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Sonargaon University (SU)
সোনারগাঁও ইউনিভার্সিটি (এসইউ)
WE WILL RISE UP WE WILL SHINE

Faculty of Science & Engineering

Department Of Textile Engineering

REPORT ON

Industrial Attachment

Faculty of Science & Engineering
Department of Textile Engineering
B.Sc. in Textile Engineering, Examination
Major: Apparel Manufacturing
Batch: 12B

Course Title: Industrial Attachment Sessional

Course Code: Tex-442

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This Report presented in partial fulfillment of the Requirement for the Degree of Bachelor of Science in Textile Engineering.

Declaration

We hereby declare that, this Industrial Attachment on **The Civil Engineering Limited** is done by us under the supervision of **Md. Kamrul Hasan**, Lecturer & Co-ordinator, Department of Textile Engineering, Sonargoan University. We also declare that, this Industrial Attachment Report has not been submitted anywhere for award, degree or diploma. We ensure that, any part of this attachment has been presented anywhere.

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Supervisor Certificate

At first, we want to dedicate this Industrial Attachment Report to the almighty ALLAH. Then we have also dedicated it to our parents, who give us lot of support all time. We have also dedicated this report to our honorable supervisor **Md. Kamrul Hasan**, Lecturer & Coordinator, Department of Textile Engineering, Sonargaon University who helped us a lot to complete this report properly & perfectly.

.....

Md. Kamrul Hasan,
Lecturer & Coordinator
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Acknowledgement

First of all, we express our gratitude to our Almighty for blessing, approval, protection, mental power & wisdom in all aspects of our lives & also for giving us the opportunities to complete the industrial attachment successfully. Sonargoan University has given us the opportunity to perform the internship. We are deeply indebted to our supervisor of **Md. Kamrul Hasan**, Lecturer & Coordinator, Department of Textile Engineering, who help, suggestion and encouragement helped us in all the time to research and writing the report.

Abstract

For any technical education, practical experience is almost equal important in association with the theoretical knowledge. By means of practical knowledge it's not possible to apply the theoretical knowledge in the practical field. Industrial attachment is the first step to professional life of student, especially of technical side. It's an indispensable part of study a practically running processing technology of an industrial unit for a student. University education provides us vast theoretical knowledge as well as more practical attachment, in despite of all these industrial attachment helps us to be familiar with technical support of modern machinery and skills about various processing stages.

This internship provides me sufficient practical knowledge about production management, efficiency, industrial management, purchasing, inventory control, utility and maintenance of machineries and their operation techniques etc. which cannot be achieved successfully by means of theoretical knowledge only. We were able to study on their different sections and their activities practically. Due to some limitation of the factory, we have found store section, cutting section, sewing section, finishing section and maintenance section. Here we have also found the sample section but this section isn't fully operational as here only the size set and production samples are produced. All the activities of this factory are performed according to the central orders of the company. This company works for Academy buyer and sometimes works for Pritha which is an own buying house of this group of company. During my internship we got the opportunity to study on some orders, from order receive to the delivery of the order. With the help of my supervisor we have acquired the knowledge of handling an order, the production procedure and the inspection procedure to maintain the quality of these orders. We have also learnt about the office management of this factory.

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Chapter One
Introduction

1.1 Introduction

The developments in spinning systems from mule spinning, cap spinning, flyer spinning and ring spinning to rotor spinning, airjet spinning shows an ultimate way to spin yarn. The compact spinning is one of the major development in the history of spinning due to improved properties of compact yarn over conventional ring yarn.

1.2 Explanation of spinning process

Spinning is the process of conversion of textile fibers and filaments into yarns for weaving or knitting into fabrics. In this article, we are going to know about the various processes which lead to the formation of worsted spun yarns.

Worsted spun yarns differ from the regular woollen yarn in various properties. Only fibers with long staple length (4 inches or longer) are taken for further processing. The yarns are carded and combed thus making them stronger, finer and smoother. Worsted yarns are used mostly for weaving as it is able to withstand the rigorous weaving process and produce smooth woven fabric.

The spinning of worsted spin yarn is carried on through the following process

Input	**Manufacturing Process**	**Output**
Cotton bale →	Blow-room →	Lap
Lap →	Carding →	Carded silver
Carding silver →	Drawing →	Draw silver
Drawn silver →	Simplex →	Roving
Roving →	Ring-spinning (Spinning Frame) →	Yarn (Spinning bobbin)
Spinning bobbin →	Winding(Auto coner) →	Cone

The yarn issuing from the drafting rollers passes through a thread-guide, round a traveler that is free to rotate around a ring, and then onto a tube or bobbin, which is carried on to a spindle, the axis of which passes through a center of the ring. The spindle is driven (usually at an angular velocity that is either constant or changes only slowly), and the traveler is dragged around a ring by the loop of yarn passing round it. If the drafting rollers were stationary, the angular velocity of the traveler would be the same as that of the spindle, and each revolution of the spindle would cause one turn of a twist to be inserted in the loop of yarn between the roller nip and the traveler. In spinning, however, the yarn is continually issuing from the rollers of the drafting system and, under these circumstances, the angular velocity of the traveler is less than that of the spindle by an amount that is just sufficient to allow the yarn to be wound onto the bobbin at the same rate as that at which it issues from the drafting rollers. Each revolution of the traveler now inserts one turn of twist into the loop of yarn between the roller nip and the traveler but, in equilibrium, the number of turns of twist in the loop of yarn remains constant as the twisted yarn is passing through the traveler at a corresponding rate.

Spinning is the process, which is used in the production of yarns or filament from fiber or from the chemical compound. Spinning is the first step to produce a textile product such as fabric, garments, home textile etc. In a spinning industry, several processes are done to produce yarn. There are also used some special machine for different processing purposes.

1.3 Process description of spinning:

1. **Bale Management:** Fiber is collected from the cotton plant. After that, all the fiber is processed to remove different types of large dust like plant leaf, soil and other impurities from the fiber. Finally, fiber bale is made with weight (218 to 225 kg) and sizes (1.400 X 0.53 X 0.69 m). Generally, the bale is a compressed lint after ginning which is tied with wire.

2. **Blow Room:** Blow room is the second step of spinning where the bale is opened and arrange one by one according to bale information for fiber mixing. In the bale, there is some information are recorded like color grade, weight (218 to 225 kg), sizes (1.400 X 0.53 X 0.69 m), batch number etc. The **objective of this process** produces the fiber lap.

3. **Carding / Carding Machine:** The lap is supplied to the carding machine to produce carded sliver. The objective of this process to straight the fiber and remove the short fiber.

4. **Draw Frame:** Draw frame is the machine, where two or more carded sliver is drafted between 3 drafting roller to produce one drawn sliver. From this 3 roller, the last roller has more speed than the previous (second) roller and the second roller has more speed than the first roller. If there need more drafting second draw frame also used.

5. **Simplex / Speed Frame:** The drawn sliver is processed into the simplex/speed frame to produce roving yarn which is little larger diameter than final yarn. The roving yarn is made without twist and its strength is very low.

6. **Ring Frame:** Ring frame machine is used to twist the roving yarn and produced the finished yarn. By this process, yarn gets good strength for twisting.

7. **Auto Coner:** Basically, Auto coner is used for making different length and size cone package. After that yarn is ready for delivery and used.

1.4 Bale Management for Spinning Industry

Bale management is a judicious selection of cotton bales to achieve consistent performance and quality in spinning mills. The performance of spinning process and yam quality will depend upon the mixing quality and consistency in the mixing quality. How to get a better consistent mixing quality with available results are detailed in this article.

