Faculty of Engineering
Department of Textile Engineering

PROJECT REPORT

Investigation on Color Fastness Properties of Various Printing on 100% Cotton T-Shirt

Course Title: Project (Thesis)
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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Textile Engineering.

Advance in Apparel Manufacturing Technology
Duration: Spring, 2020

DECLARATION

We hereby declare that, this project has been done by under the supervision of Kazi Rezwan Hossain , Lecturer , Department of Textile, Daffodil international university.
This report has been completed to proper works by us. We also declare that the information neither of this project or any part of it didn't submit elsewhere for offer of any degree or diploma.

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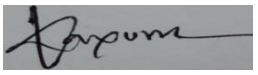
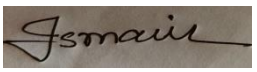
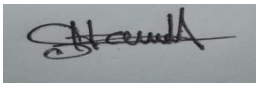
Md. A. Kayum	172-23-309	
Md. Ismail Hossain	172-23-315	
Md. Shakhawat Hossain Sakil	172-23-359	

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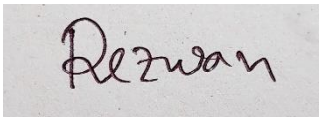
Approval Sheet

This report entitled "Investigation on Color Fastness Properties of Various Printing on 100% Cotton T-Shirt/Polo Shirt'' is prepared and submitted by **Md. A. Kayum (ID:172-23-309) , Md. Ismail Hossain (ID:172-23-315) & Md. Shakhawat Hossain Sakil (ID:172-23-359)** in partial fulfillment of the requirement for the degree of Bachelor of Science in Textile Engineering has been examined and hereby recommended for approval and acceptance.



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Acknowledgement

By the grace of almighty Allah we have completed the project report “Investigation on Color Fastness Properties of Various Printing on 100% Cotton T-Shirt/Polo Shirt” successfully. This industrial attachment is an accrual of many people’s effort. For this, we are obliged to a number of people who helped us to organize this report and or their kind opinion, suggestions, instructions and support and appropriate guidelines for this. We have adopted endless backing and guidance in preparation of this report from many sources. We would like to accept this better opportunity to thank them all.

Our special thanks to our supervisor Kazi Rezwan Hossain Lecturer, Department of textile engineering, Daffodil International University, who motivated, encouraged and helped us in preparing the report.

Special thanks to our respected Associate Head Mohammad Hossain Reza for his continuous encouragement and valuable suggestions. Our cordial thanks to Viyellatex Group as they helped us in understanding the practical processes.

While preparing the report we have taken help from various references so our cordial thanks to them. Finally we hope that the report will help in understanding the “Investigation on Color Fastness Properties of Various Printing” in apparel industry in a clear and concise way.

We would like to thank our entire course mate in Daffodil International University, who took part in this discuss while completing the course work. Finally, we must acknowledge with due respect the constant support and patients of our parents.

Dedication

At first we want to dedicate this report to Almighty Allah, (ALHAMDULILLAH) for giving us the opportunity to prove ourselves. Without His help nothing would be possible.

ABSTRACT

This project is ‘‘Investigation on Color Fastness Properties of Various Printing on 100% Cotton T-Shirt/Polo Shirt” Garment Printing is quite different from any other conventional manufacturing. It is not a continuous production method. Each style is a different product that requires a different type of fabric, color, printing paste, chemical etc. Color fastness properties of printed garments are one of the most important stages in printing process. Color fastness faults occurring during this process adversely affect the product quality and product efficiency, and also increase the production cost.

The aim of this study is to investigate whether the color fastness properties is under control and to detect the comparison between different printing on garments and find which printed garments color fastness properties is good . So as to deliver a quality item, it is essential to investigate the item with appropriate consideration. Review could be spare more generation harm.

CONTENTS

CHAPTR-1

INTRODUCTION

1.1 Introduction

Textiles and clothing will always be essential goods for human beings. Spinning and weaving were the main activities that drove the Industrial Revolution in the 18th century. Since then the textile industry has been a leading industry in the initial phase of industrialization in many countries in different periods of time in the world. Bangladesh is an important producer & exporter of knit RMG product. There are about 4500-5000 garments factories running in Bangladesh. Growth of garments factories started in Bangladesh around 1980. But now nearly 82% of our foreign currency is earned from RMG export. At present Bangladesh is producing & exporting more than 60 items of garments. Garments are exported to USA, Canada, Japan, Australia, Middle East and many other countries in the world. Cheapest labor cost is the biggest advantage for Bangladeshi garments producers & exporters.

