They result in more or less marked surface modifications, which can radically change the appearance and the sensorial properties of the fabrics. The complexity of the finishing action starts inside the Venturi tube where the tail of the fabric is subjected simultaneously to a compressive action and to a subsequent series of vibrating pulses which tend to "random-modify" and compact the textile structures, eventually giving them different properties. The one-way thrusting force is transformed into a impact force against the grid on which the fabric is pushed when emerging from the Venturi tube; this causes other modifications of the fabric and add structural and surface effects. This simple treatment that combines physical and mechanical principles, carried out at a precise temperature set by the operator, is sufficient to create particular effects on the morphology of fibres and the weave. The modifications produced by this treatment are very different and not only affect the colour, appearance and hand properties of the fabric, but also add new properties, e.g. modifying the refraction and diffraction of light on the fabric surface. The most notable effects in terms of style and added value are obtained on linen, a precious delicate fibre, particularly difficult to process without using chemicals. The combination of a chemical product or an enzyme liquor with the mechanical treatment can be carried out not only on linen but also on many other widely used fibres such as Tencel and polynosic fibres, imparting a draping, full and lively hand.
All these effects are obtained thanks to the air thrust and to the following impact against the grid, or to the pressure of rollers on the fabric rope. Comparing the effects of this treatment on a Tencel fabric and on a similar treatment carried out on a dyeing machine, we can see that, as previously explained, this finishing process not only affects the appearance of the fabric, but also .cleans up. the fabric surface homogeneously, as a result providing good anti-pilling properties. The best softness results can be obtained by carrying out the above mentioned physical mechanical processes and by applying a special chemical softening agent. As a general rule, the softening agents applied are hygroscopic or lubricating agents, which facilitate the fibre sliding within the fabric structure, thus granting easier deformation and creasing of the fabric. In most cases, the duration of the effect is limited since the products applied during the treatment are eliminated by subsequent washing; for this reason they must be applied in the final stage of the treatment. The most common softeners are below:

1. Non-ionic Softener
2. Anionic Softener
3. Cationic Surfactants
4. Silicone-Based Softeners
5. Reactive Softeners

1. Non-ionic Softeners: Generally ethers and polyglycol esters, oxiethylates products, paraffins and fats. These softening agents are generally less efficient than anionic and cationic ones but they withstand the effects of hard waters, acid or basic environment and also in presence of cations and anions, therefore the normal fabric care conditions.

2. Anionic Softeners:
Sulphoricinates, anionic surfactants produced by the condensation of fatty acids. They have good characteristics as lubricating softening agents and give the fabric a full hand; they are unstable in hard water and acid environment. In addition, they must not cause yellowing at condensation temperatures.

3. Cationic Surfactants: Usually they are quaternary ammonium salts, amino-esters and amino amides; they are recommended for all types of fibre, and can be also applied with exhaustion process in acid environment (pH 4-5). These are the best softening agents and are also called molecular valeting. Agents because they form bonds with the cationic group on the surface of the fibre generally with negative electric potential. They can give some problem in presence of large anions, and they can cause dye toning, or a reduction in fastness to light values in the presence of direct and reactive dyes; they also have a high polluting charge as waste water (bactericides).

4. Silicone-Based Softeners:
These are generally polysiloxane derivatives of low molecular weight. They are insoluble in water, and therefore must be applied on fabrics after dissolution in organic solvents, or in the form of disperse products. They feature quite good fastness to washing. They create a lubricating and moderately waterproof film on the surface and give fabrics a velvety silky hand (desirable for velvets, upholstery fabrics and emerised fabrics).

5. Reactive Softeners:
N-methylol derivatives of superior fatty amides or urea compounds replaced with fatty acids. The products have to be cross-linked and provide permanent softness and water repellency**.**
As explained previously, even though some softeners can be applied with exhaustion processes on yarns, when softening fabrics, the best technique is the continuous pad-wetting process followed by a drying stage in a stenter. This treatment must be carried out at the end of the finishing process; for this reason, softening is usually performed simultaneously with other dimensional stability processes (width stabilization, weft and warp straightening). It is worth remembering that the use of softeners can reduce the fastness to rubbing of synthetic fibres dyed with disperse dyes, as the fatty surface layer tend to attract the dye molecules after hot treatments.

Quality Inspection section

6.10 Definition Inspection Inspection in reference to the apparel industry can be defined as the visual examination or review of raw materials (like fabric, sewing threads, buttons, trims, etc), partially finished components of the garments and completely finished garments in relation to some standards. The main objective of inspection is the detection of the defects as early as possible in the manufacturing process so that time and money are not wasted later on in either correcting the defect or writing off defective garments.

6.10.1 Purpose of fabric inspection Fabric Inspection is an important aspect followed prior to garment manufacturing to avoid rejects due to fabric quality and facing with unexpected loss in manufacturing. Fabric inspection is done for fault/defect rate, fabric construction, end to end or edge to edge shading, colour, hand or feel, length/width, print defect and appearance. Fabric inspection ensures to minimize the rejection of cut panels or rejected garments due to fabric faults. Cutting inspected and approved fabric ensures not only finished garment quality but also reduces rejects, improves efficiency and timely deliveries. The purpose of fabric inspection is to determine the quality and acceptability for garments. As fabric is received, it should be inspected to determine acceptability from a quality viewpoint. Some garment manufacturers rely on their fabric suppliers to perform fabric inspection and fabric defects. In many small companies, spreading and cutting is done by the same personnel and fabric is inspected as it is being spread on a table for cutting.

Fabric inspection, mapping or marking defects is important prior to spreading and cutting because:

- Spreading can be done more quickly because the spreader is not also inspecting the fabric.
- A cutter's productivity will increase because the defects are already marked.
- The patterns are cut around the defects so as not to include them in the finished garment.

Fabric inspection machines

Fabric inspection is usually done on fabric inspection machine. These machines are designed so that rolls of fabric can be mounted behind the inspection table under adequate light and rerolled as they leave the table. Defects can be seen readily with these machines, as the inspector has a very good view of the fabric and the fabric need not be reversed to detect defects. These machines are power driven or the inspector pulls the fabric over the inspection table. The defects are located, marked and recorded on an inspection form. These machines are also equipped to accurately measure the length of each roll of fabric as well as monitor the width of the fabric. The variation in width of fabric can result in a higher cost of manufacturing for basic garments since profit margin for these garment manufacturers is usually lower than that for fashion garment manufacturers and therefore, maximum fabric utilization is vital.

How much to inspect? When a sewing factory receives fabric from the mill, it is difficult to conduct a full 100% inspection of the fabric. A minimum 10% inspection of all piece goods prior to spreading the fabric is recommended.

General Inspection Procedures

1. Fabric inspection is done in suitable and safe environment with enough ventilation and proper lighting.
2. Fabric passing through the inspection frame must be between 45 - 60 degree angles to inspector and must be done on appropriate Cool White light above viewing area. Back light can be used as and when needed.
3. Fabric speed on inspection machine must not be more than 15 yards per minute.
4. All fabric inspection must be done when 80% of good or lot is received.
5. Standard approved bulk dye lot standards for all approved lots must be available prior to inspection.
6. Approved standard of bulk dye lot must be available before starting inspection for assessing colour, hand, weight, construction, finish and visual appearance.
7. Shade continuity within a roll by checking shade variation between centre and selvage and the beginning, middle and end of each roll must be evaluated and documented.
8. Textiles like knits must be evaluated for weight against standard approved weight.
9. Fabric width must be checked from selvage to selvage against standard.
10. All defects must be flagged during inspection.
11. The length of each roll inspected must be compared to length as mentioned on supplier ticketed tag and any deviation must be documented and reported to mill for additional replacement to avoid shortage.
12. If yard dyed or printed fabrics are being inspected the repeat measurement must be done from beginning, middle and end of selected rolls.

Four-Point System, a standard established under ASTM D543
0 - 07(2011), is a standardized Test Methods for fabric Visually Inspecting and Grading. Four-Point System is widest acceptance in fabric inspection due to its practical, impartial, and worldwide recognized. The four-point system derives its name from the basic grading rule that a maximum of four penalty points can be assessed for any single defect and that no linear meter can be assigned more than four points regardless of the number of defects within that piece.

Procedure of Four Point System: Fabric inspection is usually done on fabric inspection machineries.
1. These machineries are designed so that rolls of fabric can be mounted behind the inspection table under adequate light and re-rolled as they leave the table.
2. Inspection machineries are either power driver or the inspector pulls the fabric over the inspection table.
3. The defects are located, marked and recorded on an inspection form.
4. Some machinery is equipped to measure the length of each roll of fabric (meter/yard).

Fabric defects point values based on the following:

Length of defect in Fabric	**Points allotted**
Up to 3 inch	1
Over 3 inch up to 6 inch	2
Over 6 inch up to 9 inch	3
Over 9 inch	4
Holes and Opening	
1 or less	2
Over 1 inch	4

Calculations and Result:

Total defect points per 100 yard square are calculated.

If fabric rolls contains less than 40 points per 100 yard square are considered ―first‖ quality and as an Acceptance criteria. If fabric rolls containing more than 40 points per 100 yards square are considered ―second‖. **Example:** A fabric roll 130 yard long and 45 inch wide contains the following defects:-

6 defects up to 3 inch- .....6 × 1 = 6 points

5 defects over 3 inch but less 6 inch- ..... 5 × 2 = 10 points

2 defects over 6 inch but less 9 inch- .....3 × 2 = 6 points

1 defects over 9 inch- .....1 × 4 = 4 points

1 hole over 1 inch dimensions- .....1 × 4 = 4 points

……

Total defect points.....= 30 points

Therefore,

Points per 100 yard square =

Total points scored in roll × 36 inch

…… × 100

Fabric width/inches × Total length yard inspected

30 × 36

= …… × 100

130 × 45

= 18.4 (Defect points per 100 yard square.)

So, the roll is Accepted.

CHAPTER- 7
DYEING FABRIC TESTING

7.1 Definition of Textile Testing The process to determine the properties of different kinds of textile substances is known as textile testing.

7.2 Objects of Textile Testing: The main purposes of textile testing are-

1. Research,
2. Selection of raw materials,
3. Process control,
4. Product control,
5. Process development,
6. Product development,
7. Specification test.

7.3 Classification of Textile Testing: There are different types of testing followed in textile industries which are pointed out in the below:
1. Routine process testing,
2. Quality record testing.

All the above testing has explained in the following: 1. Routine Process Testing: The testing which results can get very quickly in working field is known as routine process testing. 2. Quality Record Testing: The testing which result is to be recorded for various objects to finish the work is known as quality record testing.

Different Types of Testing Followed in Textile Industry: There are mainly three types of testing followed in textile industry, those are- **1. Fibre test:**

- Gradding,
- Identification of fibre,
- Strength and elongation i.e. tensile strength,
- Maturity test,
- Fibre length,
- Linear density or fineness test,
- Trash, neps test etc.

2. Yarn test:

- Twist per unit length,
- Yarn count or linear density,
- Appearance,
- Hairiness,
- Strength and elongation i.e. tensile properties,
- Evenness and regularity,

3. Fabric test:

- Width,
- Thickness,
- No. of ends per unit length,
- Tensile properties i.e. strength and elongation,
- Design and construction of the cloth,
- Crease resistance and recovery,
- Shrinkage,
- Abrasion,
- Thermal properties,
- Air permeability,
- Fabric weight per unit length,
- Pilling,
- The count of yarn used,
- Stiffness,
- Handle,
- Drape,
- Water absorbency or resistance etc.

7.5 Different Types of Textile Testing M/c in Textile Industry:

Name of machines	Brand	Function	Origin
Light Box	Verivide	Shade matching in different source	England
Light fastness tester	SDL International	Fastness checking in light source	England
Pilling tester	SDL International	Checking of fabric pilling	England
Rubbing tester	James H. Heal & co. Ltd.	Fastness checking by rubbing	England
Perspiration tester	James H. Heal & co. Ltd.	Fastness checking	England
Atmospheric sample dying m/c	DK Laboratory (Roaches)	Lab-dip development	England
High temp. sample dying machine	Pylotxc MBL (Roaches)	Lab-dip development	England
Tumble dryer	Ariston	Drying in circular form	Italy
Washing machine	Electrolux wascator	Fabric wash for shrinkage test	England
Spectrophotometer	Mechbath	Recipe formulation and quality & shade test	USA

Moisture tester	James H. Heal & co. Ltd.	Test moisture regain & humidity	England
Electronic balance	SDL International	Weight the material correctly	England
GSM Cutter	James H. Heal & co. Ltd.	Cut the fabric for finding out GSM	England
Oven / Incubator	Carbolite (Aston lanc)	Heat / drying	England

7.6 Fabric GSM Text:
The GSM of fabric is one kind of specification of fabric which is very important for a textile engineer for understanding and production of fabric. _GSM‘ means _Gram per square meter‘ that is the weight of fabric in gram per one square meter. By this we can compare the fabrics in unit area which is heavier and which is lighter.

The weight of a fabric can be expressed in two ways, either as the _weight per unit area‘ or the _weight per unit length‘; the former is self explanatory but the latter requires a little explanation because the weight of a unit length of fabric will obviously be affected by its width. In woven fabric, the weight per unit length is usually referred to as the _weight per running yard‘. It is necessary therefore to know the agreed standard width upon which the weight per running yard is based. Usually this width depends upon the width of loom. Before coming the term _GSM‘ there was another term called _lb/100 yards‘. This expression is used by British Standard. For measuring this there are a template and a quadrant balance. The template area is 1/100 square yards of which each arm is 1/10 yards in length. For measuring GSM, a GSM cutter is used to cut the fabric and weight is taken in balance. Both of these measurement and method is equally used for both woven and knitted fabrics.

Apparatus:
1. GSM cutter
2. Electric balance.

Working Procedure of Measuring GSM of a Fabric:
1. For Measuring GSM, fabric sample is cut by GSM cutter
2. Now weight is taken by electric balance.
3. By this way we get the weight in gram per one square meter fabric.
4. Here GSM of the fabrics by the GSM cutter is obtained by the multiplying the sample weight with 100.

7.7 Color Fastness Test: We can define colorfastness as, having color that will not run or fade with washing or wear. That means characterizes a material's color's resistance to fading or running. Clothing is colorfast if its colors and dyes do not bleed or run from the clothing. Clothing should be tested for colorfastness before using any type of bleach or bleaching solution, or strong cleaning product. Colorfastness is very important factor for buyer. Colour fastness properties of textiles are an important measure of quality of a product. To test for colorfastness, find a hidden seam of the garment or an hidden spot. Apply the cleaner to the garment and then dab the area with a clean cotton cloth. If the color removes itself from the garment onto the cloth, you should not use the cleaning product on the clothing. **7.7.1 Importance of color fastness:** Textile fabric has many properties. Colorfastness property is one of the most important properties of them. It is a property of a colorant which allows it to retain its different characteristics despite degradation conditions such as exposure to light and dry cleaning. Product performance and evaluation to determine if the fabric is suitable for the intended end use. It is a identity for fabric. If colorfastness is good then fabric quality high and if poor fastness property then fabric quality is bad. So, colorfastness is the important factor for the buyer to justify which fabric is bad and which is better.