1.5 Influence of Fibre Properties

Fibre properties which will influence the yarn quality and hence the process performance is shown in figure as published by Uster Technologies. Length and micronnaire value will influence all the yam quality parameters. Hence formulating the mixing based on these two parameters with controlled condition will result better yarn and performance.

1.6 Model mixing formulation

Within the mixing the range of length should be 2 mm and between mixing it should be less than 0.5 mm preferably uniform. In case of micronnaire within mixing the CV% should be less than 8 per cent and between mixing it should be less than 0.1. These are Uster recommendation to get better yarn results.

1.7 Laydown:

Care should be taken that no two bales of same variety or lot placed near to enhance mixing homogeneity. Give different color for easy identification to all the lots and make sure to place them uniformly distributed in the single repeat; then repeat the repeat to the full marked laydown area. There are 10 different lots to be mixed in our above example and laydown arrangement shall be as follows(with two repeats) for better homogeneity.

1.8 Mixing based on individual bale results

The above example is based on lot results, it will give good results and avoid mix to mix variation. However, if the between bale variation in the given lot is high, the results may be not so consistent.

Hence real bale management is based on individual bale results of all lots and the mixing will be based on the individual bale results. Each bale is given identification number and results are stored in system with bale identification number. The mixing formulation is explained with the following example.

In tested all the bale results, the micronnaire distribution observed is as follows, The eliminated bales can be used for lower grade or Open end mixing. For convenience of handing first two ranges are clubbed together as 4.81 to 5.00, then there will be 8 categories and it can be named as A to H. The bales are stored at godown according to the category.

1.9 Blow Room:

Blow room is the initial stage in spinning process. The name blow room is given because of the "air flow" And all process is done in blow room because of air flow. Blow room is consisting of different machines to carry out the objectives of blow room. In blow room the tuft size of cotton becomes smaller and smaller. In a word we can say a section in which the supplied compressed bales are opened, cleaned & blending or mixing to form uniform lap of specific length is called Blow room section. During the opening, cleaning, blending or mixing

different faults or defects occur in blow room. Now I will discuss about faults/defects, causes and way to remedies in blow room section.

1.10 Problems/Faults/Defects in Blow Room:

1. Low cleaning efficiency
2. High nep generation and fibre rupture
3. High variability in the delivered hank
4. Formation of cat's tail
5. Conical lap
6. Lap licking
7. Patchy lap
8. Holes in lap
9. Soft laps
10. Ragged lap selvedge

1.11 Carding:

The carding is the second process of spinning which converts fed material (lap) into uniform strand of fibres called ***"sliver"***. The good quality carding of cotton is very important because the yarn quality very much depends upon it. The neps percentage in the yarn varies according to quality of carding process. ***"The carding is called heart of spinning".*** In the carding process, the material gets passed through carding machine. The fibres are made parallel to each other. The fibres tangle in this operation, thus it makes possible to remove the all types of impurities present in the cotton. The carding, stripping and raising action take place during carding operation. In this way, continuous uniform sliver having parallel fibre arrangement almost free of impurities is obtained after carding process.

1.12 Objectives of carding:

The main objectives of carding process are given below:

• To open the cotton tufts fully (individual fibres of cotton tuft get opened in carding process).

- To make the fibres parallel to one another along the length of sliver.

- To eliminate maximum impurities present in the cotton. (to achieve higher degree of cleanness. Today's carding machine achieves 90 to 95% degree of cleanness. In this way overall degree of cleanness in the blow room and carding is 95 to 99%. A card sliver still contains 0.03 to .05 % foreign matter in it).
- To remove very short fibres which could not be spun into yarn.
- To remove all the neps present in the material generating in the previous process like blow room and mixing.
- To blend the fibres and to achieve fibre to fibre mixing.
- To finally convert the web of cotton into uniform sliver.

1.13 Structure of carding machine:

The common structure of a carding machine is illustrated in below schematic diagram:

• Pipe ducting.

• Chute feed.

• Transport roller

• Feed arrangement

• Licker-in,

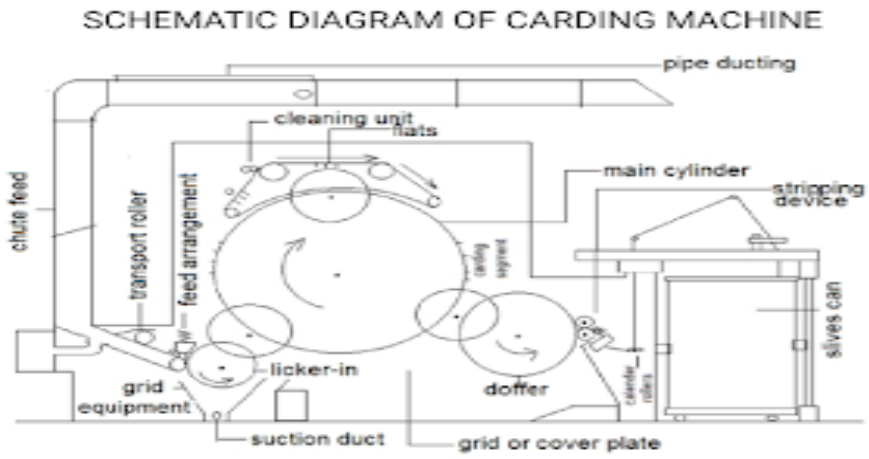

Figure-1.1: Structure of carding machine

• Suction duct l

• Main cylinder.

• Carding segments.

• Flats.

• Cleaning unit.

• Grid or cover plate.

• Doffer.

• Stripping device.
• Calendar rollers.
• Sliver can.

1.14 The Main Operations Or Functions Of Simplex Machine

Various types of objectives are achieved by simplex machine. Followings are the main functions of simplex machine –

- Creeling: Creeling is the first objective of simplex frame arrangement. By the creeling, small amount of draft is applied to the drawn sliver.
- Drafting: Attenuation of drawn sliver to produce required amount of roving by drafting. Thick drawn sliver is converted into thin roving by drafting system.
- Twisting: Small amount of twist is inserted in the drafted stand of fibres by the twisting. The amount of twist is very low.
- Building: Build the roving on to bobbin such a form which will facilate unwinding, handling and transfer to the next process.
- Winding: Produced or twisted roving is wound on the bobbin by the winding process. This bobbin is feed to the ring frame and this bobbin accelerates the next process. So, it is important.
- Doffing: It is the optional function of speed frame. Doffing could be done manually or automatically.

So, simplex frame plays an important role in the spinning process. Various types of yarn faults could be appear for the wrong drafting or twisting. For this reason, the operator should be careful during the process.

Chapter Two
Textile Dyeing

2.1 Introduction

Color is an extremely important aspect of modern textiles. The color of a textile product is a major factor in the marketing and use of that product. The color of textiles can be used to differentiate groups of people such as uniforms used for athletic teams, hospital personnel or military organizations. Color can also be functional such as camouflage or protective uniforms. However, in the modern retail store, the color of textile products is a major contributor to what is referred to as fashion. The color is very important with apparel, carpet, upholstery, curtains, drapes, sheets and towels. All of the items are marketed with an emphasis on their specific color.

2.2 Flow Chart of Wet Processing (Cotton)

Grey Fabric Inspection

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Sewing or Stitching

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Brushing

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Cropping

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Singeing

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Desizing

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Scouring

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Blessing

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Souring

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Washing

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Drying

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Mercerizing

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Dyeing

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Printing

↓

Fixing/ curing

↓

After treatment

↓

Finishing

↓

Final inception

↓

Packing

Grey Fabric Inspection: Grey fabric inspection is the process of identifying weaving faults in the fabric just after the grey fabric production in the loom.