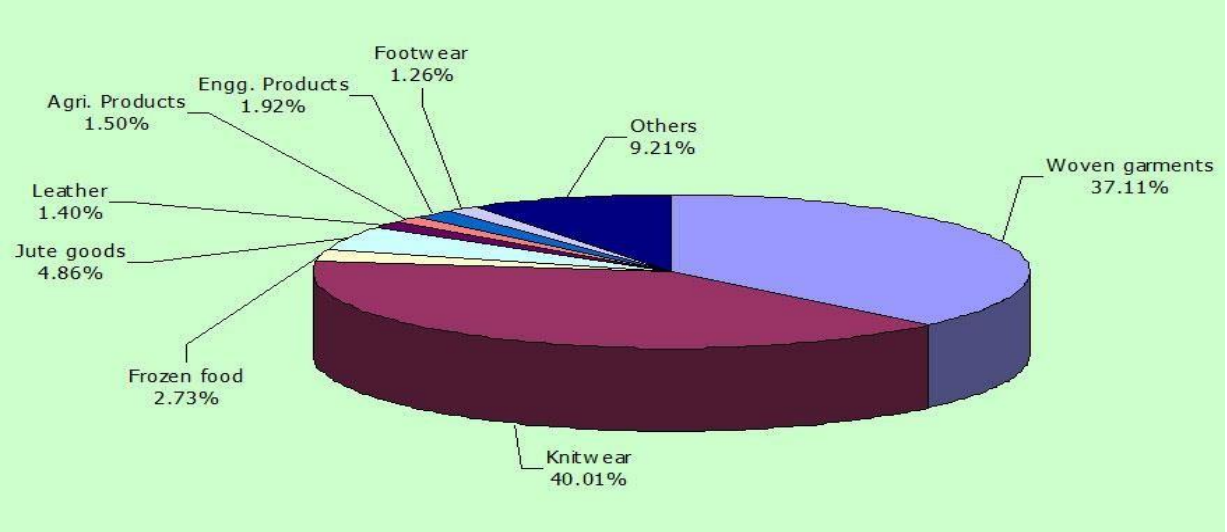
In the financial year 2017-2018, Bangladesh has exported garments and worth around US$ 29.41 billion in 148 countries across the Globe which covers 82.71% of total export. In Bangladesh, there is 4560 garments factory whose net worth is 22 billion dollar, has achieved reputation in producing world class garment products and acquired the second position in the ranking of global RMG producing countries right after China.

We acquire knowledge on knit garments manufacturing, Garments production, Quality control, Garments printing &Finishing sector. We tried our best to learn more about this project that will help our future practical life.

1.2 History of Bangladesh Garments Industry

The RMG business started in Bangladesh in the 70s but it was then merely effort, the first consignment of knitwear export as made in 1973 and the first consignment of woven garments was made in 1977. In 1981-82 the contribution of woven garments in the total export was 1.10%. Afterwards it is a story of sustained success for the Bangladesh RMG sectors. The knitwear sector has grown over the years in geometric progression and become the prime driving force of Bangladesh's export earnings. Within a decade the contribution of woven to the export basket became 42.83% (1990-1991) and the knitwear sector's contribution 41.79% to national export earnings at the end of FY 2008-09(July-April).

The entrepreneurs of the knit sector stepped forward with their expertise in the late 80s. With their earnest efforts they were able to export US$14.84 million in 1990-90. Out of this, US$ 2.02 million was exported to US. The trend continued un the knit sector because of the market access opportunities provided to the LDCs under the generalized systems of preference (GSP) benefit.



This is the rejuvenated beginning of the epic story of Bangladesh knitwear sector that in true sense has been possible due to massive industrialization in a sustainable way with effect on all probable human development aspects which is the encouraging part of the story. The growth of knitwear sector is increasing at an increasing rate. The cumulative average growth rate of the sector is 20%, and it is continuously grabbing more portions in the export pie of Bangladesh .this is mainly attributed to the facilities provided under the EC GSP and ROO. The knitwear sector is heavily driven by the favorable policies and took the opportunity to develop a strong backward linkage for the sector.

1.3Objective:

1. To find out the data of printing process.
2. To find out the color fastness properties of printing.
3. To find out / calculate proper result.

CHAPTER-2

LITERATURE REVIEW

2.1: Knit Fabric

A structure produced by interloping one or more ends of yarn or comparable material.