7.7.2 Different Types of Color Fastness

There are various types of color fastness test for fabric. Important color fastness tests are given below:

1. Color Fastness to Washing
2. Color Fastness to light
3. Color Fastness to perspiration
4. Color Fastness to Water
5. Color Fastness to Rubbing
6. Color fastness to sea water
7. Color fastness to hot pressing
8. Color fastness to chlorinated water

7.7.2.1 Color Fastness to Pressing:

Pressing fastness test of dyed and printed textile products is performed to determine of resistance of textiles to ironing and to processing on cylinders. Different tests are performed according to when the textile is dry, when it is wet, and when it is damp.

Purpose and Scope: This method is used for determining the resistance of the colour of textile of all kinds and in all forms to ironing and processing on hot cylinders. Tests are given for hot pressing when the textiles are wet, when it is damp, and when it is dry.

Apparatus and Reagent

- Hand iron of proper weight to give a pressure of approximately 30g/sq.cm at the temperature indicated in the following ;

1. Cotton & Linen 190-200C˚
2. Wool, Silk & Viscose 140-160C˚
3. Cellulose acetate & Polyamide 115-120C˚

- White bleached cotton cloth weighting approximately 125g/sq.meter. Five pieces not less than 14×4 cm are required.
- Gray scale by assessing change in colour and staining.(ISO scale)
- The size of the specimen is 10×4cm

Working Procedure Specimen preparation Specimen of materials, which has been subjected to any heat or drying treatment, must be allowed to condition at 65% RH, temp. 20±2C˚, before they tested.
Dry Pressing Place the specimen on the piece of dry cotton cloth on a smooth horizontal surface. Place the iron on the specimen and leave it for 15 Sec.

Damp Pressing: The adjacent fabric in dimensions of 100 mm x 40 mm is immersed into the water and, squeezed as 100% pick up. Dry specimen is placed onto the undyed cotton fabric on the filler and, the wet adjacent fabric is placed onto them. The top layer of the device is pulled down and, dry specimen is pressed for 15 seconds at the determined temperature. The change in color of the specimen is evaluated in two different ways according to grey scale. a) Soon after the end of the test b) After conditioning for 4 hours under standard atmospheric circumstances. The staining to undyed fabrics is evaluated by grey scale.

Wet Pressing Soak the specimen and cotton cloth in distilled water and squeeze or extract them to contain their own weight of water. Place the wet specimen on a piece of the dry cotton cloth and place the wet cotton cloth on the specimen, press by moving the iron to and fro over the wet cloth (without additional pressure) for 15 sec.

Assessment Assess the change in colour of the specimen with appropriate grey scale.
Standard Dry Pressing 4 Wet Pressing 3-4

7.7.2.2 Color Fastness Test to Light

The purpose of Color fastness to light test is to determine how much the color will fade when exposed to a known light source. It is an off line quality assurance system. Generally man wears the fabric and goes outside of the home for doing their job. In day; sun light fall on the fabric surface. So it needs to know how much protection ability have a fabric to sun light. It is determined by an experiment called color fastness to light. To measure the color fastness a blue scale is used. After completing the test, sample is compared with the blue scale.

Principle of Color Fastness to Light: This test measures the resistance to fading of dyed textile when exposed to day light. The test sample is exposed to light for a certain time which is about 24 hours to 72 hours or by customer/buyer demand and compare the change with original unexposed sample the changes are assessed by Blue Scales.

Light Fastness Grades

Grade	Degree of Fading	Light Fastness Type
8	No fading	Outstanding
7	Very slight fading	Excellent
6	Slight fading	Very good
5	Moderate fading	Good
4	Appreciable fading	Moderate
3	Significant fading	Fair
2	Extensive fading	Poor
1	Very extensive fading	Very poor

Color Fastness to Light with the Microsol light Fastness Tester: The testing is done step by step. Following step is maintained during measure the color fatness to light.

- Cut the four pieces of test specimens according to the length & width wise and attached with the specimen holder.
- Then the holder set in to the Microsol light fastness tester.
- Then the experiment continued at 72 hours according to the buyer‘s requirement.
- After 72 hours later the specimen taken from the light fastness tester
- Then the test specimen compare with the Blue scale or computer color matching system(CCMS).

7.7.3 Perspiration Test

The color fastness to perspiration (acid and alkaline) shall be at least level 3-4 (color change and staining). This criterion does not apply to white products, to products that are neither dyed nor printed, to furniture fabrics, curtains or similar textiles intended for interior decoration. A level of 3 is nevertheless allowed when fabrics are both light colored (standard depth < 1/12) and made of silk or of blends with more than 20% silk. This kind of test is specially applied for the sports wear and heavy dresses which is used specially. Normal cloths is also tested by perspiration test.

7.7.3.1 Color Fastness to Perspiration

The garments a\which come into contact with the body where perspiration is heavy may suffer serious local discoloration. This test is intended to determine the resistance of color of dyed textile to the action of acidic and alkaline perspiration. Before knowing about the Color Fastness to perspiration you must have to know about Color Fastness to Wash and Color Fastness to Rubbing.

Well, in today‘s class you will know about the perspiration matters which affects on Color fastness.

Purpose and Scope This method is used to determine the resistance of the colour of textile of all kinds and in all forms to perspiration. **Equipment For Fastness Measurement**

1. Perspiration tester
2. Oven, Maintained at 37+-2 Degree centigrade
3. Multi-fiber test fabric
4. Grey scale
5. Color matching chamber
6. Acidic and Alkaline solution
7. Glass or Acrylic plat
8. Weight.

Reagent for Perspiration Test

1. Solution freshly prepared, containing 0.5g 1-histidine mono-hydrochloride mono-hydrate, 5g sodium chloride, and 2.5g disodium hydrogen ortho phosphate per litre brought to PH 8.0 with 0.1N sodium hydroxide.
2. Solution freshly prepared, containing 0.5g 1-histidine mono-hydrochloride mono-hydrate, 5g sodium chloride, and 2.2g sodium dihydrogen ortho phosphate per litre brought to PH 5.5 with 0.1N sodium hydroxide.
3. Two undyed cloths for each specimen each 6×6cm of the same kind of fibre as the sample. Place the specimen between the two pieces of white cloth and sew along one side to form a composite sample.

Working Procedure : Thoroughly wet one composite sample in a solution of PH8.0 at the liquor ratio of 20:1 and allow it to remain in this solution at room temperature for 30min. pour off the solution and place the composite sample between two glasses plates measuring about 7.5×6.5cm under a force of about 4.5kg.

1. Treat the other sample in the same way but with the solution at PH 5.5.
2. Place the apparatus containing the samples in the oven for 4 hour at 37±2C˚
3. Separate the sample from the white cloth and dry them apart in air at the temperature not exceeding 60C˚
4. Assess the change in colour of the specimen and the staining of the white cloth with the greigh scale.

7.7.4 Rubbing Fastness Test to Crocking The rubbing off of colors is called as crocking. Crocking is simply the transfer of color from a fabric onto another white test fabric. The more color is transferred, the more the fabric "crocks". Crocking determines the amount of color transferred from the surface of colored textile material to other surfaces by rubbing. The crock meter is used to find the color fastness to crocking.

Features of Crock meter:

1. To determine the Color Fastness of Textiles.
2. The equipment consists of a counter.
3. It is provided with a flat peg.
4. It also consists of an operating handle.
5. Tests the color fastness of the textile in a very accurate manner.
6. It gives not only accurate but quick results also.

Specifications of Crock meter:

- ✓ Diameter of the Rubbing Finger : 16 mm & 25 mm
- ✓ Load on the Finger : 9 N & 20 N
- ✓ Size of Crocking Cloth : (5 x 5) Cms & (7 x7) cms
- ✓ Length of the Traverse : 100 ±5 mm
- ✓ Counter (Re-settable) : 4-Digit Counter
- ✓ Size of Test Specimen : 25 x 5 Cm

- ✓ Overall Dimension of the Unit : 600 (W) x 190 (D) x 200 (H) mm
- ✓ Net Weight of the Unit : 4 Kg. (9 lbs.)
- ✓ Construction : Cold-rolled steel

Always Check

- ✓ Quality construction
- ✓ Color
- ✓ Depth of the Color
- ✓ End Use of the product

Results which we can achieve in Normal Conditions are:

Dark Shade	**Medium shades**	**Light Shades**	
Dry	3-4	4	4-5
Wet	2-2.5	3	3.5-4

Working Principle of Crock meter:

1. The crock meter consists of a rigid flat metallic platform on which the test specimen can be held firmly and a abrading finger which rubs against it under a specified load.
2. The platform is fixed over the base of the equipment and lies in a horizontal plane.
3. The test specimen is held firmly over an abrasive paper which is pasted on the upper face of the platform, with the help of two pins holding it at both ends.
4. The abrading finger has a flat circular rubbing face which is covered with 4 piece of white abradant fabric during the test.
5. The abrading fabrics picks up color lost by the test specimen during rubbing.
6. It is held over the finger with the help of a tapered ring.
7. Motion to the finger is given through a reciprocating arm with runs an two ball bearings to minimize friction and to apply a uniform load on the finger.
8. The arm is moved by a manually operated crank and connecting lin The equipment is finished in dark metallic paint and bright chrome plating to give it a corrosion resistant finish.

7.7.5 Pilling

Pilling is a condition that arises in wear due to the formation of little 'pills' of entangled fibre clinging to the fabric surface giving it an unsightly appearance. Pills are formed by a rubbing action on loose fibres which are present on the fabric surface. Pilling was originally a fault found mainly in knitted woollen goods made from soft twisted yarns. The introduction of man-made fibres into clothing has aggravated its seriousness. The explanation for this is that these fibres are stronger than wool so that the pills remain attached to the fabric surface rather than breaking away as would be the case with wool. Figure 7.3 shows a pill on a cotton/polyester fabric. The initial effect of abrasion on the surface of a fabric is the formation of fuzz as the result of two processes, the brushing up of free fibre ends not enclosed within the yarn structure and the conversion of fibre loops into free fibre ends by the pulling out of one of the two ends of the loop. Gintis and Mead consider that the fuzz formation must reach a critical height, which is dependent on fibre characteristics, before pill formation can occur.

7.7.5.1 Pilling Resistance Test:

Purpose and Scope: This method is intended for the determination of the resistance of textiles of all kinds in all forms to the action of an applied resistive force. This causes pilling in the tested fabrics.

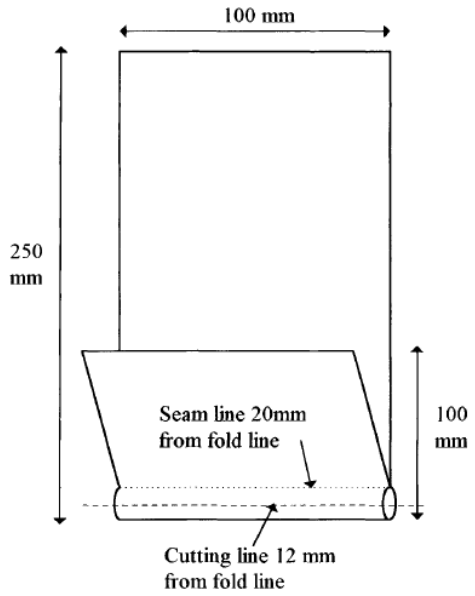
Apparatus: · Pilling tester · Metal plates 4 inch diameter and 1 inch thick · Standard for assessing the pilling grade .

Working Procedure: A piece of fabric measuring 10×10 inch is sewn to a firm fit when placed round a rubber tube. The out end of the fabrics is covered by cellophane tape and metal plates are placed on the tester .Run the tester for 300 cycles. Remove the sample and compare the sample with standard scale.
Standard Pilling Standard: 3-4 gray scale matching

7.7.6 Seam Slippage:
Seam slippage is a fabric problem especially for fabrics that contain slippery yarns or that have an open structure or where the number of warp and weft interlacings is low. Such factors mean that one set of yarns may be easily pulled through the other. Seam slippage is the condition where a seam sewn in the fabric opens under load. Some of this gap may close on removal of the load but some of it may be a permanent deformation.

7.7.6.1 Seam Slippage Test:
This test method is used to determine the resistance to slippage of filling yarns over warp yarns , or warp yarns over filling yarns, using a standard seam.
There are three different types of seam slippage test in existence, each of which has its drawbacks. Firstly there is the type where a standard seam is put under a fixed load and the seam gape is measured. In second type a load extension curve is plotted with and without a standard seam and the difference between the two curves is taken as the slippage. The third type does away with a sewn seam and measures the force required to pull a set of pins through the fabric. A variant of the first type is to measure the load required to give a fixed seam opening.

Procedure of Seam Slippage Test: The British Standard test for seam slippage is a test of the second type. Five warp and five weft specimens each 100mm X 350mm are used. Each sample is folded 100mm from one end and a seam is sewed 20mm from the fold line using the special sewing thread and sewing machine settings which are detailed in the standard. The layout of the sample is shown in Fig. After sewing the folded part of the fabric is cut away 12mm from the fold line leaving the seam 8mm from the cut edge. A standard strength tester equipped with 25mm grab test jaws is used, the gauge length being set to 75 mm.



Just before the test the sample is cut into two parts one with the seam and one without but with each part containing the same set of warp or weft threads. The sample without a seam is first stretched in the tensile tester up to a load of 20ON and a force elongation curve drawn. The matching sample with the seam is then tested in the same way making sure that the force elongation curve starts from the same zero position. In order to find the force required to open the seam a given distance, the separation of the curves at a force of 5 N is measured and this distance is added to the seam opening specified (usually 6mm but some specifications require 5 mm) making appropriate allowance for the horizontal scale of the chart. Next the point on the curves where there is a separation of this distance is located and the value of load at this point is read off the chart. If the curves do not reach the specified separation below 20ON then the result is recorded as 'more than 20ON'.

7.7.7 Abrasion Resistance

Abrasion is just one aspect of wear and is the rubbing away of the component fibres and yarns of the fabric. It is a series of repeated applications of stress; therefore a capacity to absorb punishment is required to the fibres. Inherent fibre properties such as work of rupture may give a high resistance to abrasion.

Theory: A number of important points require consideration before abrasion resistance tests are carried out. The choice of the method may be governed by the type of apparatus available, the precision demanded and so forth. Some of the more important points are condition of the specimen, choice of testing instrument, choice of abrasive motion, direction of abrasion, choice of abradant, backing the specimen, cleanliness of the specimen and instrument, tension on the specimen, pressure between abradant and specimen, end-point

of the test etc. Now there are various abrasion resistance testing instruments available for example, the WIRA abrasion tester, the LIRA abrasion tester, the Taber abraser, the Shiefer machine, the Wyzenbeek abrasion tester, the Stoll universal wear tester, the LINRA wear tester, the BFT abrasion tester etc. The abrasion tester we used here is made by GOODBRAND & CO. LTD. In this instrument abrasion surfaces wrapping by sand paper are used to abrade the fabric samples. A counter is used to count the no. of abrasion. This is an electrical tester. **Apparatus:**

1. Abrasion tester
2. Scissor
3. Electric balance
4. Brush

M/c specification:

- ✓ Name: Abrasion Tester
- ✓ Manufacturer: GOODBRAND & CO. LTD. ELM WORKS, MERE LANE ROCHDALE, ENGLAND.
- ✓ Serial no.: GB 78627.
- ✓ Sample: Canvas fabric.