Sewing or Stitching: In the textile arts, a stitch is a single turn or loop of thread, or yarn. Stitches are the fundamental elements of sewing, knitting, embroidery, crochet, and needle lace-making, whether by hand or machine. A variety of stitches, each with one or more names, are used for specific purposes.

Brushing: This process, applied to a wide variety of fabrics, is usually accomplished by bristle-covered rollers. The process is used to remove loose threads and short fibre ends from smooth-surfaced fabrics and is also used to raise a nap on knits and woven fabrics.

Cropping : Cropping or shearing mean Cropping Shearing To harvest or reap cropping Wool fiber is preferred for this process is the process of removing of protruding fibers from surface of fabric.

Singeing: The process of removing the loose hairy fibers/projecting fibers/protruding fibers from the surface of the textile materials (Yarn, Fabric) is called Singeing.

Desizing: the process of removing the size material from warp yarns after a textile fabric is woven.

Scouring: Scouring is the first process carried out with or without chemicals, at room temperature or at suitable higher temperatures with the addition of suitable wetting agents, alkali and so on. Scouring removes all the waxes, pectins and makes the textile material hydrophilic or water absorbent. See also scouring wool.

Blessing: a special favor, mercy, or benefit: the blessings of liberty. a favor or gift bestowed by God, thereby bringing happiness. the invoking of God's favor upon a person: The son was denied his father's blessing. praise; devotion; worship, especially grace said before a meal: The children took turns reciting the blessing.

Souring: The process by which the alkali are removed from the scoured fabric with dilute acid solution is known as **souring**. Bleaching: The process by which the natural colours (nitrogenous substance) are removed from the fabric to make the fabric pure & permanent white is known asbleaching.

Washing: is a technology which is applied to change or modify the outlook, appearance, comfortability, and design of garments. Garment washing is applied on solid dyed garments or solid printed fabric.

Drying: is a mass transfer process consisting of the removal of water or another solvent by evaporation from a solid, semi-solid or liquid. This process is often.

Mercerization: is a process in which textiles (typical- ly cotton) are treated with a caustic (NaOH) solution to improve properties such as fiber strength, shrink- age resistance, luster, and dye affinity. The caustic actually rearranges the cellulose molecules in the fiber to produce these changes.

Dyeing: A dyeing process is the interaction between a dye and a fiber, as well as the movement of dye into the internal part of the fiber. Generally, a dyeing process involves adsorption (transfer of dyes from the aqueous solution onto the fiber surface) and diffusion (dyes diffused into the fiber).

Printing: Printing is a process of decorating textile fabrics by application of pigments, dyes, or other related materials in the form of patterns. ... Printing styles are classified as direct, discharge, or resist. In direct printing, colored pastes are printed directly on the cloth.

Fixing : What is "Fixing agent"? After dyeing process, fabric has unfixed dyestuff on the surface and if it becomes final goods, it causes color migration when it is wet or during washing. Fixing agent is to be applied to dyed fabric to fix the unfixed dyestuff on fabric. It improves wet color fastness and fabric quality.

After treatment: In textile manufacturing, finishing refers to the processes that convert the woven or knitted cloth into a usable material and more specifically to any process performed after dyeing the yarn or fabric to improve the look, performance, or "hand" (feel) of the finish textile or clothing.

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Inspection : It is an inspection in the manufacturing process, and refers to the inspection performed in the final stage of manufacturing process. ... In the Final Inspection, the whole of the product including the requests from customers is inspected.

Packaging: Textiles. Packaging textiles include all textile packing material for industrial, agricultural and other goods. The demand for packing material is directly proportional to economic growth, industrial production and trade as goods are produced and then distributed both locally and internationally.

2.3 Dyeing chemicals and their selection process

Introduction Production of colored textiles is one of the basic technologies in human civilization. Textile consumption is steadily increasing worldwide, following the growth of world population and stimulated by a growing GDP in many countries, primarily in Asia .The scale and growth of the dyes industry has been complicate linked to that of the textile industry. World textile production has grown steadily to an estimated 35 ×1000000 ton in 1990 . The two most important textile fibers are cotton and polyester. Consequently, dye manufacturers tend to concentrate their efforts on producing dyes for these two fibers. The estimated world production in 1990 was 1x 1000000t. The figure is significantly smaller than that for textile fibers because a little dye goes a long way. For example, 1 t of dye is sufficient to color 42 000 suits . Overall the demand of dyeing chemicals are rapidly increasing from the beginning of industrialization of textile.

Textile Coloration: Textile coloration is a generalize process of textile where the fiber become colored by specific dyestuff with the help of dye- fiber interaction. In textile dyeing process , the use of dyestuff is mandatory.

Dyes: Dyes are the chemical which is use to make colored textile. It has a vast derivative area . Here we are giving a short discussion about dyestuff classification and their selective methodology below.

Classification of Dyes: There are several ways for classification of dyes. Those are listed below, Dyes according to the source A very common classification of the dyestuff is based on the source from which it is made. According to source, dyes are generally two types. Those are as follows,

- Natural dyes
- Synthetic dyes

Natural: dyes Man has been used coloring materials over thousand years. Most of that case the sources of these coloring materials are nature. Which dyes are the common derivatives of natural resources those are called as natural dyes. Natural dyes are often negatively charged. For special case it might be 3 positively charged. Although the molecular charge is often shown on a specific atom in structural formulae, it is the whole molecule that is charged. The use of dyes is very ancient. Kermes (natural red 3) is identified in the bible book of Exodus,

where references are made to scarlet colored linen. Today, many of the traditional dye sources are rarely but some of our most common dyes are still derived from natural sources. These are also termed as natural dyes.

Synthetic Dyes: Dyes derived from organic or inorganic compound are known as synthetic dyes. Examples of this class of dyes are Direct, Acid, Basic, Reactive, Mordant, Metal complex, Vat, Sulfur , Disperse dye etc.

2.4 Now a brief discussion about some of most popular dyes are listed below :

Direct dyes: The name 'direct dye' alludes to the fact that these dyes do not require any form of 'fixing'. They are almost always azo dyes, with some similarities to acid dyes. They also have sulphonate functionality, but in this case, it is only to improve solubility, as the negative charges on dye and fibre will repel each other. Their flat shape and their length enable them to lie along-side cellulose fibres and maximise the Van-der-Waals, dipole and hydrogen bonds. Structure of a typical direct dye is given below, Note that the sulphonate groups are spread evenly along the molecule on the opposite side to the hydrogen bonding -OH groups, to minimise any repulsive effects.

Vat dyes: Vat dyes are a good example of the cross-over between dyes and pigments. Large, planar and often containing multi-ring systems, vat dyes come exclusively from the carbonyl class of dyes (for example, indigo). The ring systems of the vat dyes help to strengthen the Van-der-Waals forces between dye and fiber.

Basic dyes: Basic dyes possess cationic functional groups such as -NR3+ or =NR2+. The name 'basic dye' refers to when these dyes were still used to dye wool in an alkaline bath. Protein in basic conditions develops a negative charge as the -COOH groups are deprotonated to give -COOBasic dyes perform poorly on natural fibres, but work very well on acrylics. A general structure of an acrylic type polymer is shown below. It is simplified, and doesn't show any anionic groups which are often present.

Reactive Dyes: A reactive dye will form a covalent bond with the appropriate textile functionality. This is of great interest, since, once attached, they are very difficult to remove. The first reactive dyes were designed for cellulose fibres, and they are still used mostly in this way. There are also commercially availablreactive dyes for protein and polyamide fibres. In

theory, reactive dyes have been developed for other fibres, but these are not yet practical commercially. Although reactive dyes have been a goal for quite some time, the breakthrough came fairly late, in 1954. Prior to then, attempts to react the dye and fibres involved harsh conditions that often resulted in degradation of the textile.