2.2: Fabric Types

Weft knit fabric

a) Single jersey
   - Single Jersey plain
   - Pique
   - Lacoste

b) Double jersey
   - Rib
   - Interlock
   - 1x1 Rib
   - 2x2 Rib
   - Waffle
   - Flat Back Rib

c) Specialized weft knit
   - Intarsia
   - Jacquard Jersey
   - Fleece
   - Fleece Terry

Warp knit fabric

- Tricot
- Raschel

2.3 Most Common knit readymade garments

T-Shirt (Long Sleeve & Short Sleeve)

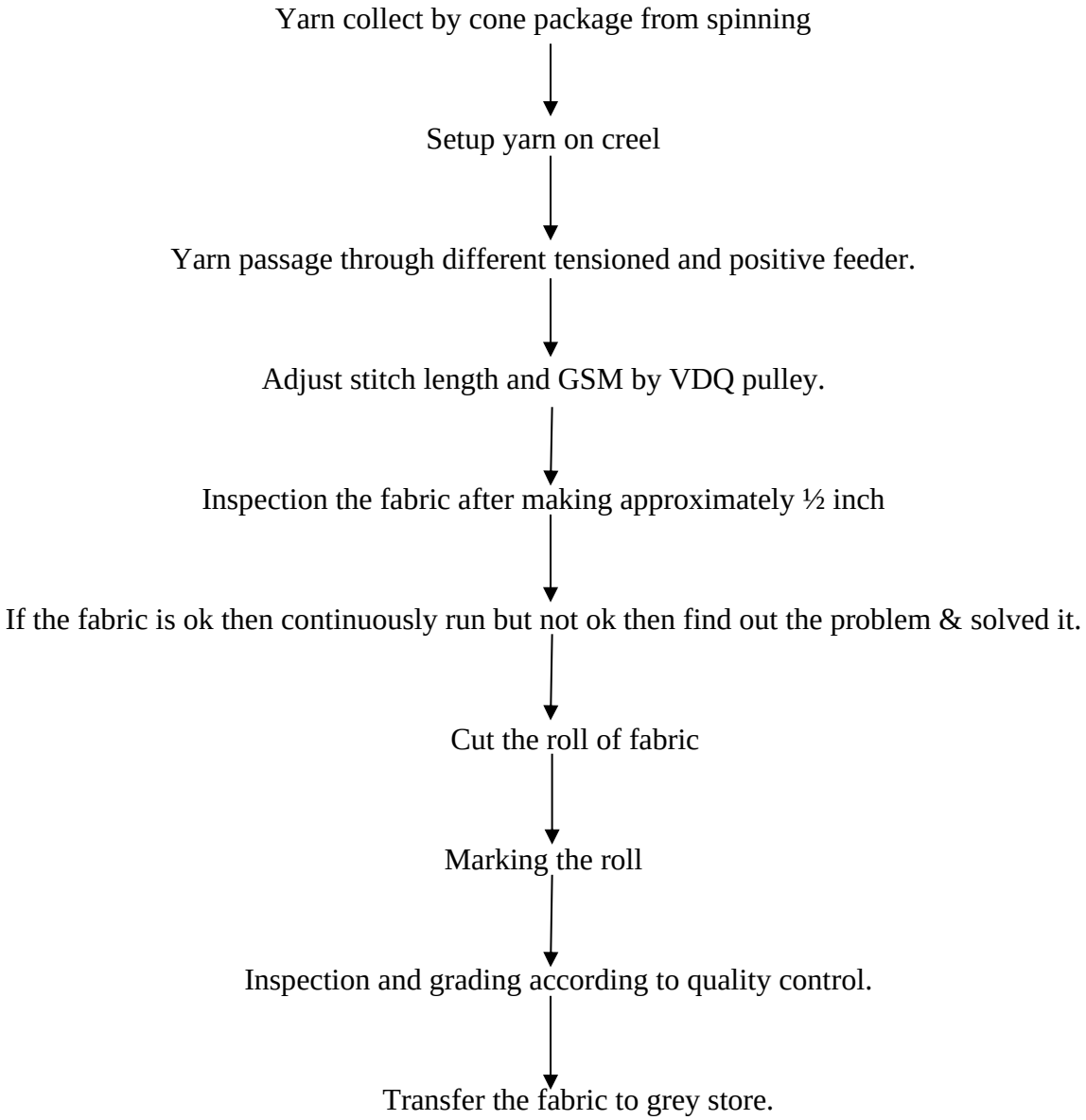
Polo Shirt

Trousers

Kids Wear

Hoody

2.4 Flow chart of Knitting:



2.5 Textile Printing

Textile printing is the process of applying color to fabric in different patterns or design.In properly printed fabrics the color is bonded with the fibre so as to resist washing and friction. Textile printing is related to dyeing but in dyeing properly the whole fabric is uniformly covered with one color, whereas in printing one or more color is applied to it in certain place only,and in sharply defined pattern.