Atmospheric status:

- ✓ Testing atmosphere: Relative humidity - 65%+/-2% & Temperature - 270+/-20C.
- ✓ Present atmosphere: Relative humidity - 68% & Temperature - 290.

Procedure:

1. At first cut the fabric into 4 pieces according to the measurement of the instrument.
2. Weigh these 4 pieces of fabric samples.
3. Now place these samples in the instrument under a certain load as supplied in the instrument.
4. Now start the machine and observe the counter of abrasion no.
5. After an abrasion of 200 bring out the first sample and weigh it.
6. After an abrasion of 300 bring out the second sample and weigh it.
7. Similarly after abrasion of 400 and 500 bring out the third and fourth sample and take their weight.
8. Now put the weights before and after abrasions in a table and find out their wear index.

Data:

S/n	Sample wt. before abrasion (mg)	No. of abrasion cycle	Sample wt. before abrasion (mg)	Wt. loss	Wear index
1	4970	200	4940	30	6
2	4680	300	4640	40	8
3	4860	400	4790	70	14
4	4870	500	4770	170	34

Calculation:

Suppose for s/n 2, we got cycle = 300, wt. loss = 40 therefore,

Result:

Wear index for 200 cycle = 06
Wear index for 200 cycle = 08
Wear index for 200 cycle = 14 &
Wear index for 200 cycle = 34.

Remark: It is easily understood that the more is no. of abrasion cycle the more will be the wt. loss of fabric. That is when a fabric is used more it losses its weight more. Now depending on yarn quality, fabric design and above all end use this loss may be less or more, again may be quickly or lately. But indeed the fabrics will loss its weight and serviceability.

7.7.8 Shrinkage: Shrinkage is the process in which a fabric becomes smaller than its original size, usually through the process of laundry. Cotton fabric suffers from two main disadvantages of shrinking and creasing during subsequent washing.

There are two types of shrinkage occurs during washing
1) Length wise
2) Width wise

Cause : Due to high tension during preparation of fabric which result in excess stretch in yarn. This type of shrinkage is known as London shrinkage. Due to swelling of fibers for fiber structure.

Working Procedure: The sample which is done shrinkage test, spread on table. Then a glass template put on sample fabric which is square size. There are six mark on glass template and distance between two mark is 35 cm. Marking the sample fabric by unchangeable marker. Then sample is sewn by hand sewing machine. Sample is ready for washing. Simple wash the fabric at 60˚c temp for 90 min. after washing the fabric is taken out. Dry the sample as per any of the method. It can either be Line Dry or Flat Dry or Tumble Dry.To find the dimensional change read the Shrinkage/Stretch on 3 points on the Wrap side and 3 points on Weft Side. Get the mean value of wrap-wise and weft wise readings to get the Accurate Shrinkage or Stretch.

Shrinkage is determined as; Shrinkage % = (length of fabric before wash)-(length of fabric after wash))/ (length of fabric after wash) *100 Example, length of fabric before wash = 35 cm length of fabric after wash = 33 cm Now, Shrinkage % = {(35-33)/ 33} * 100 = 6% Here, Shrinkage is 6%. Normally shrinkage is acceptable less than 5%. But it can be change in case of buyer requirement.

7.8 EU Textile Standards & Regulations

1. REACH (Regulation on Registration, Evaluation, Authorization, and Restriction of Chemicals)
2. Textile Regulation 1007/2001
3. General Product Safety Directive (2001/95/EC)
4. Textile labeling regulations
5. EU Ecolabel for textile products

USA and Canada Textile Standards & Regulations

1. AATCC 8 Colorfastness to Crocking (wet & dry)
2. AATCC 15 Colorfastness to Perspiration
3. AATCC 16 Colorfastness to Light
4. AATCC 106 Colorfastness to Sea Water
5. AATCC 107 Colorfastness to Water
6. AATCC 116 Colorfastness to Crocking (rotary)
7. AATCC 135 Dimensional Stability for Home Laundering
8. AATCC 150 Dimensional Changes to Home Laundering
9. AATCC 162 Colorfastness to Chlorinated (Pool) Water
10. AATCC 112 Formaldehyde Release from Fabric (quantitative) – sealed jar method
11. AATCC 94-2007 Formaldehyde (spot test)
12. 16 CFR 1610 Flammability of Clothing Textiles
13. 16 CFR 1611 Flammability of Vinyl Plastic Film
14. 16 CFR 1615 & 1616, Flammability of Children‘s Sleepwear
15. 16 CFR 1500.51-53 Attachment Strength
16. 16 CFR 423 Care Labeling
17. 16 CFR 303 Fiber Content Label
18. Canadian Textile Flammability Regulations (SOR/2011-22) – Bedding Textile
19. Canadian Textile Flammability Regulations (SOR/2011-22) – Non-bedding Textile
20. Canadian Toys Regulations (SOR/2011-17) Item 34, Flammability Requirement of Hair or Mane
21. Canadian Toys Regulations (SOR/2011-17) Item 32, Flammability Requirement of Outer Covering
22. Canadian Toys Regulations (SOR/2011-17) Item 33, Flammability Requirement of Yarn
23. Canadian Toys Regulations (SOR/2011-17) Item 21, Celluloid or Cellulose Nitrate
24. CPSIA Lead Content in Surface Coatings
25. CPSIA Lead Content in Substrates
26. CPSIA Phthalates Content
27. Cross Cut Adhesion – ASTM D3359
28. Polymer Identification – FTIR

Other Standards & Regulations

1. China – GB 18401 testing
2. CPAI-84, Flammability of Camping Tents

CHAPTER-08
Introduce To
Ready Made Garments

8.1 Introduction Ready Made Garments

The making of garments products from fabrics through the process design, cutting and sewing are called garments productions. cutting, sewing, washing, finishing, packing, etc. For handling an export order, need to smooth operation of every step of the production process. Faulty activities of the production process can be hazarded garment production flow chart. So, let's talk about an ideal garment production flow chart.
Production Process in Apparel Industry:
A garment industry has different department. But mainly four departments are play important role for execution an order. They are-
1. Sample Department
2. Cutting Department
3. Sewing Department 4. Finishing Department Here, given a general idea about export garments production process flow chart. Above all discussion we see that, garments process is started by color fabric and finished by complete garments. This is the long journey where need to lots of process for manufacturing a complete garment. The flow chart of garment manufacturing can be changed according to the buyer requirement.
In the apparel industry, production is including few activate such as order receiving, sampling,

8.2 Flow Chart of Apparel Manufacturing Process Step by step apparel manufacturing processes are discussed in below:

Design/Sketch

(A particular style of design/ sketches with measurement mainly comes from the buyer to manufacturer.)
↓
Basic Block

(Basic block is an individual element of garments, which is created by without any allowance, style, and design.)
↓
Working Pattern

(Working pattern is made for a particular style with net dimension concerning the basic block along with allowance.)
↓
Sample Garments

(After making a sample, it is sent to buyer for approval to correct the faults and write comment on sample garments.)
↓
Approved Sample

(After re-correct the sample faults, it is again sent to buyers. If it is ok, then it is called approved sample.)
↓
Costing
(In this stage apparel merchandisers prepare a costing sheet for the buyer. Including fabric costing, cost of making (CM) charged, trimmings, profit etc)
↓
Production Pattern (For bulk production making production pattern with allowance and net dimension.)
↓
Grading
(Different size should be graded as per buyer requirement like S, M, L, XL, XXL.)
↓

Marker Making
(For a particular style of garments, marker is made with a thin paper which is contains all the components of different sizes.)

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Marker Making
(For a particular style of garments, marker is made with a thin paper which is contains all the components of different sizes.)

8.3 Pre-production Meeting:

Pre-production (PP) Meeting is a meeting which called by general manager before start the production. There are some important person has to come to the meeting. It is a very common word in garment industry but a few people can realize its importance. Sometimes people do it only to follow a system in the organization. If a PP Meeting goes properly with all of the requirements surely everyone will feel happy as soon bulk is finished.

8.4 Process Flow Chart of Pre-production Meeting in Apparel Industry:

How to produce the fabric within schedule with cost control?
(**Knitting department**)
↓
How to minimize the time and cost control? (Knitting department)
↓
What dia need after compaction and dimensional stability? (Dyeing finishing)
↓
How actual consumption minimize then budget consumption? (**Cutting department**)
↓
What are the critical processes in the style and how can we make it? (Sewing department)
↓
How can we make buyers required folding, poly, assortment etc.? (**Finishing department**)

STORE HOUSE SECTION IN TISWL

8.5 Introduction:

The fabric and accessories stores department is centralized in apparel industry and all the fabric and accessories comes to this unit first from the supplier and audited here and kept until it is distributed to other units. For an export oriented and bulk production of garment industry. it is essential to maintain a well-organized & well equipped inventory system. The main responsibility of this department is to store all the raw material necessary to produce garments. This department is sub divided into three sections. Store keeper follows a strong and appropriate working procedure.

8.5.1 Flow chart of Store House Section in TISWL

Accessories
10% Fabric Inspection
Mat Making
Shrinkage Test
Shade Segregation
Roll Segregation

8.5.2 Flow Chart of Inspection in Fabric Section in RMG Industry

(For Knitted fabric)

Fabric receiving
↓
Inspection
↓
GSM Checking
↓
Shade Matching

(For Woven Fabric)

Fabric receiving
↓
Inspection
↓
GSM Checking
↓
Shrinkage test
↓
Shade Matching
↓
Blanket test

Product Receive: Here invoice is collect by Merchandiser, without invoice it is not possible make the inventory, because there is a list of Goods In invoice.

- **Inventory:** After Comparing invoice with received goods, the goods are placed in inventory.

- **Inspection of Goods:** Generally 10% goods are inspected, if found defects more that tolerance, the lot will be declared as reject and inform supplier for replace. Trims and accessories will be inspected 10% of total quantity. if found defects more than tolerance , then declared as reject.

- **Shade segregation:** Here pieces of fabrics from all roll have to cut and made a blanket to segregate shade.

- **Shrinkage Test:** from the fabric roll, 10% roll will be selected for shrinkage test . Piece of fabric cut from each roll at 50cm ×50cm and sends for shrinkage test. Shrinkage test repost then send to Pattern Section.

- **Issuing Product:** Store always issues product for cutting and sewing section as per pre-requisition from that department.

- **Sustain balance:** Store always keeps the sustain record after the issuing product in cutting and sewing section.

Machine Used in Store:

- Fabric Inspection Machine
- Heat wear label cutting machine

Resister & Report use in Store:

- ✓ Needle Change register
- ✓ Different types needle balance register
- ✓ In House fabric Inspection report (4 Point system)
- ✓ Fabric Shade report
- ✓ Accessories Inspection Report
- ✓ Shrinkage test Report
- ✓ Fabric receive packing List
- ✓ Button issue register

8.5.3 Needle Issued for different Machine from Store

Table - List of Different types of Needle Issued from Store

Machine Type	Needle Type	Needle Size
Plain Machine	DB×1	11
Button hole & 2N Machine	DP×5	11,16,14
BTN stitch and Bartech Machine	DP-7	14
Chain Stitch Machine	TV-7	11,14,16
Feed Off The Arm machine	TV-64	11,14,16
Over clock Machine	DC-1	9,11,14,16

Inspection Procedure:
1. As soon as the fabric received, the fabric inspection department inspects the fabric.
2. From the supplier the fabric is received in the form of Rolls.
3. According to the order placed, they place 5% extra order to the supplier to meet the requirement.
4. Fabric received in the form of Takes may be of length usually 100 meters, but it can be 45 or 65 meters also.
5. Every fabric has to be inspected 100% incase 15% with the consent of concerned merchandiser approvals.
6. Then the Takes or Rolls are inspected in full width on the table or machine under the good light for defects analyses.
7. They are following Four Point System, in which total 100 meters of fabric is inspected and, if the points allotted for 100 meters are Less than (<) 40 points is accepted More than (>) 40 points is Rejected Check the fabric length & width & compare against the length declared by the supplier.
8. Fabric width 1½‘‘ to 2‘‘ tolerance of specified width is accepted.
9. For every lot / every fabric order keep 1mts of fabric for lab testing & for quality standard reference.
10. Inspection reports are produced. Copies of the report are presented to concerned merchandiser & department.

Store Keeping System: Unload fabrics
- Inventory in warehouse.
- Fabrics inspection
- Recording in register book and Excel sheet.
- Updated information put in Bin Card (It is updated information card for bin or rack,

Common Fabric Fault
- ✓ Broken Yarn
- ✓ Missing Yarn
- ✓ Colour Yarn
- ✓ Shading Bar
- ✓ Thick Yarn
- ✓ Shading
- ✓ Slubs
- ✓ Knots
- ✓ Hole

8.5.5 Fabric Inspection Systems There are various fabric inspection systems:
- 10-Point System.
- Graniteville "78" system.
- Dallas system.
- 4- Point system.

Ten Point System It was developed in the 1950's. This system assigns penalty points to each defect, depending on the length of the defect. Penalty points are assigned as per the following:

Under the Ten-Point System, a piece is graded a "first" if the total penalty points do not exceed the total yardage of the piece. A piece is graded a "second" if the total penalty points exceed the total yardage of the piece. The following points are noteworthy:
- This system is bit complicated because points per length are different for warp and weft defects.
- It is difficult in practical use.

Graniteville "78" system This system was introduced in 1975 for the field of fabric grading. The system divides defects into major and minor types .The major defect is one, which is very obvious and leads the goods to second quality. The minor defect is one, which may or may not have caused garment to second, depending on its location in the end use item. Penalty Points are assigned as per the following:

The following points are noteworthy in this system:
- ✓ The principle was established in garment cutting piece, in which, the short length defects (less than 9") will normally be removed.
- ✓ The system tries to balance the importance of longer defects (over 9") and put less weight on 1-10" defects such as slubs.
- ✓ The system also suggests the viewing distance of 9 foot instead of normal 3-foot viewing distance.
- ✓ The system tends to eliminate very small defects from the total penalty score.
- ✓ This is mostly recommended for use, where larger garments are to be cut with fabrics of wider widths.

Dallas System This system was developed in 1970s specifically for knits. It was approved by Dallas Manufacturers Association. According to this system, if any defect was found on a finished garment, the garment would then be termed as a "second". For fabrics, this system defines a second as "more than one defect per ten linear yards, calculated to the nearest ten yards". For example, one piece 60 yards long would be allowed to have six defects.