Disperse dyes: Disperse dyes have low solubility in water, but they can interact with the polyester chains by forming dispersed particles. Their main use is the dyeing of polyesters, and they find minor use dyeing cellulose acetates and polyamides. The general structure of disperse dyes is small, planar and non-ionic, with attached polar functional groups like -NO2 and -CN. The shape makes it easier for the dye to slide between the tightly-packed polymer chains, and the polar groups improve the water solubility, improve the dipolar bonding between dye and polymer and affect the colour of the dye. However, their small size means that disperse dyes are quite volatile, and tend to sublime out of the polymer at sufficiently high temperatures. The dye is generally applied under pressure, at temperatures of about 130°C. At this temperature, thermal agitation causes the polymer's structure to become looser and less crystalline, opening gaps for the dye molecules to enter. The interactions between dye and polymer are thought to be Van-der-Waals and dipole forces.

Mordant dyes: Mordant is a Latin word meaning 'to bite'. Mordants act as 'fixing agents' to improve the color fastness of some acid dyes, which have the ability to form complexes with metal ions. Mordants are usually metal salts; alum was commonly used for ancient dyes, but there is a large range of other metallic salt mordants available. Each one gives a different colour with any particular dye, by forming an insoluble complex with the dye molecules.

Other important dyes: A number of other classes have also been established, based among others on application that includes the following: Leather Dyes – Used for leather.

- Oxidation Dyes – Used mainly for hair.
- Optical Brighteners – Used primarily for textile fibres and paper.
- Solvent Dyes – For application in wood staining and production of coloured lacquers,
- solvent inks, waxes and colouring oils etc. Fluorescent Dyes – A very innovative dye. Used for application in sports good etc.
- Fuel Dyes – As the name suggests it is used in fuels.
- Smoke Dyes – Used in military activities.

- Sublimation Dyes – For application in textile printing.
- 8 Inkjet Dyes – Writing industry including the inkjet printers
- Leuco Dyes – Has a wide variety of applications including electronic industries and papers.

2.5 Reactive Dyes on Cellulose and Other Fibers:

Reactive dyes are the newest class of dyes for cellulose fibers.ICI introduced the first group of reactive dyes for cellulose fibers in 1956. In the dye molecule, a chromospheres is combined with one or more functional groups, the so-called anchors, that can react with cellulose. Under suitable dyeing conditions, covalent bonds are form between dye and fiber. One-third of the dyes used for cellulose fibers today are reactive dyes. The range of available reactive dyes is wide and enables a large number of dyeing techniques to be used. Shades ranging from brilliant to muted can be obtained. They have better wet fastness properties than the less expensive direct dyes. Chlorine fastness is slightly poorer than that of vat dyes, as is light fastness under severe conditions. In addition to cellulose, many other fibers can be dyed with reactive dyes, provided they have chemical groups capable of forming a chemical bond with the reactive dye, e.g. wool or polyamide fibers.

Reactive Dyes on Wool and Silk:

Reactive dyes produce brilliant shades on wool with good fastness. They differ from reactive dyes for cellulose fibers because the reactivity of the chemo active groups in wool is considerably higher than that ofthe hydroxyl groups in cellulose. To achieve level dyeing on wool, dyes with reduced reactivity must be used, and an auxiliary agent added.

Direct Dyes on Cellulosic Fibers:

In contrast to some naturally occurring dyes like indigo or kermes, which must be vatted or mordanted to be applied in textile dyeing but direct or substantive dyescan be used on cellulosic fibers directly. Their use is widespread because of their easy handling. 9 Direct dye can also easily handle the printing on cellulosic fiber.

Sulfur Dyes on Cellulosic Fibers: The dyeing of cellulose and its blends with synthetic fibers, is the main field of application of sulfur dyes. They are also used to a limited extent to dye polyamide fibers, silk, leather, paper, and wood. These dyes are used for deeper, muted shades, such as black, dark blue, olive, brown, and green, where their favorable price has its

full effect. With respect to fastness, sulfur dyes are close to vat dyes but not equal to them. They have varying lightfastness; the wash fastness at 60°C is good, and their fastness to boiling water is moderate. Wetfastness can be improved by aftertreatment of the dyeing with quaternary (poly) ammonium compounds or formaldehyde condensation products. Most sulfur dyeing are not fast to chlorine. Therefore, faulty dyeing can be stripped by treatment with sodium hypochlorite.

Acid Dyes on Wool: The presenceof aliphatic groups in the acid dye molecule contributes to a substantial increasein binding to wool, converting leveling dyes to types that are fast to fulling. Thesulfonic acid groups determine not only the number of possible ionic bonds tothe fiber, but also hydration, which counteracts binding

Disperse Dyes on Polyester: The Polyester fiber is quantitatively the most important syntheticfiber. Their inexpensive production from petrochemical raw materials and excellent textile properties alone and in combination with natural fibers guarantee PESfibers universal applicability. PES fibers are hydrophobic, water-soluble dyes do not attach. In contrast,PES fibers can be dyed easily with water-insoluble, small molecular dyesoriginally developed for dyeing cellulose acetate. Since the preferred dyeing mediumis an aqueous liquor, the poorly water-soluble dyes must be dispersedbefore application

Vat Dyes on Cellulosic Fibers: Vat dyes are water-insoluble, organic pigments that are used to dye cotton andother cellulose fibers. The principle of vat dyeing is based on chemical reductionof these dyes to the leuco compounds, which are soluble in aqueous alkali andexhibit fiber affinity, followed by reoxidation within the fiber to the water-insoluble starting dye.

Azo (Naphtol AS) Dyes on Cellulosic Fibers: The dyeing process is carried out in steps: First, a cotton fabric is impregnated with a solution of sodium naphtholate and, after drying, is passed through a solutionof a diazotized aniline derivative to give an attractive deep dyeing. Besidesbases that need to be diazotized before use in dyeing, diazotized diazonium compoundsin stabilized form are also being marketed as fast color salts. Cellulosic fibers in all processing states can be dyed with NaphtolAS combinations. Handling is safe and relatively simple. Based on these above discussion we can include that all the derivatives of

dyestuff and their proper application on suitable textile materials are very important for textile coloration process.

2.6 All Over Printing

Flow Chart of Printing Section

Art work from merchandiser

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Design input

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Design development

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Positive/film

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Print taken

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Requisition by merchandiser

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Panel (cutting fabric parts)

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Expose (frame adjusted)

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Fila and frame adjusted

↓

Water spray

↓

Panel send to buyer

↓

Buyer approval

↓

Sale sample

↓

Counter sample

↓

P P production

↓

Accessories booking

↓

Requisition by merchandiser for fabric

↓

Fabric received and store

↓

Count the fabric

↓

Inspection the fabric

↓

Fabric adjusted

↓

Bulk production start

↓

Hydro extractor from dryer

↓

Inspection

↓

Finishing

↓

Delivery

2.7 Types of printing : Printing has been divided into,

A) Hand printing B) Machine printing

A) Hand printing

Block Printing : Block printing was practiced by Chinese and Indians some two thousand years ago. Blocks are made of wood or wood and lino. The design is carved on line which is generally cut to a thickness of inch. This cut piece of lino is struck to wooden piece of the same size. Many printers use only wooden blocks on which the design has been carved.

These blocks are dipped in paste of colour and then pressed on the fabric, so that coloured pattern is produced on the fabric. First a block carrying the paste of one colour is stamped on the fabric and allowed to dry. Then another block carrying the paste of different colour is stamped over it to form the multi-coloured patterns. The process is repeated over the entire fabric surface to be printed. It is a slow and costly process, uniform pressure is needed to transfer the colour. The intensity of colour cannot be uniform throughout.