In printing wooden blocks, stencils, engraved plates, rollers or silk screens can be used to place colors on the fabric. Colorants used in printing contain dyes thickened to prevent the color from spreading by capillary attraction beyond the limits of a pattern or design.

2.6 Methods

Traditional textile printing techniques may be broadly categorized into four styles:

- Direct printing, in which colorants containing dyes, thickeners, and the mordents or substances necessary for fixing the colo on the cloth are printed in the desired pattern.
- The printing of a mordant in the desired pattern prior to dyeing cloth; the color adheres only where the mordant was printed.
- Resist dyeing, in which a wax or other substance is printed onto fabric which is subsequently dyed. The waxed areas do not accept the dye, leaving uncolored patterns against a colored ground.
- Discharge printing, in which a bleaching agent is printed onto previously dyed fabrics to remove some or all of the color.

Resist and discharge techniques were particularly fashionable in the 19th century, as were combination techniques in which indigo resist was used to create blue backgrounds prior to block-printing of other colors. Modern industrial printing mainly uses direct printing techniques.

The printing process does involve several stages in order to prepare the fabric and printing paste, and to fix the impression permanently on the fabric:

- pre-treatment of fabric,
- preparation of colors,
- preparation of printing paste,
- impression of paste on fabric using printing methods,
- drying of fabric,
- fixing the printing with steam or hot air (for pigments),
- after process treatments.

2.7 Preparation of cloth for printing

Cloth is prepared by washing and bleaching. For a colored ground it is then dyed. The cloth has always to be brushed, to free it from loose nap, flocks and dust that it picks up whilst stored. Frequently, too, it has to be sheared by being passed over rapidly revolving knives arranged spirally round an axle, which rapidly and effectually cuts off all filaments and knots, leaving the cloth perfectly smooth and clean and in a condition fit to receive impressions of the most delicate engraving. Some fabrics require very careful stretching and straightening on a stenter before they are wound around hollow wooden or iron centers into rolls of convenient size for mounting on the printing machines.

2.8 Preparation of colors

The art of making colors for textile printing demands both chemical knowledge and extensive technical experience, for their ingredients must not only be in proper proportion to each other, but also specially chosen and compounded for the particular style of work in hand. A color must comply to conditions such as shade, quality and fastness; where more colors are associated in the same design each must be capable of withstanding the various operations necessary for the development and fixation of the others. All printing pastes whether containing coloring matter or not are known technically as colors.

Colors vary considerably in composition. Most of them contain all the elements necessary for direct production and fixation. Some, however, contain the coloring matter alone and require various after-treatments; and others again are simply thickened mordants. A mordant is a metallic salt or other substance that combines with the dye to form an insoluble color, either

directly by steaming, or indirectly by dyeing. All printing colors require thickening to enable them to be transferred from color-box to cloth without running or spreading beyond the limits of the pattern.

2.9 Thickening agents

The printing thickeners used depend on the printing technique, the fabric and the particular dyestuff . Typical thickening agents are starch derivatives, flour, gum arabic, guar gum derivatives, tamarind, sodium alginate, sodium polyacrylate, gum Senegal and gum tragacanth, British gum or dextrine and albumen.

Hot-water-soluble thickening agents such as native starch are made into pastes by boiling in double or jacketed pans. Most thickening agents used today are cold-soluble and require only extensive stirring.

Starch paste

Starch paste is made from wheat starch, cold water, and olive oil, then thickened by boiling. Non-modified starch is applicable to all but strongly alkaline or strongly acid colors. With the former it thickens up to a stiff unworkable jelly. In the case of the latter, while mineral acids or acid salts convert it into dextrine, thus diminishing its viscosity or thickening power, organic acids do not have that effect. Today, modified carboxymethylated cold soluble starches are mainly used. These have a stable viscosity and are easy to rinse out of the fabric and give reproducible "short" paste rheology.

Flour paste is made in a similar way to starch paste; it is sometimes used to thicken aluminum and iron mordants. Starch paste resists of rice flour have been used for several centuries in Japan.