4-Point System The 4-Point System, also called the American Apparel Manufacturers (AAMA) point-grading system for determining fabric quality, is widely used by producers of apparel fabrics and is endorsed

by the AAMA as well as the ASQC (American Society or Quality Control). The 4-Point System assigns 1, 2, 3 and 4 penalty points according to the size and significance of the defect. No more than 4 penalty points can be assigned for any single defect. Defect can be in either length or width direction, the system remains the same. Only major defects are considered. No penalty points are assigned to minor defects. In this system, one should inspect at least 10 per cent of the total rolls in the shipment and make sure to select at least one roll of each colour way. Fabric defects are assigned points based on the following:

Length of Defect	Penalty points Allotted
Upto 3 inches	1 Point
3 - 6 inches	2 Points
6 - 9 inches	3 Points
Over 9 inches	4 Points
Holes and Openings (1 inch or less)	2 Points
Holes and Openings (over 1inch)	4 Points

Total defect points per 100 square yards of fabric are calculated and the acceptance criteria is generally not more than 40 penalty points. Fabric rolls containing more than 40 points are considered "seconds". The formula to calculate penalty points per 100 square yards is given by:

$$\frac{\textit{Total points scored in the roll x 3600}}{\textit{Fabric width in inches x Total yards inspeced}}$$

The following are noteworthy points for this system:

- No more than 4 penalty points can be assigned for any single defect.
- The fabric is graded regardless of the end-product.
- This system makes no provision for the probability of minor defects.
- 4 point system is most widely used system in apparel industry as it is easy to teach and learn.

8.5.6 Sewing Line Accessories item stored in the store

- ✓ Yarn
- ✓ Thin yarn: 40/2, 50 /2,60/2
- ✓ Thick yarn: 20/2, 20/3
- ✓ Button
- ✓ Interlining
- ✓ Main Label
- ✓ Sub labels
- ✓ Size Label
- ✓ Fit label
- ✓ Care Label: It contains the care construction. Different types of care label are given below.
- ✓ Washing Symbol
- ✓ Bleaching symbol
- ✓ Ironing Symbol
- ✓ Dry cleaning Symbol
- ✓ Drying Symbol

Finishing Line Accessories item stored in the store:

- ✓ Neck board
- ✓ Hangtag with sticker
- ✓ Tissue (when folding shirts)
- ✓ Poly

8.5.7 List of Trims and Accessories Used in Garment Industry

In garment manufacturing process main raw material is fabric. It is not possible to make garment only with fabric. To make complete garment different types of auxiliary materials are used. These auxiliary materials are called trims and accessories. Garment trims and accessories are very important to make garments aesthetic, functional and commercially acceptance. But trimmings and accessories are not same. There function and looks are completely different. We have discussed about trims and accessories in the following section.

Trimmings: Trimmings or trims are attached with the body of garments by sewing. These materials are used in sewing room with fabric. Trims are directly attached with garments. These are used for functional purposes. List of trims used in apparel manufacturing:

1. Sewing Thread
2. Button
3. Zipper
4. Lining
5. Interlining
6. Motif
7. Rivet
8. Stopper
9. Lace
10. Braid
11. Elastic
12. All types of Label
13. Shoulder pad
14. Hook & Loop
15. Twill tape
16. Velcro tape
17. Seam Sealing tape
18. Shoulder Tape
19. Fusing material
20. Crochet
21. Rib
22. Pon pom
23. Wadding
24. Ribbon
25. Metal Badge
26. Down
27. String/Draw Cord
28. Piping Cord
29. Emblem
30. Logo Print
31. Swivel Hook
32. Eyelet/ Grommet
33. Collar Stay
34. Cord Bell
35. Buckle
36. Weaving Belt
37. Cable (steel ware)
38. Adjuster
39. Recco
40. Elastic Threads

List of accessories used in garment manufacturing:

1. Hanger
2. Hangtag
3. Poly bag
4. Collar stand
5. Size Tag
6. Tissue paper
7. Backboard
8. Neck board
9. Paper Band
10. Pin/Clip
11. Tag pin
12. Carton Sticker
13. Safety sticker
14. Arrow sticker
15. Elastic bag
16. Mini poly bag
17. Gum tape
18. Scotch tape
19. P.P Band
20. Inner Carton
21. Outer carton
22. Iron seal
23. Tarpaulin paper
24. Butterfly
25. Both side tape
26. Plastic staple
27. Barcode, UPC
28. Ball chain
29. Carton Pad
30. Size Stickers
31. Numbering Stickers
32. Defect Indicator
33. Safety Pin
34. Brass Pin
35. Size Clip
36. Master Carton

8.6.2 Brief Description of the Sampling Processes 1. Tech Pack Receiving:
This is the first stage of the sampling processes. In this stage Tech Pack or the Technical pack is received from the buyer, via merchandiser. Tech pack contains all the specifications to produce a garment.

2. CAD & Pattern Making:
In this stage pattern is made through CAD. Sometimes pattern is made manually, but CAD is more popular and easy, Computer-aided design (CAD) is the use of computer Technology for the design of objects, real or virtual. The design of geometric models for object shapes, in particular, is often called computer-aided geometric design (CAGD).However CAD often involves more than just shapes. As in the manual drafting of Technical and engineering drawings, the output of CAD often must convey also symbolic information such as materials, processes, dimensions, and tolerances, according to application- specific conventions. CAD

may be used to design curves and figures in two-dimensional ("21") space; or curves, surfaces, or solids in three-dimensional ("3D") objects. Viyellatex pattern section uses Optitex CAD software for pattern making.

3. Sample Making: Sample making is the ultimate goal of this department. After making the pattern, the sample is made by using the pattern set. **4. Size Setting:** After making the sample, size is set according to the Tech Pack. If there is any fault, the sample is redone.
5. Pre Production (PP) Meeting: After the buyer has inspected the sample, a preproduction meeting is called. In this meeting buyer or his agent, merchandiser, sample manager, all remain present. They decide on how to and when to start the production. If the decision Okayed, the sample is ready to go for final production.

6. Grading of Sample: After finalizing the sample. Grading is done. There may be several grades of a single design. The grading is done to separate the samples and patterns from each others.

7. Marker: After grading the samples. The design is inputted into the marker software. This software specifies how to set the pattern in the actual fabric. By using the marker software efficiently, fabric can be saved. Viyellatex uses Gerber Garment Technology (GGT) for marker making.

8. Cutting: After making the marker the pattern is delivered to the cutting unit and the fabric is cut for final production.

9.6.3 Sample Procedure in RMG:

There are some standard sample procedures after pattern making, they are as follows:

Sourcing the Fabric and
Accessories for making the Garment
↓
Cutting (For Sample Only)
↓
Embellishment
↓
Sewing
↓
Iron
↓
Quality Control
↓
Precheck Form
↓
Buyer QC
↓
Forwarding from the Merchandiser
↓
Sending Sample to the Buye

8.6.4 Types of sample & their uses:

Serial No.	Sample	Use
01	Proto/ Development Sample	To convert the pattern into actual garment.
02	Size set/ Grade/ Fitting Sample	To fit the styling of the garment.
03	Additional Sample (White Only) Magazine. Photo shot) garment on the rack.	All these Samples are made to show the garment of the rack
04	Contract Seal/ Seal Sample	To gain approval before the bulk Production.
05	Pre Production (PP) sample	To gain approval before the bulkProduction.
06	Production Sample	To gain approval for shipping the garment._
07	Sales Man Sample (SMS)	To gain approval for bulk production
08	Rack Sample	To show the garment on the rack.

8.6.5 Sampling Stages of Different Buyers:

Marks & Spencer

Buying/ Development Sample
↓
Fit Sample (To fit on the best size)
↓
Grading Sample
↓
Contract Seal
↓
Go for Production
↓
Rack Sample

G-Star:

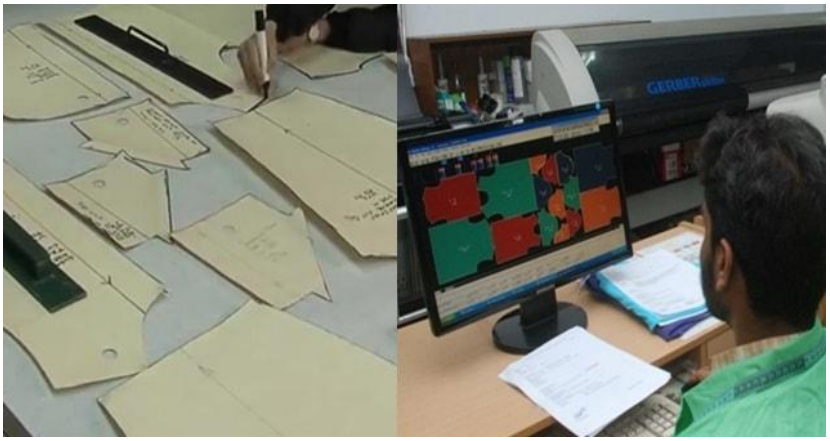
Proto/development sample
↓
Salesman Sample (SMS)
↓
Sealer sample

PUMA:

Price tips sample
↓
Pre proto sample
↓
Proto sample
↓
PLM sample (before SMS)
↓
SLM (or SMS)
↓
Size set
↓
Seal Sample

8.7.1 Pattern:

A marker is commonly done by large thin paper that holds all the size of pattern pieces for a specific style of garments. Marker is the perfect way to reduce fabric wastage. Marker gives actual guide line for completing the flawless or correct fabric cutting. Marker making can be done in both ways like manually and computerized method. Marker width is greater than or equal to the fabric width. Marker length is mainly depends on the number of patterns of the particular style of garments used for marker making.
From this article you will get the detail information about the following topic like, what is marker? Types of marker in the garments industry, marker making, objectives of marker making, different methods and techniques of marker making, manual marker making method, computerized marker making method in the apparel industry.



8.7.2 Types of Pattern Used in Clothing Sector:

There are mainly two types of patterns used in **readymade apparel sector** which mentioned in the below:
1. Basic block or block pattern,
2. Working pattern or apparel pattern.

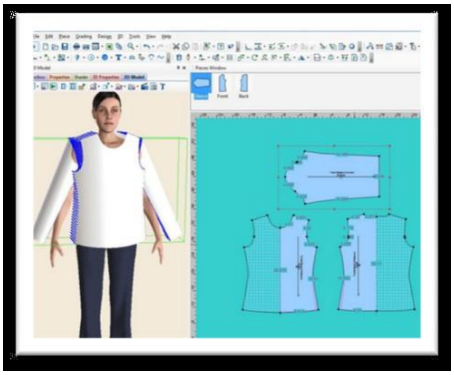
All the above two patterns have discussed in the following:

1. Basic block or block pattern:

Basic block or block pattern is an individual component of apparel without any design or style. It can be made into two ways such as modeling and flat method.

a. Modeling: Modeling is a primary and first method. Still it is widely used in apparel industry. In modeling method, block is made with standard body measurement of dummy which is known as toile. Toile is worn on the body of dummy to check fittings. After that, toile is worn out from the body of dummy and individual parts of toile are drawn on board paper or hard paper. This method is most efficient but needs more time.

b. Flat method:
In case of flat method, the pattern of different parts of apparel especially body and sleeve are made by technical drawing. Actually, this method comes from modeling method and by this method fast pattern making is possible.



2. Working pattern or apparel pattern:

Apparel pattern is made on the basis of basic block or block pattern. Individual block pattern are drawn on board paper or hard paper. Different types of allowances i.e. trimmings allowance, sewing allowance, bottom line, center front line, pleat, drat is considered in this type of pattern.

8.7.3 Computerized marker making method:
Computerized method is the best and most popular method of marker making. Generally it gives higher efficiency. During this marker making method every specific style and part of the patterns are kept in the computer memory and grade rule is also mentioned. To do this marker making, computerized marker paper directly placed on fabric layer. Then the computer makes the marker by its programming techniques. Computer Aided Design (**CAD**) system are used to make marker. Comparison between manual and CAD marker making is huge.
For completing the computerized marker making, pattern information's can be stored by different manners. Such as: a. Digitizing system b. Scanning system

a. Digitizing system:
- Patterns are placed in computer by using the digitizing board to run this process.
- Every component is send to the computer memory by clicking special mouse around the pieces.

b. Scanning system: This is special kind of photocopier machine. Two things are done here. They are:
- Production or Working patterns are set up on the scanning glass and then marker is made in a selected size.
- For making other size grade rule is used.

Fig: CAD system use to make marker

8.7.3.1 Types of computerized marker making method: Computerized marker making method is mainly two types. Such as: i. Automatic marker making ii. Interactive marker making **i. Automatic marker making:**

- To do this automatic marker making method, computer can make marker itself according to given commands.
- From this method most efficient marker can be got.
- Computer makes marker with the help of permutation and combination but it required more time.

ii. Interactive marker making:

- Interactive marker making is a very common process.
- Computer operator takes a marker plan by interacting directly with the system through a computer screen.
- Every pattern pieces are shown in a miniature of the screen.
- Operators are transferring patterns information by the use of pen drive or tablet.

Advantage of computerized marker making:

- Perfect method for large scale production
- Marker efficiency is high
- Low fabric wastage
- If you want to get marker print out then it possible.
- pattern grading could be done by automatically
- Low time consumption
- This method help to prepare marker quickly

Disadvantage of computerized marker making:

- High investment cost
- Required skilled operator

8.7.3.2 Process flowchart of CAD section I'm describing the process sequence of CAD sections of garments with an image :

8.7.3.3 Different Types of CAD Software for Apparel Manufacturing Industry

CAM and CAD Software for Apparel Industry:

In textile and apparel industry, computer aided design (CAD) and computer aided manufacturing (CAM) plays a significant role to achieve higher output from the available company resources. There are different types of CAM and CAD software used in textile and apparel manufacturing sector. This article has presented the mostly used 2D and 3D clothing design software's with the name of their developers.

List of 2D Clothing Design Software Used in Apparel Sector:
Available 2D CAD software for clothing industry listed in the following:
1. GRAFIS from Software Dr. K. Fridrich (Developed by Germany),
2. Audaces Apparel Pattern from Audaces (Developed by Brazil),
3. COAT from COAT-EDV System (Developed by Germany),
4. PAD Pattern design from PAD System Technologies Inc. (Developed by Canada),
5. TUKACAD from Tukatech (Developed by USA),
6. CAD Assyst from Assyst (Developed by Germany),
7. Fashion CAD from CAD CAM Solutions (Developed by Australia),
8. Modaris from Lectra (Developed by France),
9. Accumark from Gerber Technology (Developed by USA).

List of 3D Clothing Design Software Used in Apparel Sector:
Available 3D CAD software for the clothing industry is listed in the below:
1. Modaris 3D Fit from Lectra,
2. Virtual fashion from Reyes Infografica,
3. Vidya from Assyst-Bullmer,
4. Accumark Vstitcher from Gerber,
5. 3D Runway from Optitex,
6. Haute Covture 3D from PAD System,
7. Design concept from Lectra,
8. Vstitcher from Browzwear,
9. EFit Simulator from Tukatech.

Classification of 3D CAD System Used in Apparel Industry:
1. Combined Techniques,
2. 3D modeling and 2D pattern unwrapping,
3. Digital draping,
4. 3D simulation of 2D patterns,
5. 2D sketch-based 3D simulation,
6. Reactive 2D/3D design technique.