Stencil Printing : Stencil printing originated in Japan. Its high cost limits its use and importance. In this, printing, the design must be first cut in cardboard, wood or metal. The stencil may have a fine delicate design, or there may be large spaces through which a great amount of colour may be applied. A stencil design is usually limited to the application of one or two colours and generally used for narrow width of fabric like block printing. This method is very slow.

Screen Printing : Originally, this technique was referred to as silk screen printing because the screens were made of fine, strong silk thread. Today they are also made of nylon, polyester, vinyl and metal. Screen printing is done with the use of either flat or cylindrical screens.

Each screen design may be drawn by hand and a coating of lacquer or other impermeable substance applied to all parts of the screen that are not part of its design. Today the design is photographed and a negative is used for each sensitized screen to opaque or block out, those areas not part of the screen's colour design. Each screen is then fitted into a wooden or metal frame.

The printing paste or dye is poured on the screen and forced through its unblocked areas onto the fabric with a rubber-edged squeeze. The frame is then raised and placed on the next section of the fabric and the operation is repeated until the entire length of the cloth is printed with that particular colour. This process must be repeated for each colour to be used in the design. The hand screen printing is time-consuming and limited to relatively short lengths of 60 yards (58m) of fabric. Electronically controlled automatic machines can screen print long lengths of cloth at rates of upto 450 yards (400m) per hour.

B) Machine Printing

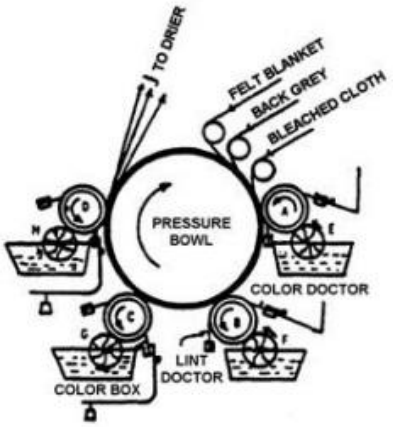
Machine printing includes Direct Roller printing, Duplex printing, discharge printing, resist printing, pigment printing, transfer printing, photo printing and flock printing.

Direct Roller Printing : Roller printing was developed in 1785. Thousands of yards of coloured designed fabrics are produced in an hour by this method of printing.

In this printing, several copper cylinders or rollers are engraved with design. Engraving the designs on the rollers is a hard and careful work lasting many days, but actual printing by this method takes very little time.The roller is as wide as the cloth. The numbers of rollers required depends on the number of colours used in the design. One roller prints one colour only.

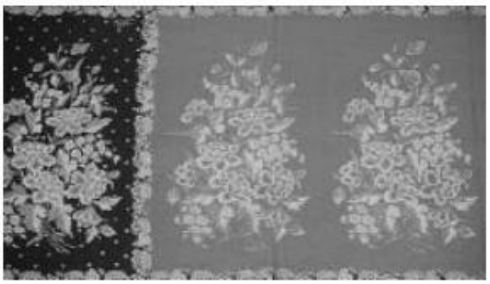
The roller printing machine comprises of a large central cylinder around which passes the fabric to be printed, this cylinder rotates with the moving fabric. Number of colour printing rollers, carrying different colours, press against the fabric and the central cylinder. Thus if there are five colours in the design there are five colour printing rollers. Each of these rollers is made of copper and engraved with the respective design. Furnished rollers which move at intervals, containing the colour or dye are placed close to the design rollers. The dye is absorbed by the brush like surface and transferred to the design engraved rollers.

Next to the design roller is a big iron cylinder or roller around which the cloth is drawn as it is printed. The cloth to be printed needs a rubberized blanket (for padding) and grey cloth pass between the engraved rollers and the cylinder. The blanket gives a good surface for sharp printing and the grey cloth protects the blanket besides absorbing the excess dye.



Roller Printing Technique

Printed Cloth with Roller Machine



Printed Design

Roller Printing Machine

Printed Design

Printing machine

Printed Design

Figure-1.2: Direct Roller Printing

Printing machines of this kind can be provided with upto fourteen rollers, as they are able to produce patterns in fourteen colours. The roller printing machine prints only on one side of the fabric.

Duplex Printing : In Duplex printing, the printing is done on both the sides. The fabric may be passed through the roller printing machine in separate operations. This printing forms clear outline on both sides of fabric.

Discharge Printing : This type of printing is suitable for fabrics with dark backgrounds. The fabric is first dyed. A discharge paste which contains chemicals to remove the colour is then printed on the fabric, to produce a white pattern on a ground colour. This print is done on materials like cotton and rayon.

Resist Printing : This is just the opposite of discharge printing. In this type of printing, resist paste is printed first on the white fabric, and the fabric is then piece dyed. The resist materials used are resins, or clay or gum. It is put in a patterned form on fabric and is subsequently immersed in dye. The dye will affect only the parts that are not covered by the resist paste. The places where resist material has been put remain undyed. After fabric has been passed through subsequent dyeing processes, the resist paste is removed, leaving a pattern on dark background.

Pigment Printing : In this, dyes used are insoluble in water and very fast to light. These pigments are made into colour printing paste, using various ingredients especially resin to act as binder and the pigment to the printed fabric.

Transfer Printing : In this process, certain substances can be made to pass from a solid state directly to a vapour state when heated and return directly to a solid when cooled. The design is printed to a paper, which is fed into a machine. This is brought into contact with heat zone, which vapourizes the dye on the paper. Thus the dye is absorbed by the fabric.

Photo Printing : In this type, the fabric is coated with a chemical that is sensitive to light. The negative of the design is put against the fabric surface and the light is made to fall on it.

The design on the negative gets printed on the fabric. The fabric is then washed. Black and white designs and coloured designs can be printed on the fabric.

Flock Printing : This is a technique of adhering minute pieces of fibre, called flock, to form design on fabrics. Using a suitable adhesive, a design is roller printed onto the fabric. Then flock of cotton, wool, viscose rayon, nylon or acrylic are applied to the fabric in a manner that causes it to adhere in an upright position and produce a pile like, velvet - textured design.

2.8 Chemical Used in Printing

Name	**Function**
Binder	To fix color
Thickener	Maintain viscosity
Softener	Soft
Urea	To reduce friction
Liquor Ammonia	P^H control
Fixing agent	Fixation
Resist salt	Prevent color bleeding

Table-2.1 Chemical Used in Printing

Finishing

Machine Name: Stenter

Brand Name: LK

Origin: China

In textile manufacturing, finishing refers to the processes that convert the woven or knitted cloth into a usable material and more specifically to any process performed after dyeing the yarn or fabric to improve the look, performance, or "hand" (feel) of the finish textile or clothing.

Function

- Dye is fixed by subjecting the print to hot air by using heat of steam.
- Mainly used after reactive color print of cotton fabric.

Chapter Three
Apparel

3.1 Description of the Attachment

In this factory the major actions which are performed –

- Order Collection
- Development sample
- Produce pre-production sample
- Sample approved
- Pattern making
- Marker making
- Fabric spreading
- Cutting
- Sewing
- Inspection
- Packing
- Delivery or shipment

3.2 Sample Section

- Receive developed sheet from buyer
- Send the sample to buyer for approval
- Send pre-production sample to buyer
- Approval of sample/comments about the sample (if necessary)
- Start bulk production

3.3 Store Section

For a bulk production of an industry it is essential to maintain a well-organized & well equipped inventory system. Being a bulk production industry Civil Engineering Ltd. maintains an organized store department. This department is located at the 3rd floor of the 7 storied main factory building. The main responsibility of this department is to store all the raw material which are necessary to produce garments and requisite when it is needed.