Uses of Computer Aided Design (CAD) in Different Sector:
Computer aided design software or CAD software is vastly used in some major sectors of today‘s technological areas; those are pointed in the following:
1. **Fashion design** sector,
2. Apparel sector,
3. AEC i.e. Architecture Engineering and Construction sector,

4. ECAD i.e. Electronic and electrical sector,
5. MCAD i.e. Mechanical sector:

- ✓ Aerospace,
- ✓ Automotive,
- ✓ Machinery,
- ✓ Consumer Goods,
- ✓ Ship Building.

8.7.4 Flow Chart of Cutting SectionZ:

Marker Check
Spreading Q/Control
Cutting Q/Control
100% Panel Check
Random Bundle audit.

8.7.4.1 Different Types of Fabric Cutting Machine: Various types of cutting machine are used in apparel production. From many years hand operated scissor is used for cutting fabric. But after industrialization hand scissors are not appropriate for bulk layer cutting. Then started semi automatic fabric cutting machine. For increasing productivity in cutting room computerized fully automatic cutting machine have to use. According to the working process, the cutting machine may be classified in three categories. Such as-

1. Manual cutting machine
2. Semi- Automatic cutting machine
3. Fully Automatic / Computerized cutting machine

1) Manual Cutting Machine:

- Hand Operated Scissor

2) Semi-Automatic Cutting Machine:

- Straight knife of Cutting Machine.
- Round Knife Cutting Machine.
- Band Knife Cutting Machine.
- Die Cutting Machine.
- Notcher Machine.
- Drill Machine.

3) Fully Automatic / Computerized Cutting Machine:

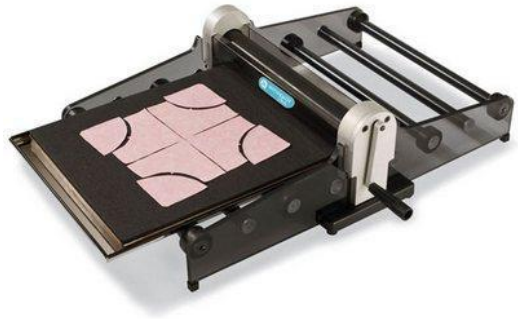
- Computer Controlled Knife Cutting Machine.
- Laser Cutting Machine.
- Water Jet Cutting Machine.
- Rib Cutting Machine
- Air jet Cutting Machine.
- Ultrasonic Cutting Machine.
- Plasma Torch Cutting Machine

Manual Cutting Machine: We can understand scissor as a manual cutting machine. Scissor only used when cutting only single or double plies. Almost every type of cloth is cut by scissor. But it takes huge time for fabric cutting. So it is not used in bulk production.

2) Semi-Automatic Cutting Machine: Straight Knife of Cutting Machine: Straight knife cutting machine is the most popular and versatile cutting machine. It is widely used in clothing industry. Because it‘s production speed is very high. Higher lay of height can be cut very easily. Besides, knife is comparatively cheap and can be transferred from one place to another easily.

Round Knife Cutting Machine: Round knife cutting machine is called because it‘s cutter is round in shape. It is also popular cutting machine. This machine is small in size, flexible & used for small production. Round knife is widely used for cutting the big parts of the garments pattern.

Band Knife Cutting Machine: Band knife cutting machine is look like a wood cutter machine. This cutting machine works automatically according to the height of the relevant material. Band knife cutting machines have been recognized around the world for many years for its high quality cutting.



Die Cutting Machine: Die cutting machine involves pressing a rigid blade through the lay of fabric. It is useful where small motifs with particular shape and pattern are needed for cutting. Die cutting is most useful to cut sharp and small parts. Mainly two types of die cuttings are available in market namely, Clickers and Presses.

Drill Cutting Machine: Sometimes it is needed to mark on the end of components of dresses especially for the position of pockets, darts and similar features, a hole is often drill through all the plies of fabric in the

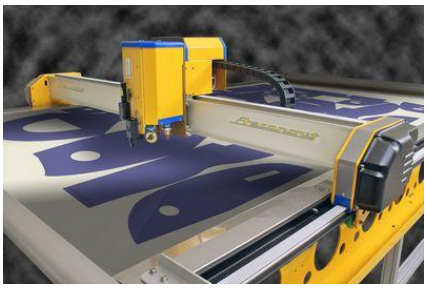
lay. This machine is also used for marking on the middle of the components of dresses. It can make the hole permanently for a long.

3) Fully Automatic / Computerized Cutting Machine:

Computer Controlled Knife Cutting Machine:

This cutting machine provides the most accurate possible cutting at high speed. It is suitable for large scale production. Marker is not necessary to put over the fabric lays during cutting. This technology has the advantage of being highly accurate and fast, but does cost considerably more than other cutting techniques.

Laser Cutting Machine: In laser cutting machine, the fabric is cut by a ray of light in a very fine spot by using a laser. Laser cutting processing depends on its precise processing, faster, simple operation, high degree of automation has been widely used in the leather and apparel industry. The cutting head is controlled by a computer.



Water Jet Cutting Machine:

Water jet cutting machine is an industrial tool capable of cutting fabric lay by using a very high-pressure jet of water. A very fine water-jet is passed through a nozzle at a very high speed to cut the fabric lay. The pressure of water is 60,000 pounds per square inch. The high pressure jet acts as a solid tool when it encounters the material to be cut, tearing the fibers on impact.

Rib Cutting Machine: These are specialized machines used to cut rib or rolls of strips from knitted tubular fabrics. Knit garment industry uses this machine widely

Plasma Torch Cutting Machine: Plazma cutting was originally developed to satisfy our demand for high quality cutting. It is used for cutting stainless steel and aluminum. But it can also be used to cut textile material. In this system, fabrics are cut by a thin through the nozzle which is made by Argon gas.

8.7.4.2 Working flowchart of cutting room in garment industry

Received the fabric from dyeing finishing

Received the cutting ratio from apparel merchandiser
Make the cutting quantity plan

8.7.4.3 Spreading Quality Control System Cutting Quality Controller Should Be check Following steps for better Cutting.

1. Table Marks : Check that the table is marked carefully.
2. Ends : Ensure ½‘‘ Cutting allowance at both end of spreading. \
3. Marker Placement : Check that marker is placed on the spread with the edge parallel to the salvage of the piece goods verify that all cut pieces will be complete.
4. Tension: Check tension during spreading this is very important for knit & stretchable fabric.
5. Leaning : Check carefully to ensure that one edge of the fabric is squire to the table top. To ensure the alignment of the edge spreader can use sat scale. \
6. Narrow Goods : After the completion of the spread. Check the far edge of the spread to sac that all plies extend beyond the marker line.
7. Remnants : To make sure reasonable amount of fabric is kept to replacement of defective panel.
8. Counts : Check the count after compression of spreading and before cutting all plicate both ends.
9. Fabric Flaws : When section of fabric are removed due to flows it‘s must be recorded.

8.7.4.4 Functions of Cutting Department in Garment Industry

Cutting department is responsible for cutting fabrics and feeding the sewing department with cuttings. The cutting department‘s capacity is planned based on the daily feeding requirement of the sewing lines. The cutting department is set up with a cutting department head, cutters, spreaders, quality checkers and helpers for sorting, ply numbering and bundling. The activities of the cutting department are explained in this post.

1. Take fabric from the fabric store: The cutting department gets a cut order from the production manager.

According to the cutting plan, the cutting in-charge generates a fabric requirement sheet or requisition slip to the fabric store to issue fabrics.

2. Relaxation of fabrics: Knitted fabrics require relaxation before cutting. After receiving the fabric from the fabric store, the cutting department opens the fabric from the fabric roll and lays it on the table for relaxation for some hours before cutting. Factories also relax fabric in the fabric store overnight after opening the fabric rolls.

3. Cut order planning: Cutting master plan the number of markers they need to prepare, the size combination to be set for each marker and the number of plies to be laid in each marker.

4. Fabric Spreading/ layering: In mass production, multiple layers of fabric are cut at the same time. So spreaders lay fabric on a cutting table as per total marker length. The layer height is kept up to a certain inch.

5. Planning markers: The cutting master plans marker ways, marker lengths and the numbers of plies to be laid in each lay.

6. Making markers: This is a process of making an outline of garment patterns on the lay for cutting garment components. After layering, the marker paper is laid on the top of the layer. Those factories that don‘t have CAD markers make markers manually using paper patterns.

7. Cutting fabrics: After making the marker, garment patterns are cut and taken out from the layer. Various technologies are used for cutting fabric layers, such as straight knife cutting, band knife machine cutting and a computer-controlled automatic cutting machine.

8. Sorting, bundling and numbering of garment plies (parts):
After cutting the fabric, layers are sorted size-wise and colour-wise. Each ply is numbered using stickers. Bundles are kept on inventory tables, before these are sent to undergo the next process.
Inspecting cut components:

To maintain the cutting quality, standard cutting components are checked randomly by quality checkers. If defective components are found, they replace those defective parts. Details of cut part inspection are explained in Chapter 10.

10. Sorting printed and embroidery panels:
As per order requirements, printing and embroidery is done on cut panels. Size-wise sorting is done after receiving printed and embroidered panels. The checking of printed and embroidered panels is also done by the cutting department

11. Re-cutting panels:
Re-cutting is done for garment component that require to be replaced in bundles. Re-cutting requests are received from the sewing department for defective garment parts. Re-cutting is also done for block panels cut for the printing and embroidery processes. After receiving garment panels from the printer or embroiderer, these panels are reshaped.

13. Fusing garment components:
Fusing in garment components is done to stiffen parts of a garment. If needed, fusing is done at the cutting section (e.g. fusing of the collar and cuff components of formal shirts).

SEWING SECTION IN TISWL

8.8 Flow chart of Sewing Section

Size set marking
⬇
Pmeeting
⬇
Pattern adjustment
⬇
Pilot run
⬇
Inspector Layout
⬇
Machine/SPI Check
⬇
100% In-process check
⬇
In- process Audit
⬇
Measurement Check
⬇
End Line Check
⬇
Rejection Management
⬇
Hourly Audit

8.8.1 There are some Industrial sewing m/c`s in our Garments Industry They are:-

1. Double chain stitch machine (four needle short……),
2. Double chain stitch machine (four needle elastic inserting machine),
3. Double chain stitch m/c (double needle with reverse feed),
4. Fed of the arm (Double chain stitch m/c with three needles),
5. Interlock machine (twine needle, 5- thread over lock machine),
6. Lock stitch machine (single with split needle bar sewing),
7. Lock stitch m/c (twin needle feed),
8. Lock stitch sewing m/c (one needle with vertical trimmer wiper and reverse feed),
9. Lap seaming m/c (for back tape attaching),
10. Linking machine,
11. Over lock machine (twine needle four threaded machine),
12. Over lock machine (one needle, 3-thread),
13. Zigzag sewing machine (one needle),
14. Top and bottom cover stitch flat bed machine (three needle),
15. Three needle covering machine, five thread flat bed top and bottom covering m/c,
16. Button hole m/c (for woven fabric),
17. Button sewing machine,
18. Bar tack m/c with automatic thread trimmer,
19. Button hole sewing m/c (for knitted fabric),

20. Button covering stitch belt loop making m/c (kansai m/c),
21. Bias tape cutting machine,
22. Label sewing machine.

Objective :

1. Gather knowledge about different industrial sewing m/c.
2. Acquire knowledge about different parts and mechanism of sewing m/c
3. Know about end use or function about this m/c.

Atmospheric Condition :

- ✓ Relative Humidity= 65% (2%) □
- ✓ Temperature = 200 C

Precautions :

1. During observing the weshonlel came and avoid any kinds of damage.
2. We should sincere to know about m/c. By knowing well we can apply in practical side.

8.8.2 Description Machine :

Machine No: 01

SL. No	Description	Specification	Machine Figure
01	Name of the m/c	Industrial Lock stitch sewing m/c	
02	Model No	KX-5550	
03	Brand Name	KAIXUAN	
04	Country of Origin	CHINA	
05	Stitch Types	Lock stitch	
06	Needle No	Single	
07	Needle Name	DB×1	
08	Needle Size	11,14,16,18	
09	S.P.M	4,000	
10	End Use	To sewing all kinds of pant shiet	

Machine No: 02

SL. No	Description	Specification	Machine Figure

01	Name of the m/c	Industrial Button Attaching Sewing m/c	
02	Model No	LK-1903	
03	Brand Name	JUKI	
04	Country of Origin	Japan	
05	Stitch Types	Button attaching	
06	Needle No	DP□17	
07	Needle Name	Single	
08	Needle Size	11	
09	S.P.M	2700	
10	End Use	All kind attach button	

Machine No: 03

No	Description	Specification	Machine Figure
01	Name of the m/c	Industrial Button Attaching Sewing m/c	
02	Model No	KE-430	
03	Brand Name	Brother	
04	Country of Origin	Japan	
05	Stitch Types	Button attaching	
06	Needle No	DP□17	
07	Needle Name	Single	
08	Needle Size	11	
09	S.P.M	3200	
10	End Use	All kind attach button	

Machine No: 04

SL. No	Description	Specification	Machine Figure
01	Name of the m/c	Industrial Straight lock stitch sewing m/c	
02	Model No	S-6200A	
03	Brand Name	Brother	
04	Country of Origin	Japan	
05	Stitch Types	Lock stitch	
06	Needle No	5,000	
07	Needle Name	Single	
08	Needle Size	11-18	
09	S.P.M	5,000	
10	End Use		

Machine No:05

SL. No	Description	Specification	Machine Figure

01	Name of the m/c	Industrial Lock Stitch sewing m/c	
02	Model No	FY-5550	
03	Brand Name	YAMATA	
04	Country of Origin	CHINA	
05	Stitch Types	Lock Stitch	
06	Needle No	Single	
07	Needle Name	DB×1	
08	Needle Size	11,12,16,18	
09	S.P.M	1500-5,000	
10	End Use	All Kinds of Plain sewing	

Machine No: 06

SL. No	Description	Specification	Machine Figure
01	Name of the m/c	Industrial Chain stitch sewing m/c	
02	Model No	FY-0058-A	
03	Brand Name	YAMATA	
04	Country of Origin	CHINA	
05	Stitch Types	Lock Stitch	
06	Needle No	2 Needle & 2 Lopper	
07	Needle Name	TV×17	
08	Needle Size	11,14,16,18	
09	S.P.M	6,000-8,000	
10	End Use	Knit garments	

Machine No: 07

SL. No	Description	Specification	Machine Figure
01	Name of the m/c	Industrial Over Lock sewing m/c	
02	Model No	FY-2100	
03	Brand Name	YAMATA	
04	Country of Origin	CHINA	
05	Stitch Types	Lock Stitch	
06	Needle No	3Thread(1Needle&2Lopper), 4Thread(2Needle&2Lopper)	
07	Needle Name	DC×1	
08	Needle Size	11,14,16,18	
09	S.P.M	6500-8500	
10	End Use	Over locking/Edge neatening	

Machine No: 08

SL. No	Description	Specification	Machine Figure

01	Name of the m/c	Industrial Flat Lock sewing m/c	
02	Model No	FY-31016	
03	Brand Name	YAMATA	
04	Country of Origin	CHINA	
05	Stitch Types	CHINA STITCH	
06	Needle No	3 Needle & 2 Lopper	
07	Needle Name	UY×128	
08	Needle Size	11,14,16,18	
09	S.P.M	6,000-8,000	
10	End Use	Knit garments	

Machine No: 09

SL. No	Description	Specification	Machine Figure
01	Name of the m/c	Industrial Buttom Holding sewing m/c	
02	Model No	L.B.H-781	
03	Brand Name	JUSTTA	
04	Country of Origin	JAPAN	
05	Stitch Types	Lock Stitch	
06	Needle No	Single	
07	Needle Name	DP×5	
08	Needle Size	11,14,16,18	
09	S.P.M	3,000-6,000	
10	End Use	Bottom holding	

Machine No: 10

SL. No	Description	Specification	Machine Figure
01	Name of the m/c	Industrial Feed of the arm sewing m/c	
02	Model No	MS-1261	
03	Brand Name	JUKI	
04	Country of Origin	JAPAN	
05	Stitch Types	CHINA Stitch	
06	Needle No	2Needle & 2 Lopper/3Needle & 3Lopper	
07	Needle Name	TV×64	
08	Needle Size	11, 14, 16, 18	
09	S.P.M	4,000-4,500	
10	End Use	Inseam or out seam of trouser & Side seam or arm hole of shirt.	

Machine No: 11

SL. No	Description	Specification	Machine Figure
01	Name of the m/c	Industrial Bar-Taking sewing m/c	
02	Model No	LK-1850	
03	Brand Name	JUKI	
04	Country of Origin	JAPAN	
05	Stitch Types	CHINA Stitch	
06	Needle No	2Needle & 2 Lopper/3Needle & 3Lopper	
07	Needle Name	DP×5	
08	Needle Size	11, 14, 16, 18	
09	S.P.M	3,000-6,000	
10	End Use	Bar taking	

Machine No: 12

SL. No	Description	Specification	Machine Figure
01	Name of the m/c	Industrial Zegzog sewing m/c	
02	Model No	130	
03	Brand Name	DAICHI	
04	Country of Origin	CHINA	
05	Stitch Types	Lock Stitch	
06	Needle No	Single	
07	Needle Name	Daichi	
08	Needle Size	11,12,16,18	
09	S.P.M	15,00-3,000	
10	End Use	Embroidery/Zegzog	

Machine No:13

SL. No	Description	Specification	Machine Figure
01	Name of the m/c		Industrial Lock Stitch sewing m/c
02	Model No		KM-590BL
03	Brand Name		SUNSTAR
04	Country of Origin		CHINA
05	Stitch Types		Lock Stitch
06	Needle No		Single
07	Needle Name		DP×17
08	Needle Size		16-23
09	S.P.M		24,000
10	End Use		

Machine No: 14

SL. No	Description	Specification	Machine Figure
01	Name of the m/c		Industrial Straight lock

		sewing m/c
02	Model No	KM-957
03	Brand Name	SUNSTAR
04	Country of Origin	CHINA
05	Stitch Types	Lock Stitch
06	Needle No	Single/Double
07	Needle Name	DP×5
08	Needle Size	11-18
09	S.P.M	3,500
10	End Use	

Machine No: 15

SL. No	Description	Specification	Machine Figure
01	Name of the m/c		Industrial Buttom hemming sewing m/c
02	Model No		KM-360
03	Brand Name		SUNSTAR
04	Country of Origin		CHINA
05	Stitch Types		Lock Stitch
06	Needle No		Single
07	Needle Name		DP×5
08	Needle Size		SCRV 7-1100
09	S.P.M		4,000
10	End Use		

8.8.3 Production Process in TISWL:

Design/Sketch
Pattern Design
Sample Making
Production Pattern
Grading
Marker Making
Spreading
Cutting
Fusing
Embroidery
Printing
Sorting/Bundling
Sewing/Assembling
Inspection
Pressing/Finishing
Final Inspection
Packing
Dispatch

8.8.5 Sewing Fault in RMG Sector

1. Broken Stitch
2. Skip Stitch
3. Open Stitch
4. Over Stitch
5. Uneven
6. Run of stitch
7. Un-complete
8. Tension
9. Puckering
10. Raw Edge
11. Slant/Miss Placed
12. SPI
13. Twisted
14. Size Mistake
15. Wrong Thread
16. Needle Mark
17. High Low
18. Poor Shape
19. Missing
20. Poor Joint Stitch
21. Dirty/Stain/Oil mark
22. Fabric Defect
23. Fusing Mark
24. Shading
25. Number Mistake
26. Measurement

8.8.6 Sewing Previous Production Activities in RMG Sector

- 1st create a size set sample which is done by the measurement from buyer sample.
- Then size set sample pass on send to wash.
- Then quality section checked the quality of size set sample which compared with PDM.
- Then size set sample send to merchandiser.
- Buyer compared or check this size set sample with his requirement. It this sample fulfilled the requirement of buyer, than its ok on if doesn`t fulfilled, than buyer create some comments on this size set sample and called a P.P meeting within soon as possible.

- In P.P meeting many person appeared such as PM, Line chief, LQC, CQC, Maintenance, Store, Cutting In-charge, Cutting controller, Pattern Master. This all person a head from production.
- More person are appeared from Head Office such as Merchandiser, Quality manager, Pattern master, Fabric inspection, central bond store and also from buyer. They also talked about size set sample in P.P meeting.
- If size set sample is passed in P.P meeting then Pilot run is done based on size set sample which is started within 3 to 5 days.

8.8.7 Sewing Thread Consumption

Sewing thread is required for seam sewing/assembling, over locking, various types of stitching, buttonholing, label attachment etc. Besides, it is important to know the amount of thread consumed in a sewn product. We often need figure out thread consumption of various items like Shirt, Shorts, Tank tops and Pants etc. Thread consumption means how much **thread** we need to stitch a product.

Thread consumption can be determined in several ways. To calculate the amount of thread in a seam, you can:

- Measure the actual amount of thread consumed in a specific length of seam.
- Calculate the thread consumption by using mathematical stitch formulas based on the thickness of the seam and the number of stitches per inch.
- Calculate the thread consumption using A&E's ANECALC spreadsheets.

***Example:** Stitch and seam: 401 SSa-1 Stitches per inch: 8 Thickness of the seam: .075 inches (measured with a micrometer) Length of the seam: 42 inches or 1.17 yds.

Chart Union Special 401 Chain stitch

Consumption based on the mathematical equation – C = 4 + 2ts C = 4 + 2(.075 X 8) = 5.20 Where, t = thickness of the seam s = stitches per inch Here, 1.17 yds X 5.20 = 6.08 yds / seam. => 6.08 yds/seam X 1.15 = 7.00 yds per seam including a 15% waste factor. *** A shirt having 104 inches 4 Threads Over lock stitches, 52 inches Flat lock stitches, 20 inches 1 Needle Chain stitches, 15 inches Single Needle Plain Machine stitches, GSM is normal, find out its thread consumption in meters?

Answer: {(104 x 19) + (52 x 32) + (20 x 5) + (15 x 2.75) + 10%} / 39.37 = 106.71 Meters. (39.37 inches = 1 Meter) *** Suppose, we want to buy thread cones with 2000 meters thread, now figure out how many cones do we need to stitch 3000 pcs of garments, per garment's thread consumption 106.71 meters? **Answer:** 106.71 x 3000 / 2000 = 160 cones.

8.8.8 Sewing Thread Consumption for Different Garments:

Thread consumption for some garments which can be used as rough has shown in the below table.

SL No.	Name of Garments	For Using	Sewing Thread Consumption (m)
01	Aprons	All	20
02	Blouses	Girls, ladies	85
03	Brassieres	Girls, ladies	40
04	Brief	Childs, men‘s, ladies	40/ 50/ 65
05	Dressing gown	Childs, men‘s	165 / 250
06	Jacket	Men‘s	200
07	Jeans	Men‘s	170
08	Neat wear	Ladies, men‘s	70 / 80
09	Night dress	Childs, ladies	55 /100
10	Over coat	Childs, ladies, men‘s	135 / 315 / 520
11	Skirts	Childs	100
12	Rain coat	All	285
13	Trouser	Childs, ladies, men‘s	100 / 140 / 190
14	Shirt	Men‘s, child‘s	110 / 75
15	Slipping bag	Adult, child‘s	275 / 185
16	Suits	Ladies, men‘s	365 / 480
17	Swim wear	Ladies	75
18	Tie	Men‘s	5
19	Towel	All	10
20	Track suit	Ladies, men‘s	160
21	Trouser	Men‘s	270
22	Under wear	Men‘s	50
23	T-shirt	Childs, ladies, men‘s	25 / 45 / 35
24	Waist coat	Ladies, men‘s	180

8.8.9 Sewing Thread Consumption Ratio for Different Types of Stitches:

The amount of thread consumption varies according to the types of stitches.

Stitch Type	Thread consumption for per cm seam (cm)	No. of needle	Needle thread and looper thread ratio
101, chain stitch	4.0	1	1:0
301, lock stitch	2.5	1	1:1
304, zigzag lock stitch	7.0	1	1:1
402, 2- thread chain stitch	5.5	1	1:3
503, 2- thread over edge stitch	12.0	1	1.2:1
504, 3- thread over edge stitch	14.0	1	1:5
512, 4- thread mock safety stitch	18.0	2	1:3.3
602, 4- thread covering stitch	25.0	2	1:3.3
606, 9- thread flat lock stitch	32.0	4	1:3.5
801, 4- thread safety stitch	17.5	2	1:1.4
802, 2- thread safety stitch	20.0	2	1:1.34
805, 2- thread safety stitch	21.0	3	1:2

8.8.10 Button ligne

Button ligne calculation is an important task for the **garment merchandisers**. Improper button size can turns the garments into faulty garments. As its importance in readymade garments sector, today I will present here the button size measurement system with examples.

What is Ligne?

Ligne means ―line‖ which is a French word that became the standard reference used by German button manufacturers in the early eighteenth century. Ligne is expressed as ―L‖ which is the internationally recognized standard. Ligne is used to measure the diameter of button.

Button Size Measurement Method in Readymade Garments Sector: To measure the button size, we have to use ligne.

Button Ligne (L),

$$= \frac{\text{Button diameter (mm)}}{0.635}$$

Example-01: If the button diameter is 15mm then what will be the size of button?

Solution:

Here, Button diameter = 15mm,

$$= \frac{\text{Button diameter (mm)}}{0.635} = \frac{15}{0.635}$$

= 23.62 = 24 L So, button size stands at 24L.

Example-02:

If the button diameter is 19mm then what will be the **size of button**?

Solution:

Here, Button diameter= 19mm So,

Button Ligne (L),

$$= \frac{\text{Button diameter (mm)}}{0.635} = \frac{19}{0.635}$$

= 29.92 = 30L So, button size stands at 30L.

Relation Between Ligne, Millimeters and Inches:

By calculating in the above way, we can get easily the various button ligne according to button diameter.

1inch=40L

Relation Between Ligne, Millimeters and Inches

SL No.	Ligne (L)	Millimeters (mm)	Inches
01	14	9.20	0.35
02	16	10.5	0.40
03	18	11.6	0.45
04	20	12.5	0.50
05	21	13.5	0.53
06	22	14.2	0.55
07	23	14.8	0.58
08	24	15.0	0.60
09	27	16.8	0.68
10	28	17.8	0.7
11	30	19.0	0.75
12	32	20.5	0.80
13	34	21.5	0.85
14	36	22.9	0.90
15	40	25.4	1.00

8.8.11 Stitch:

Stitch is very important during **manufacturing a garment**. Stitch can be defined as, one unit of conformation resulting from one or more strands or loops of thread by intra-looping, inter-looping and interlacing. Stitch quality is measured with stitch size, stitch length, width, depth, tension, sequence, elongation, elasticity, resilience, fabric distortion, yarn severance and abrasive strength. There are six types of stitch, which are deeply discussed in this article.

8.8.11.1 Types of Stitch Used in Garments:

There are different types of stitch used in garments; those are mentioned in the following:
1. Class-100 (Chain Stitch),
2. Class-200 (Hand Stitch),
3. Class-300 (Lock Stitch),
4. Class-400 (Multi Thread Stitch),
5. Class-500 (Over Edge Stitch),
6. Class-600 (Covering Chain Stitch).

All the above types of stitch have discussed in the below:

1. Class-100 (Chain Stitch):

Class-100 named as chain stitch, which is produced by one or more needle threads and are characterized by interloping. In chain stitch, one needle thread is passed through the fabric, form needle loop and is secured by the next loop formed by the same thread. It should be noted that, chain stitch is elastic and thicker than lock stitch and can easily be raveled, where particular care is required to prevent run back from the last stitch.

Class-100 (Chain Stitch) has three types- 101, 103 and 104. These types of stitch is used in hemming, belt loops, padding operations and felling.

2. Class-200 (Hand Stitch):

Class-200 named as hand stitch which is produced from a single thread. This single thread is passed through the fabric from one side to another and the stitch is secured by the single line of thread passing in and out of the garment.

Class-200 (Hand Stitch) has four types- running basting, back stitch, diagonal basting and buttonhole stitch. These types of stitch is used for stitching costly dresses, jackets and sample dresses.

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3.Class-300 (Lock Stitch):

Class-300 named as lock stitch which is produced with two or more groups of threads and two threads are joined by interlacing. Here, loops of one group are passed through the fabric and are secured by the thread of

second group, where one group is referred as needle thread and other as bobbin thread. Class-300 (Lock Stitch) has enough strength and same appearance on both sides.

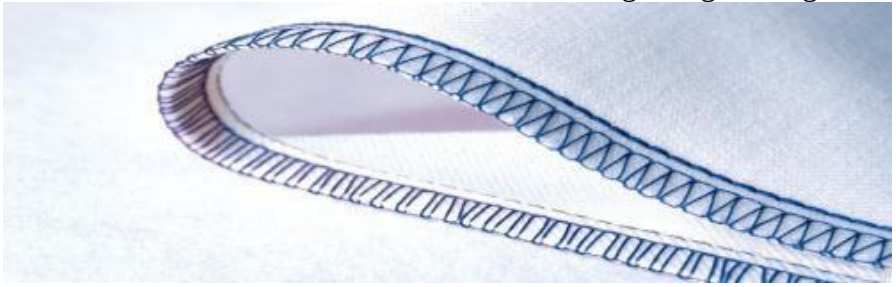
4.Class-400 (Multi Thread Stitch):

Class-400 named as multi thread stitch which is formed with two or more groups of threads. Here, loops of one group of thread are passed through the fabric and are secured by interlacing and interloping with loops of another group. Among two groups, one group is called needle thread and another group is called looper thread.