Figure-3.1: Store Section

3.4 Inventory Control

Store is the place where every type of raw materials, spares, finished goods are kept in proper system. Inventory control means the accurate calculation and data of every type of raw materials spares and finished goods in time to time store.

Inventory Procedure

- Swatch Card
- Store Requisition
- Store Ledger Account
- Daily Inspection & Package Report
- Monthly Stock & Consumption Report
- Received Delivery & Balance Stock

Figure-3.2: Inventory Procedure

Spare parts Store

In Civil Engineering Ltd. required amount of spares of different machines are stored in the mechanical store room which is situated at 4th floor of the building. All these spare are listed in a sheet which is controlled by the mechanical & maintenance personnel. Spares are arranged in the store room according to their size, quantity & requirements. There are shelves in the store room to keep the small spare parts.

3.5 Cutting Section

In garments industries fabric is cut from lay and spreading with accuracy and properly which is termed as fabric cutting. Marker outline is used to cut the fabric. Fabric cutting is very important as if something is cut in wrong way, cannot be rectified.

Figure -3.3: A worker is busy with cutting fabric layer

Plan Layout of Cutting Section

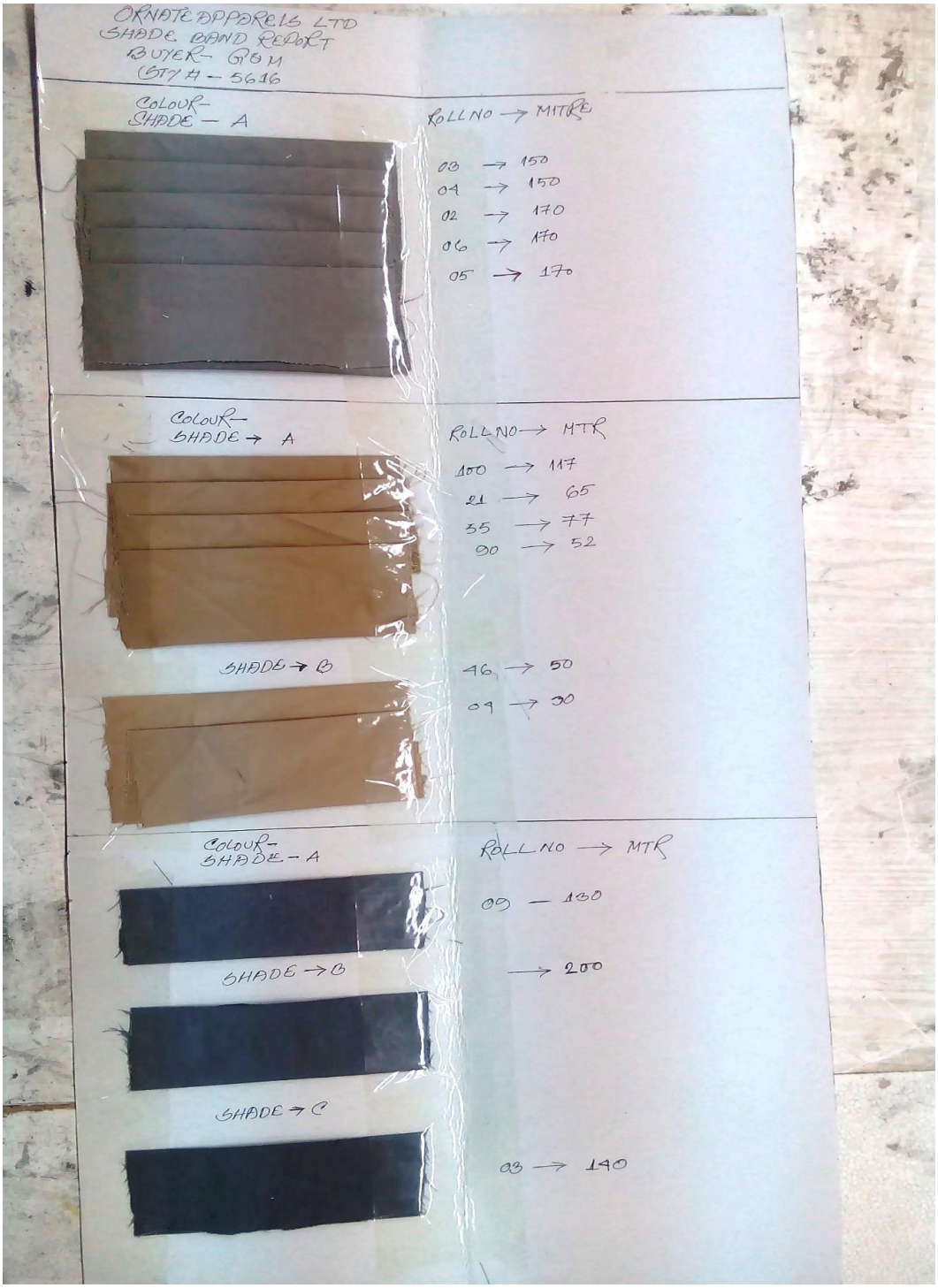
Figure-3.4: Plan layout of cutting section

Fabric Test

Different tests are being performed to ensure the buyer recommended quality. Among the tests, the important test matters are GSM, width, shed, shrinkage, twisting, fastness etc. These tests are done to be sure about that the fabric quality is fair enough for maintaining garments quality. These tests are done from the Mirpur factory.

Figure-3.5: Fabric cut pieces are marked for shade variation and fastness test

Figure-3.6: Fabric cut piece ready for fastness and shade variation test



Pattern making

The cutting section of Civil Engineering Ltd. just modify the pattern provided by central pattern section, Mirpur. According to fabric quality and type and buyer recommendation (after pre-production meeting) cutting incharge modify the master pattern and graded as required sized.

Fabric Inspection

When the fabrics are received from the supplier, it needs to be checked, because, faulty fabrics can be supplied. So the cutting section has to check it properly before cutting operation, otherwise the end products will be faulty. For this, the fabric is being inspected by the quality inspector of the cutting section. They check the fabric fully and find out the faults. Then mark it so that, these faulty portion of the fabric can be rejected during spreading and cutting. Then the fabric is being stored for relaxation.

Fabric Relaxation

Fabric relaxation is performed for a certain period. This time is varied from fabric to fabric. But the minimum time of relaxation is twelve (12) hours. This time also may vary according to the buyer‟s recommendation.

Figure-3.7: Fabric is unrolled for relaxation

Test Cutting & Approval

After testing the fabric, if it is seemed that, the fabric quality is ok, then test cutting is done. Here a little amount of fabric is cut and sewed in sewing section required for size set sample. Then the garments are compared with the approved sample. Sewing allowance and other

measurements are also observed. If everything is ok, then the approval is given and the fabric is ready for bulk production.

Figure-3.8: A worker is busy in test cutting of fabric

Fabric Spreading

Spreading means the smooth laying out of the fabric in superimposed layers of specific length. The marker paper is laid on the top of the fabric layer. During spreading number of the plies are maintained less than the cutting blade height. In this factory fabric is laid manually on cutting table. Worker use stick, gum tape, clip to keep the fabric as much parallel to each ply as it possible. This process should be done carefully otherwise garments parts may be cut in wrong size which may not get altered later.

Figure-3.9: Workers are laying fabric on cutting table manually

During the spreading of fabric on cutting table –

- Alignment of fabric plies is done by hand
- Correct ply tension is maintained
- Elimination of fabric faults during spreading
- Correct ply direction and adequate lay stability is checked by cutting quality controller
- Avoidance of distortion in spread is performed by hand
- Fabric is laid flat and easy spread by using sticks
- Matching checks or strips by quality controller
- Matching the grain line during spreading

Marker making

Marker is a thin paper which contains all the pattern pieces of a garment. It is made just before cutting and its purpose is to minimize the wastages. In this factory marker is made by hand drawing. There is no automatic machine to do this job. Though it is a time consumable job but factory authority says that it is cost effective for them.

Figure-3.10: A worker is busy with making the marker

In this factory the marker size, no. of garments containing in a marker and the direction of garments parts are guided centrally. Here the workers follow these rules and a convenient marker for the job.

Methods of Fabric Cutting

Civil Engineering Ltd. doesn‟t have any computerized cutting tools. So they use manual method of cutting. They use straight knife m/c to cut the fabric lay. Though it is time consumable but authority thinks that it is cost efficient for them for now. The factory has two cutting table on 4th floor whereas more cutting tables are also available on other floors, but those floor are not active now. Four straight knife cutting m/c is used in this floor and there are two extra m/c in idle m/c room.

Straight knife cutting machine:

Machine name: K.M company cloth cutting m/c

Model: K.M KS_AUV

Producer: Made by K.M cutting m/c co, JAPAN

Type: Heavy duty industrial cloth cutting machine with self-Sharpening

Dimension: 8 inch width X 11 inch length X 24 inch height

Weight: 33.5 lbs.

Current: A.C (2.6-33 amps)

Fig-3.11: Straight Knife Cutting M/C

Machine parts:

- Base plate
- Terminal block
- Plug
- Pressure foot
- Blade
- Sharpener pulley
- Pulley spring
- On/off switch

Numbering

After cutting the cut pieces are shorted out size and shade wise. All the components of the same size are brought together. And they are numbered with Numbering machine. This numbering process is an important factor. As it prevents the garments parts form mix up. The sorted pieces are now ticketed. Ticketing is the process of marking the cut components for shade matching precision and sequence identification. The seal number maintains cutting number, size number, serial number.

Figure-3.12: Worker is numbering the cut piece of the garments

Numbering section

- Seal Machine: 6pcs

Prepared the bundling card

Quality controller prepare bundling card according to fabric lay. This report card maintain –

- Date
- Style number
- Shade number
- Card Serial
- Quantity
- Color
- Lot Number

Bundling

The numbered components of one styles and in one size are now bundled using ties. The size of bundle depends upon the requirement of the production plant. Each bundle contains pieces of the same style and same size only. Bundling is done according to card no. In this stage all numbered parts are bundled according to serial number.

Figure -3.13: Workers are bundling the cut piece of garments

If any parts requires print or embroidery, parts are send to the print or embroidery factory as this factory doesn‟t have any printing section or embroidery section. After the process is done all the parts are quality checked and if passed then supplied to the next step.

3.6 Cutting Section Quality Control

Step by step process by which quality is checked in the Cutting Section –

Fabrics Roll spreading Inspection:

- Roll number
- GSM
- No. of lays
- Ends of Bits
- Shade number

Spreading Quality Control (Defects):

- Table marking
- Fabrics flaws
- Marker placing
- Splices or Joints
- Ends
- Leaning
- Tension

Quality Inspection for Marker:

- Every parts Measurement check
- Calculate the total no. of parts of each Garments
- Marker length & width determined.

During Cutting Quality Control:

- Notches
- Miscut
- Matching plies
- Ragged Cutting
- Pattern Check

3.7 Limitation of Cutting Section

1. Input problem.
2. There is no fixed group for any table.
3. Handmade marker as the factory hasn‟t equipped with any computerized marker maker.
4. Check, variegated rib fabric lay quantity may be excess. As a result reject percentage may be increase.
5. Fabric spreading is done manually.
6. Workers are often found impatient for proper fabric relaxation, lay spreading and cutting.
7. Low efficiency.

3.8 Sewing Section

Sewing is an operation by which the fabric cut panels are joined together by thread and gets the shape of a garment. Main responsibility of this department is to stitch fabric together in a standard way that it meets the needs of a buyer as a garment. As mentioned earlier this garment industry contains 5 sewing lines. These production lines are equipped with sound sewing machines. All the lines are functional and executing the function of sewing.

Figure-3.14: A worker is working with sewing machine

3.9 Plan Layout of Sewing Floor

Fig-3.15: Sewing layout plan

Fig-3.16: Sewing plan layout

Input from cutting & store

After receiving all the details they send a request for the cut parts from the cutting & sorting section & the request is sent to the accessory stores for all the accessories that are required for the particular style then they start the production for the new style.

Starting of layout

Before starting the proper production the production floor does a process of batch setting for the floor which is training the operators for the new style that has to be produced bulk, this teaching session will go on for about 1-2 days maximum. After this batch setting process the

production for the next day starts with a smaller commitment i.e. may be for 50 pieces for the entire day then the production gradually increases from 50-100-150 & so on, this will make the operators team slowly & precisely about the processes that has to be carried out for the particular style.

3.10 In process quality control Sewing:

During the swing in process quality control is done by the line QC„s through 7 pieces inspection system. For critical operations 100% process inspection are carried out.
The following parameters are also checked in sewing process –

- Machine check.
- Tension.
- Stitch per Inch (SPI) checks
- Needle check.
- Cleanness.
- Table inspection.
- Inspection before wash.

Once the cut parts are received from the cutting & store section then the parts are prepared & assembled according to the line that is planned. After the assembling of the parts is done then there will be a line checking where the shade matching and the measurements are checked and then sent for next operation (Finishing).

3.11 Sewing Quality checking points

- Skip/Drop/Broken/Joint stitch
- Raw edge
- Size mistake
- Uneven Hem
- Uneven Cuff
- Uneven Neck

- Uneven Shoulder
- Uneven Placket
- Uneven Pocket
- Twisting
- Without care label
- Sleeve up-down
- Stripe up- down
- Open seam
- Shading

Sewing problems in Factory

- Input problem
- Shortage of skilled operator
- To achieved the overtime, they worked slowly

1. If any problem will create during production then
   - Nobody will take the responsibility,
   - Nobody will give the instant decision.
2. Sewing line production depends on supervisor and incharge.
3. Needle hole due to friction, needle eye is to large, mistake of needle selection.
4. Measurement problem- from cutting section.
5. **Seam pucker:**
   - Due to unequal tension of feed dog and pressure foot on two plies of fabric.
   - Due to unequal thread tension.
   - Shrinkage of either fabric or sewing thread.

6. **Broken stitch:**

- Due to tension variation between needle & bobbin thread.
- Tension of needle thread is more.
- Low quality sewing thread.
- Needle heating or hook heating.
- Sharp edge of throat plat, hook plate, bobbin cage, needle groove etc.
- Faulty fitting of bobbin cage.

7. **Skipped/ Slipped stitch:**

- If the timing between needle & looper or bobbin is not proper. Needle thread loop is not picked up by bobbin thread loop when required.
- If the loop of needle becomes smaller in size, slipped stitch occurs.
- Unequal tension between sets of threads.
- Deflection or vibration of needle.

8. **Variable stitch density:**

- If fabric cannot move forward properly due to lack of pressure of pressure foot.
- Due to faulty feed mechanism.