Class-400 (Multi Thread Stitch) has an appearance of lock stitch on the top but has a double chain effect formed by a looper thread on the under-side. Class-400 (Multi Thread Stitch) has three types- 401, 404 and 406. These types of stitch is used for setting elastic in waist bands and decorative stitching on belts.

5.Class-500 (Over Edge Stitch):

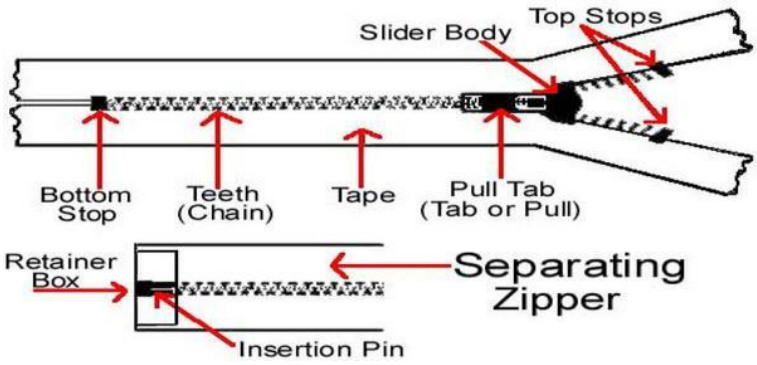
Class-500 named as over edge stitch which is formed with one or more groups of threads. In Class-500 (Over Edge Stitch), one group of thread passes around the edge of fabric so that no thread from the fabric can come out. The most used stitch of this type have one or two needle threads and one or two looper threads and thus forms a narrow band of stitching along the edge of the fabric.



Class-500 (Over Edge Stitch) has three types- 503, 504 and 512. This type of stitch is used for edge neatening of knitted fabrics, where extensibility of stitches is important, also used for sportswear and dance wear garments.

6. Class-600 (Covering Chain Stitch):
Class-600 named as covering chain stitch which is produced with three groups of threads. Here, threads of two groups can be seen from either side. In class-600 (Covering Chain Stitch), the first group of thread is called needle thread, second group is called top cover thread and the third group is called bottom cover thread.
Class-600 (Covering Chain Stitch) is very complex and up to 9 threads can be used in producing this types of stitch. Class-600 (Covering Chain Stitch) has three types- 602, 605 and 607. These types of stitch is used for knits, lingerie, binding elastics, decoration, etc.

8.8.12 Zipper:
It is a fastening device operated by means of two parallel rows of plastic or metal teeth on either side of a closure that are interlocked by a sliding tab is called zipper. Here, the teeth are carried in two zip fastener tapes which run the length of the zip and which are usually stitched into apparel and other textile products. It is an essential part of garments which is widely used in garments manufacturing sector. It can be used in functional or decorative purposes. It may be different in types and sizes. The function of one zipper is different from another.



8.8.12.1 Types of Zipper Used in Apparel Industry:
There are different type of zippers which are vastly used in **readymade garments sector** are mentioned in the below:

1. Concealed zipper:
This type of zippers is widely used for making the skirts of women.

2. Continuous zipper:
It is widely used for making the **garments** of men, women and children.
There are also some zippers which are provided with two sliders used for long coat or garments, but specially used for the large suitcase.
Different Parts of Zipper with Their Function:

Zippers consists with the below parts:
1. Zipper‘s tape,
2. Teeth or Chain,
3. Slider body,
4. Slider pin or teeth,
5. Stopper.

All the above zipper's parts have mentioned in the below with their functions:

1. Zipper tape:
It is a narrow fabric which has a high lateral strength and may be knitted or woven, being so constructed as to provide at one selvedge. For the suitable embodiment of the fastener elements is called zipper tape. It's produced by cotton, polyester, nylon or blended fibre. It is attached by sewing with the garments.

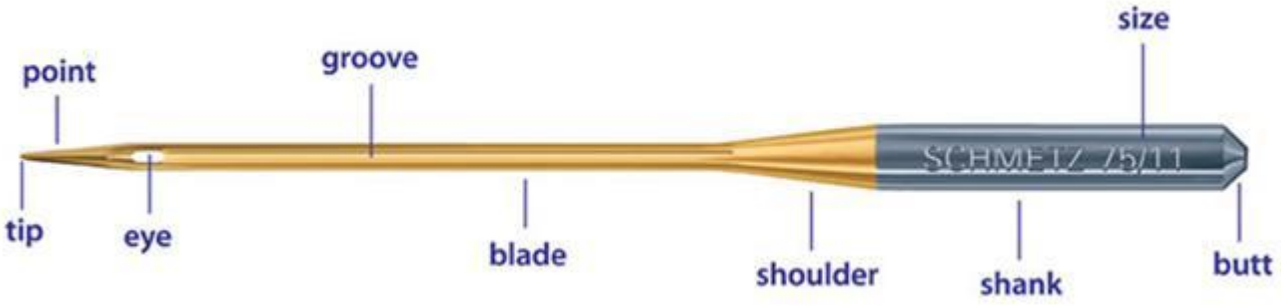
2. Teeth or Chain:
Teeth are made of brass, aluminum, nylon or plastic. It is opened and closed by these teeth.

3. Slider:
Slider is used to open and close the zipper's teeth or chain.

4. Slider pin:
Slider pin or teeth is used in the slider which keeps the slider from the unwanted movement.

5. Stopper:
Stopper controls the slider run out of the zippers.

9.8.13 The two most Important Things to know about choosing sewing m/c needles are the type and the size You should select the type of needle based on the textile construction (i.e. knit vs. woven), and the needle size is determined by the thickness of the thread and the weight of the fabric you will be using for your project.



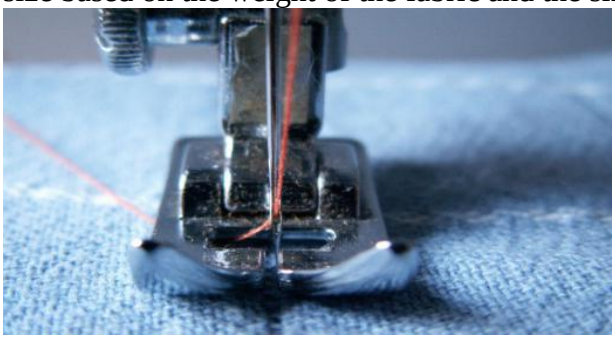
8.8.13.1 It Helps To Understand The Different Parts of a Home Sewing M/c Needle:
✓ The shank is the part of the needle that fits into your sewing machine, with the flat side to the back.
✓ The blade is what determines the needle size. (For example, a size 75 needle has a blade that is .75 mm in diameter.)
✓ The shaft is the ―body‖ of the needle, and the groove that runs the length of the shaft holds the needle thread. Did you know that the diameter of the thread you are using should take up no more than 40% of the groove?
✓ The point and tip of the needle refer to the size, shape and length — all of which vary based on the type of needle.
✓ The scarf of the needle is an indentation on the backside that allows the bobbin hook to smoothly grab the thread under the sewing machine throat plate to create a proper stitch.

8.8.13.2 Needle Types

There are three main types of needles that are used for the majority of sewing, as well as many specialty needles.

✓ Universal needles have a slightly rounded tip, and this general purpose needle should be used on wovens as well as some sturdy knits.
✓ Jersey needles have a medium ballpoint tip designed especially for knit fabrics because it slips between the knit fibers and does not break or damage them while sewing.
✓ Stretch needles, often confused with Jersey needles, are also a medium ballpoint tip, but these have a special eye and scarf that are designed for extremely stretchy fabrics and elastic. Swimwear is an ideal application for this type of needle.

In addition to the three most widely used needle types, there are also specialty needles for sewing with denim and leather, sewing suede, topstitching, needlepoint and embroidery, along with specific needles for quilting. Remember to select the needle first based on fabric type or usage, and then determine the correct size based on the weight of the fabric and the size of the thread you will be using.



8.8.13.3 Needle Sizing There are two needle sizing systems: American and European. American needle sizes range from 8 to 19, and European sizes range from 60 to 120. The larger the number, the larger the blade of the needle. Often you will see both sizing numbers on the needle package, such as 60/8 and 70/10. Home sewing machine needles are also classified as the 130/705 H system, which means they are for use in home sewing machines rather than industrial machines. That designation means the needles have a flat shank and a scarf.

8.8.13.4 Needle Lifespan Needles are one of the least expensive components in a sewing project, so feel free to change your needle with each new project. Sewing machine needles only have a lifespan of 6 to 8 hours of sewing time, but that can be even less if the fabric is particularly tough to sew. In short, change your needles often! Whatever you paid for your fabric, it was certainly more than the cost of a needle. It‘s not worth the risk of damaging your project by using a dull needle.

Garments finishing is an important section in readymade garments sector. It‘s the last section of garments manufacturing department. As all the others section of garments manufacturing, garments finishing section has also followed a process flow chart, which has explained in this article.

FINISHING SECTION IN TISWL

8.9 Flow chart of Finishing Section

Shade Check
↓
100% Inside Check
↓
100% Top Side Check
↓
Rejection Management
↓
Bottom Pull Test
↓
100% Measurement
↓
Rejection Measurement
↓
Get Up Check
↓
Hourly Audit
↓
Metal Detection Check
↓
Accessories Compliance
↓
Day Final audit
↓
Pre-Final audit
↓
Ready For Final audit

8.9.1 Process Sequence Flow Chart of Garments Finishing

Sewing garments received in finishing section
↓
Initial quality check
↓
Spot removing if there‘s any spot
↓
Ironing or pressing
↓
Inspection
↓
Hang tag attaching
↓
Folding
↓
Poly bag
↓
Metal check
↓
Packaging or cartoon

All the processes have discussed in the below table:

S/L No.	Process	Procedure
01	Sewn garments received in finishing section	Here, sewn garments are received for finishing the garments.
02	Initial quality check	Sewn garments are checked here by the quality controller. If found major sewing problems then garments sent again to the sewing section for rectification.
03	Spot removing if there‘s any spot	Sometimes garments contain various types of spots which are removed here carefully.
04	Ironing or pressing	It‘s one of the important processes in garments finishing. Here garments are ironed by following measurement chart of that garments.
05	Inspection	After completing ironing or finishing, garments are inspected again here by quality controller to confirm the correct measurement of the

		garments.
06	Hang tag attaching	In this section, hang tag have to attach with the garments.
07	Folding	After completing all the above processes, garments are folded here.
08	Poly bag	Garments are poly bagged here to keep the garments dust, dirt and other impurities free. send the garments safely in to the buyer.
09	Metal check	In this section, garments should be passed through a metal detector machine to identify metal lies in the garments.
10	Packaging or cartooning	Finally all the garments should pack to send the garments safely in to the buyer.

8.9.2 Garment finishing department's function are discussed below: Received sewing garments from sewing room:

Here, sewn garments are received from sewing department for finishing the garments.

Initial quality check:

Here stitched garments are initially checked by the quality controller. If their found any repairable or washable defects then garments need repair works in finishing section. But if found major sewing defects, fabric faults then again send to the sewing department for correction.

Washing: For wash garments, 100% check is required after receiving the garments from the sewing department. Defective garments should be rectified and reject pcs should be sorted out. If there are any faults like oil marks, stains, other dust and spots then garment washing must be needed. Some spots are

removed by using spot remover and dust and stains are removed by using machine wash inside the finishing section.

Button attached:

Button, button holes, snap button, eyelets are attached on garment in finishing section.

Tread trimming: Garment uncut treads are trimmed by helper in finishing section. Otherwise it creates major or minor defects in garment. **Ironing/pressing (inside):** To remove unwanted wrinkles or crease mark, garments are pressed by using steam iron. For getting actual garment measurement vacuum tables are used for garment ironing.

Quality inspection (inside) process wise:

After complete the inside ironing then inspect the quality of garments.

Ironing / pressing (outside):

If the inside garments quality inspection is done then it passes for outside pressing.

Quality inspection (outside) process wise:

Check the outside garments quality like measurement, placement of collar etc.

Re-pressing: When all the quality (like inside and outside) inspection is complete then garments are placed for re-pressing.

Inspection overall (out looks): Here, quality inspector ensures the overall out looks of garments.

Accessories attached: All kinds of garments accessories like hang tag, price tag, barcode etc are attached here.

Folding: Garments are folded here as following the buyer‘s instruction.

Shade sorting: Quality inspector checks the color shade sorting on garments. They calculate a shade number for each sample based on how close its color shade is to the standard.

Poly packing: After folding and color shade sorting garments are poly packed here as per buyer requirements.

Quality audit: Quality audit can be performed in the sewing section as well as in the finishing section. It is very effective quality control activity to achieve the quality target. Quality audit is done prior to final inspection.

Prepare a packing list: In this stage, finishing in-charge prepare packing list for cartooning and garment shipment also. After preparing packing list finishing department inform it with apparel merchandiser.

Assorting: Before cartooning finishing in-charge must confirm and follow the color and size wise assorting system.

Carton pack: Here all the garments should pack to send the garments safely in to the buyer.

Final inspection: If all the above processes are perfectly done, then apparel manufacturers are organized pre-shipment or final inspection on garments. After finished the garments, factory top management, merchandiser, production manager, QC, Finishing inspector and buyers representatives are to do this final inspection.

Record the documents: All details documents about production to shipment must be recorded or file up in the official desk.

QUALITY SECTION IN TISWL

8.10 Introduction: Quality means customer needs is to be satisfied. Failure to maintain an adequate quality standard can therefore be unsuccessful. But maintaining an adequate standard of quality also costs effort. From the first investigation to find out what the potential customer for a new product really wants, through the processes of design, specification, controlled manufacture and sale.
There are a number of factors on which quality fitness of garment industry is based such as - performance, reliability, durability, visual and perceived quality of the garment. Quality needs to be defined in terms of a particular framework of cost.
In the garment industry quality control is practiced right from the initial stage of sourcing raw materials to the stage of final finished garment. For textile and apparel industry product quality is calculated in terms of quality and standard of fibres, yarns, fabric construction, colour fastness, surface designs and the final finished garment products. However quality expectations for export are related to the type of customer segments and the retail outlets.

8.10.1 Objectives:
1. To maximize the production of goods within the specified tolerances correctly the first time.
2. To achieve a satisfactory design of the fabric or garment in relation to the level of choice in design, styles, colours, suitability of components and fitness of product for the market.

8.10.2 Requirements: The Quality System Requirements are based on the principle of PDCA Cycle.

8.10.3 Process Cycle
1. Understanding the customers' quality requirements.
2. Organizing & training quality control department.
3. Ensuring proper flow of quality requirements to the QC department.
4. Ensuring proper flow of quality requirements to the Production Department.
5. Establishing quality plans, parameters, inspection systems, frequency, sampling techniques, etc..
6. Inspection, testing, measurements as per plan.
7. Record deviations
8. Feed back to Production Department.
9. Plan for further improvement.