3.12 Finishing Section

The finishing department is the department which comes after all the department and it plays an equally important role in the final appearance of the garments. Finishing is an area which is generally overstaffed being the last link of the value chain all the problems from the previous stages have to be sorted out here. This department is located at the 4th floor. Here mainly workers performs pressing, folding and packing of garments. This includes hand stitching (unseen handwork done inside collars and lapels to give them shape) and its automated substitutes. This may also include adding buttons, hooks, eyes or trims as well as clipping loose threads. After completing pressing, the garments are folded with a predetermined area. Garments are folded according to the direction of Buyers requirements or in a standard area.

3.13 Responsibilities of Finishing Section

The major responsibilities are performed by the finishing department. It is their duty to confirm the required quality as required by the buyers. For this they performed several action which can only be performed after the garments production. They perform –

- Cut the excess threads
- Check the stitch quality
- Suck out the loose thread sticking with the garments
- Check the shade of different parts of the garments
- Check the accessories
- Trimming
- Attachment of button if required
- Hand sewing if needed
- Check all the labels and their position as instructed by the buyer
- Measure the size according to the size label
- Check faulty areas of the garments
- Remove spots if found
- Pressing if required
- Attaching tags
- Folding as guided by the buyers
- Assortment and packing

The main Responsibility of the finishing department is that after washing they receive garments from the washing department. Then these garments are lying in the table to style wise, size wise, shade wise. After checking the garments are ready to thread cutting, pre-final inspection, Final inspection, ironing to the buyer wise. After Ironing garments are taken to the Button machine to attach the button and after completing button attaching the garments are ready for Get up table to check the overall sewing checking. If any garments are not complete then the garments are sent to the alter section that mean to complete the garments.

After completing all requirements for each garments then passing to the packing zone. In the packing zone workers fold the garments and packed according to buyer guideline.

3.14 The activities of the finishing department

The activities carried out by the finishing department of Civil Engineering Ltd. are described shortly below –

Trimming

This involves the removal of the extra threads form the garment at the stitched area. This operation is done by scissors. Workers stand around the table and cut extra threads form every part of the garments. They works in groups, different groups cut thread of different area of the garments. After cutting of extra thread the lose threads & other impurities are sucked off by a sucker machine.

Figure-3.17: Workers are trimming the excess treads

Buttons Attaching

All buttons must be in accordance with the relevant fabric performance standard and the care instructions selected for the garment. Each button must be securely attached to garments with at least 16 stitches.

Figure-3.18: A worker is attaching button with the help of machine

Button-holes

Stitch density of buttonholes must have full edge cover with no fraying. Cleanly cut buttonholes and trim all threads. Tie off and secure stitches, where using a single thread chain-stitch buttonhole. Worker position buttonholes correctly to prevent unfastening, dragging and gaping.

Snap Button

Some garments required snap buttons. Civil Engineering Ltd. uses manual controlled snap button machine GZN – 2 manual button attaching machine. This process is performed in two stage. At first hole is made and then button is attached. Sometimes metallic logo is attached with this machine.

Ticketing and Bar-Coding

Retailers request that manufacturers supply them with ―hanger ready garments; in other words, the garments must be pre-ticketed with bar-coded price tags attached and hung on the hangers the retailers will use. A contractor or a distribution warehouse routinely handles the ticketing.

Packing

At Civil Engineering Ltd. packing is done manually according to the packing list. This packing list prepared by the merchandiser according to the requirement of buyer.

Garments Inspection Elements

Following elements must be checked on each order. Failure to meet any of the elements could cause the order to be rejected. Prior to final inspection following paperwork shall be provided to the onsite auditor to facilitate inspection of packed goods.

- Order quantity
- Packaging
- Labeling
- Style
- Shade
- Accessories
- Approved bulk / trim swatches
- Measurement Specification sheet

Store for delivery

After the packing is done, the garment cartons are kept in suitable place for the buyer (Quality Control) to check. They also keep the products until the delivery is done. The delivery goods store is located at 3rd floor of the Civil Engineering Ltd. building.

Maintenance & Utilities

The duties of maintenance section are carried out by the mechanics and electricians. The maintenance section is located on 5th floor. Though Civil Engineering Ltd. is not so big project but it of course having a vast project of utility service.

Utilities

The utilities of Ornate Apparels are –

- Electricity

- Water
- Gas
- Steam.

Electricity

The main utility electricity is supplied from PDB line. There are also two Diesel generator for continuous electricity supply during load shedding.

Specifications of Generator:

Diesel Generator -1:

- Manufacturer : TEKSAN
- Country : Germany
- Standby Power : 180 KVA
- Maximum Load : 144 KW
- Cooling System : Water & Air Cooling

Diesel Generator -2:

- Company : VOLVO
- Country : China
- Type of fuel used : Diesel
- Standby Power : 200 KVA
- Maximum Load : 160 KW
- Cooling System : Cold Air and water cooling by Cooling tower

Gas

Gas is mainly used in boiler for steam production. The gas is used from TITAS GAS Distribution Company.

Steam

Pure steam is required at certain temperature in the iron section. There is Fire tube type boilers used for steam generation, to meet the requirement of iron section of Civil

Engineering Ltd. At first the boiler takes NTA (Natural gas) from the gas line and suck air. Then through the air and gas inside the boiler. For this reason the water is boiled and produce steam. The steam is supplied by the steam line in the iron section.

Compliance

Compliance means conformity of certain standard. Civil Engineering Ltd. maintain a moderate working condition for their employees. Though it is a well-established project, there is some lacking of proper compliance issues. Here is list of compliance in which some points are maintained fully and some are partially.

- Compliance for holiday
- Leave with wages
- Maternity leave
- Time care
- Health register
- Accident register
- Working register
- Equal remuneration
- National festival holiday
- Overtime register
- Labor welfare
- Sexual harassment policy
- Child labor abolition policy
- Anti-discrimination policy
- Working hour policy
- Environment policy
- Security policy
- Buyers code of conduct

- Dining Hall
- Health and safety committee

Health

- Drinking water at least 4L/day/employee
- Drinking water supply
- Drinking water signs in Bangla and English locate min.

Fire Safety

- Sufficient fire extinguisher and active reserve water supply
- Access area without hindrance
- Fire signs in both language
- Fire certainly personal photo
- Two Emergency exit

Toilet

- Separate toilet for woman & men
- A seat with proper privacy and lock facility
- Effective water sewage system
- Soap in toilet for hand wash
- Water tap
- Dust tins.

Safety Guard

- Metal gloves on good condition
- One First aid box in each floor
- Ironers wearing sleepers
- Motor guard

- Doctor
- Medicine
- Medicine issuing register
- Welfare officer
- Childcare center

Others

- Convenient floor temperature
- Enough lighting facilities for clear visibilities

Chapter Four

Conclusion

We have completed our industrial attachment successfully by the grace of Almighty. Industrial attachment send us to the expected destiny of practical life. It has earned very good reputations for its best performance over many other export oriented garments. During the training period we have received co-operation and association from the authority full & found all man, machines & materials on appreciable working condition. All stuffs & officers were very sincere & devoted their duties to achieve their goal.

Some Limitations, we faced during report writing are given below:

- Because of the secrecy act, the data on costing and marketing activities has not been supplied and hence this report excludes these chapters.
- We had a very limited time. In spite of our willing to study more details it was not possible to do so.
- Some of the points in different chapters are not described as these were not available.
- This whole process is not possible to bind in such a small frame as this report, hence our effort spent on summarizing them.

The management of Civil Engineering Ltd. was very helpful to provide our many important information. Our respective seniors gave our time whenever they got free time. The specialty of this report is that, the information, data and description are very much subjective and practical oriented. So, one can easily have an idea about Civil Engineering Ltd. at a single look on it. The new comer can use this report for further details study or can know Civil Engineering Ltd. without much work. But, some process steps may be modified within the period of time while this paper will reach to the reader in future.