8.10.4 Establishing the Quality Requirements: The first step for quality control is to understand, establish & accept the customers' quality requirements. This involves the following steps.
1. Getting customers specifications regarding the quality
2. Referring our past performance
3. Discussing with the Quality Control Department
4. Discussing with the Production Department
5. Giving the Feed Back to the customers
6. Receiving the revised quality requirements from the customers
7. Accepting the quality parameters

8.10.5 Various Steps of Inspection & Quality Control: The following levels are discussed at the Garment Making Department assuming that this department is receiving the ready to cut dyed & finished fabrics from the Dyeing & Finishing Department. **9.10.6 Before or Pre-production Inspection** The following parameters & defects are checked prior to cutting.

1. Shade Matching
2. Fabric Construction
3. **GSM** (grams per square meter)
4. Whales & courses if required)
5. Diameter
6. Dyeing Levelness
7. Ecological parameters if required
8. Softness
9. Shrinkage
10. Matching of Rib, Collars & Cuffs
11. Fabric Holes
12. Vertical & Horizontal Stripes
13. **Knitting defects** such as missing loops, sinker lines, etc.
14. Bowing
15. Skewing
16. **Yarn defects** such as thick & thin places
17. Dirts & Stains

8.10.7 During Production Inspection

1. Verify cutting patterns
2. Cut components measurements
3. Cutting shapes
4. Fabric defects
5. Other specific parameters as required by the customers Rib, Collars & Cuffs matching
6. Stitching defects
7. Sewing threads matching
8. Dirts & Stains
9. Measurements
10. Labels
11. Trims & Accessories

8.10.8 Before Production Inspection Many of the important parameters of Pre-productions, During productions & Final inspection parameters. This is to ensure that wrong or major defective garments are not packed.

8.10.9 Final Inspection A. Packing & Assortment

1. Wrong Model
2. Wrong Quantity
3. Missing labels & tags
4. Wrong Size & Colour assortment
5. Wrong Folding

B. Fabric Defects
1. Wrong Shade
2. Uneven dyeing
3. Holes
4. Knitting stripes
5. Thick & Thin places
6. Dirt & Stains
7. Oil stains
8. Sinker line
9. Poor softness
10. Higher Shrinkage
11. Crease Marks

C. Workmanship Defects
1. Open seam
2. Puckering
3. Needle holes & marks
4. Unbalanced sleeve edge
5. Unbalanced placket
6. Insecure shoulder stitch
7. Incorrect side shape
8. Bottom hem bowing
9. Uneven neck shape
10. Cross labels
11. Broken & Missing stitch
12. Insecured buttons
13. Untrimmed threads & fabrics
14. Poor Ironing
15. Double stitch

D. General Defects
1. Shade variation within the garment parts
2. Shade variation between the garments
3. Defective printing
4. Defective embroidery
5. Defective buttons

E. Measurement Deviations Compare the garment measurements against the Customers' Measurement Charts. Following are the some of the important garments' measurement aspects to be considered.
1. Garment length
2. Body width
3. Shoulder length
4. Arm hole
5. Arm Opening
6. Sleeve length
7. Placket length
8. Placket width
9. Neck width
10. Neck opening
11. Hemming width
12. IRib or Collar width

8.10.10 Acceptable Quality Level (AQL) in Garment Industry

The term AQL stands for acceptable quality level or acceptance quality level. It is one of the most used terms in readymade garments industry when it comes in consideration to quality. It should be noted here that, most of the acceptance decisions of garment export order shipments are made on the basis of AQL based sampling plans. To ensure the right quality products, an AQL chart has to follow during inspection of apparel which varies from product to product, process to process and even buyer to buyer. Acceptable Quality Level (AQL) has great importance in ready-made apparel business.

Acceptable Quality Level (AQL) refers to the maximum number of defective items that could be considered accepted during the random sampling of and inspection. It is expressed in a percentage (%) number of average defective items where average defective item is the multiple result of total number of defective items found during inspection and total number of items inspected.
The faults or defects which are found during inspection are mainly classified into four categories:
1. Critical: Must be 100% accurate. There is no range.
2. Major: Normally 2.5%
3. Minor: Normally 4%
4. Slight: Normally 6.5%

8.10.10.1 Types of AQL System Followed in Apparel Industry:

There are total six types of acceptable **quality** level (AQL) system followed in garment manufacturing industry which are pointed out in the below:
1. AQL-1.0%,
2. AQL-1.5%,
3. AQL-2.5%,
4. AQL-4.0%,
5. AQL-6.5%,
6. AQL-10%.

8.10.10.3 AQL (Acceptable Quality Level) A certain proportion of defective will always occur in any manufacturing process. If the percentage does not exceed a certain limit, it will be economical to allow the defective to go through instead of screening the entire lot. This limit is called the "Acceptable Quality Level" (AQL) Considering the practical & economic aspects, Sampling Techniques are adopted to Accept or Reject a Lot on the basis of the Samples drawn at Random from the lot. It has been found and accepted that a scientifically designed sampling & inspection plan protects a Manufacturer as well as the Buyer economically. American Military Standards known as MIL-STD-105A to 105E is accepted world-wide for sampling sizes. It has the following sample size levels. Normally for Garment Industry 105D or 105E are followed.
1. Special Inspection Levels (S1, S2, S3 & S4)
2. General Inspection Levels (I, II & III)
3. It has various AQL levels from 0.040 to 25 for Accepting or Rejecting the lots. Normally for Garment industry, the AQL levels of 2.5, 4.0 and 6.5 are followed.

8.10.10.4 Ecological Parameters: Now all the Customers are asking for Ecological Parameters. Now European Buyers are stressing this. Following are main Ecological Parameters to be considered.
1. pH range
2. Formaldehyde levels
3. Extractable heavy metals
4. Chlorinated phenols (PCP, TeCP)
5. Forbidden Amines of MAK III A1& A2 categories
6. Pesticides
7. Chlorinated Organic carriers
8. Biocide finishes

9. Flame retardant finishes
10. Colour fastness to Water
11. Colour fastness to acid & alkali perspiration

12. Colour fastness to wet & dry rubbing
13. Colour fastness to saliva
14. Emission of volatile chemicals
15. Other specific parameters as required by the customers

INDUSTRIAL ENGINEERING IN TISWL

8 .11 Introduction:

At present Industrial Engineering (IE) is one of the important department for each garments or textile factory. Today's maximum factory is run by industrial engineers, where they have to follow a process flow chart. By which they can easily control the whole garments production processes**.** Such kinds of process flow chart has discussed in this article.

8.11.1 Process Flow Chart of Industrial Engineering (IE):

Negotiation with **garments merchandiser**
↓
Garments analysis
↓
Make **P.P meeting** if all the required fabrics, **trimmings and accessories** are in housed
↓
Production target
↓
Set machine layout
↓
Line setting
↓
Line balancing
↓
Continuous production meeting
↓
Collecting production data
↓
Preparing production report
↓
Production report analysis
↓
Report submit to factory manager

All the above processes are discussed in the below table:

SL No.	Process	Procedure
01	Negotiation with garments merchandiser	It is the very first work of an industrial engineer. Here, he should vastly discussed with garments merchandiser about the in-coming garments product.
02	Garments analysis	Confirmed garments

		product is clearly analyzed here by industrial engineer. It helps to complete rest of the processes very easily.
03	Make P.P meeting	Here, P.P meeting should be organized if all the required fabrics, trimmings and accessories are in housed and take all the pre-cautions for the up-coming garments production.
04	Production target	Production target should set here according to factory capacity. It helps to respect the shipment date.
05	Set machine layout	Machine layout is set here according to total processes needed to complete a garment item.
06	Line setting	In this process, actual line setting should be done to utilize the garment workers properly. If it takes more time in line setting then garments production will be decreased.
07	Line balancing	To minimize the number of work stations, cycle time, line balancing is done here. Its a very important process to achieve desired production target.
08	Continuous production meeting	Production meeting should be done here at regular interval. If any problem will arise during garments production, should take necessary actions to solve that.
09	Collecting production data	Production data should be collected here for preparing production report.
10	Preparing production report	Here, total garments production report has prepared to analysis about the whole production.
11	Production report analysis	Garments production report is analyzed here from different points of view.
12	Report submit to factory manager	Finally garments production report have to

		submit into the factory manager.

8.11.2 Line Balancing in Apparel Production

Line Balancing Line Balancing is leveling the workload across all processes in a cell or value stream to remove bottlenecks and excess capacity. A constraint slows the process down and results if waiting for downstream operations and excess capacity results in waiting and absorption of fixed costs.

It is the allocation of sewing machine, according to style and design of the garments. It depends on what types of garments we have to produce. It is done to increasing productivity. When you consider mass production, garments are produced in lines or set of machines instead of single machine. A line may be assembly line, modular line or section, a line set with online finishing and packing. A line includes multiple work stations with varied work contents. Production per hour is varied depending on work content (standard minutes of particular task/operation), allocation of total manpower to a particular operation, operator skill level and machine capacity. Operation with lowest production per hour is called as bottleneck operation for that line.

8.11.3 Objectives of Line Balancing Match the production rate after all wastes have been removed to the talk time at each process of the value stream.
1. Regular material flow.
2. Maximum uses of man power and machine capacity.
3. Minimum process time.
4. Minimizing slack time.
5. Minimizing workstation.
6. Maximum output at the desired time.
7. Quality maintenance of the garment.
8. Reduce production cost.

8.11.4 Importance of Line Balancing
1. Line balancing helps to know about new machine required for new style.
2. It becomes easier to distribute particular job to each operator.
3. It becomes possible to deliver goods at right time at the agreed quality for list cost.
4. Good line balancing increase the rate of production.
5. Line balancing helps to compare the required machinery with the existing one and compare balance.
6. It also helps in the determination of labor requirement.
7. Good balancing reduces production time.
8. Profit of a factory can be ensured by proper line balancing.
9. Proper line balancing ensured optimum production at the agreed quality.
10. It reduces faults in the finished product.

8.11.5 Example of Line Balancing 1. Machine layout with actual production.
- Process#1. Production 40 pieces by 1 machine end production 40 pieces.
- Process#2. Production 45 pieces by 1 machine end production 40 pieces.
- Process#3. Production 75 pieces by 1 machine end production 40 pieces.
- Process#4. Production 80 pieces by 1 machine end production 40 pieces.
- Process#5. Production 50 pieces by 1 machine end production 40 pieces.

Output: 40pices/hour. **Analysis:** Insufficient production due to lack of supply.

9.11.6 Limitations of Line Balancing

1. Production lines were designed so that conveyor belts paced the speed of the employees‟ work. This arrangement wasn't appreciated by the employees.
2. Inevitable changes lead to production lines being out of balance.
3. Rebalancing causes disruptions to production

8.11.7 Role of Industrial Engineer in Garment Industry Each executive/supervisor has eight areas of responsibility that need to be managed.

1. Safety
2. Line balancing
3. Quality – operation control
4. Training – how to train new employees
5. Operator output – maintains high output and improves abilities of those with low output.
6. Loss control – minimize off-standard loss
7. Waste control – in materials, supplies and machinery
8. Standard conditions – in the workplace, in sewing method, in the machines

Executive as a leader A good way of showing leadership is to be a good example for others. Every executive/supervisor represents the company and any of his/her actions are an extension of the Maintenance

- Quality work
- Productivity

Authority is usually earned but from the beginning, executives will be assigned to do the following tasks that require authority:

1. Employee transfers between the operations
2. Assigning of off-standard tasks
3. Overtime planning
4. Rejecting defective product
5. Disciplinary actions
6. Recommendations for dismissal

Employee respect will depend on how an executive/supervisor acts as a leader and uses his/her authority to benefit all employees in his/her department.

8.11.8 Obligations of an executive To manage effectively, an executive/supervisor should identify and divide his/ her obligations to primary and secondary. He/she must first take care of primary obligations adequately. In some cases this means that secondary obligations will have to be delegated to someone under the supervisor‟s authority.

Primary obligations

- Provide safety
- Plan and balance production lines
- Control quality
- Develop employees
- Follow up on low output employees
- Material utilization
- Discipline

Secondary obligations

- Bundle handling and movement
- Adjustments to machines
- Distributes supplies
- Handle parts that needs reprocessing
- Samples
- Maintenance
- House keeping
- Miscellaneous

8.11.9 Daily activities of an executive First thing in the morning Arrive early

- Greet arriving employees
- Encourage them to start work early
- Check attendance •
- Make adjustments to balance the line according to absence.
- Attend production meeting and discuss yesterday‘s results and today‘s targets and plans.
- Plan

.....How to increase efficiency? .....How to improve outgoing quality? .....How to prepare for routine problems or problems that might arise?

8.11.10 During the day

- Measure the target vs. actual output every hour
- Check quality level
- Check inline and end line quality reports
- Discuss with quality inspectors Perform quality drill
- Work with low output operators
- Check proper method
- Motivate and empower operator
- Follow up on new operators in training
- Follow up on operator in re-training
- Identify the bottle neck operations and balance accordingly
- Provide immediate and continuous follow-up to repairs
- Monitor and follow up on bundle tracking and outgoing bundles.
- Authorize any off-standard ―clock-out‖
- Order supplies and material for production

At the end of the day

- Make sure the operators have turned off their machines, cleaned their work area, kept a piece of fabric under the pressure foot, and covered their machine.
- Check and authorize the production work sheet
- Organize production sheets and check the last hour production with the sheet.
- Review the hourly production report and WIP report
- Analyze the next day‘s needs and take notes for implementation
- Calculate the next day‘s initial inventory according to production information

Weekly

- Review the capacity studies of low output operators
- Plan operator cross training to solve balancing problems

As and when required

- Resolve any operator efficiency problems
- Follow up and motivate new employees
- Work out quality problems with quality inspectors
- Work out problems with operators; review the proper method with them when necessary

8.10.11 Concept of IE

The garment manufacturing and exporting industry is facing heavy challenges due to various factors including global competition, production costs increase, less productivity/efficiency, labor attrition, etc. the basic fact that our country has immense strength in human resources itself is the motivating aspect to feel for such an analysis. For overcoming those challenges our need industrial engineering knowledge. Industrial engineers (IEs) are responsible for designing integrated systems of people, machines, material, energy, and information. Industrial engineers figure out how to do things better. They engineer processes and systems that improve quality and productivity. They work to eliminate waste of time, money, materials, energy, and other resources. This is why more and more companies are hiring industrial engineers and then promoting them into management positions. .
We can see at a glance of IE,

Industrial Engineering (IE) = Production ↑ **Cost** ↓ Proper use of all elements ↑ Efficiency ↑ Profit ↑ I‘m giving some formula for Industrial engineering students or professionals. If those help them then I will be thankful.

CONCLUTION

Conclusion: At the end of the Internship report, we complete that **Denim Attires Ltd** is one of the biggest renowned Garments where they always maintain maximum complacence and try their best to keep their commitment in best product quality and wash. We are really pleased and proud to being with them for a long training period. So, we have also observed that they are handling some famous buyers. It proves that they are best in Garments production capability with better product equity.

We hope and pray that, **Denim Attires Ltd** will continuous their journey and definitely will make sure that they are the top of the country.

We have completed our Industrial Training in **Denim Attires Ltd** with great pleasure. We observed a lot of things in this Garments Industry and gained a huge ideas and knowledge about Garments production. These will play a very important role in my job life to build our career.

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