Gums

Gum arabic and gum Senegal are both traditional thickenings, but expense prevents them from being used for any but pale, delicate tints. They are especially useful thickenings for the light ground colors of soft muslins and sateens on account of the property they possess of dissolving completely out of the fibres of the cloth in the post-printing washing process, and

they have a long flowing, viscous rheology, giving sharp print and good penetration in the cloth. Today guar gum and tamarind derivates offer a cheaper alternative.

British gum or dextrin is prepared by heating starch. It varies considerably in composition, sometimes being only slightly roasted and consequently only partly converted into dextrine, and at other times being highly torrefied, and almost completely soluble in cold water and very dark in color. Its thickening power decreases and its gummy nature increases as the temperature at which it is roasted is raised. It is useful for strongly acid colors, and with the exception of gum Senegal, it is the best choice for strongly alkaline colors and discharges. Like the natural gums, it does not penetrate as well into the fibre of the cloth pr as deeply as pure starch or flour and is unsuitable for very dark, strong colors.

Gum tragacanth, or Dragon, which may be mixed in any proportion with starch or flour, is equally useful for pigment colors and mordant colors. When added to a starch paste it increases its penetrative power and adds to its softness without diminishing its thickness, making it easier to wash out of the fabric. It produces much more even colors than does starch paste alone. Used by itself it is suitable for printing all kinds of dark grounds on goods that are required to retain their soft clothy feel.

Starch always leaves the printed cloth somewhat harsh in feeling (unless modified carboxymethylated starches are used), but very dark colors can be obtained. Gum Senegal, gum arabic or modified guar gum thickening yield clearer and more even tints than does starch, suitable for lighter colors but less suited for very dark colors. (The gums apparently prevent the colors from combining fully with the fibers.) A printing stock solution is mostly a combination of modified starch and gum stock solutions.

Albumen

Albumen is both a thickening and a fixing agent for insoluble pigments. Chrome yellow, the ochres, vermilion and ultramarine are such pigments. Albumen is always dissolved in the cold, a process that takes several days when large quantities are required. Egg albumen is expensive and only used for the lightest shades. Blood albumen solution is used in cases when very dark colors are required to be absolutely fast to washing. After printing, albumen thickened colors are exposed to hot steam, which coagulates the albumen and effectually fixes the colors.

2.10 Printing paste preparation

Combinations of cold water-soluble carboxymethylated starch, guar gum and tamarind derivatives are most commonly used today in disperse screen printing on polyester. Alginates are used for cotton printing with reactive dyes, sodium polyacrylates for pigment printing, and in the case of vat dyes on cotton only carboxymethylated starch is used.

Formerly, colors were always prepared for printing by boiling the thickening agent, the coloring matter and solvents, together, then cooling and adding various fixing agents. At the present time, however, concentrated solutions of the coloring matters and other adjuncts are often simply added to the cold thickenings, of which large quantities are kept in stock.

Colors are reduced in shade by simply adding more stock (printing) paste. For example, a dark blue containing 4 oz. of methylene blue per gallon may readily be made into a pale shade by adding to it thirty times its bulk of starch paste or gum, as the case may be. The procedure is similar for other colors.

Before printing it is essential to strain or sieve all colors in order to free them from lumps, fine sand, and other impurities, which would inevitably damage the highly polished surface of the engraved rollers and result in bad printing. Every scratch on the surface of a roller prints a fine line on the cloth, and too much care, therefore, cannot be taken to remove, as far as possible, all grit and other hard particles from every color.

Straining is usually done by squeezing the color through filter cloths like artisanal fine cotton, silk or industrial woven nylon. Fine sieves can also be employed for colors that are used hot or are very strongly alkaline or acid.

2.11 Paste Specification

S/L no	Paste Name	Survival Time (after mixing color)	Cost (Tk/Kg)
1	Rubber	90 days	250-1400
2	Pigment	45 days	300-360
3	Plastisol	Unlimited	350-3500
4	Discharge	12 hour	175-450
5	Puff	90 days	550-750
6	Glitter	12 hour	800-2700
7	Reflective	6 hour	5000-6000
8	High density	Unlimited	350-3500
9	Gel	Unlimited	1275-1500
10	Afsan	6 hour	700-1600
11	Crack	30 Days	650-1150
12	Foil	6 hour before heat press	750-1300

2.12 Methods of printing

There are eight distinct methods presently used to impress colored patterns on cloth:

- Hand block printing
- Perrotine printing
- Engraved copperplate printing
- Roller, cylinder, or machine printing
- Stencil printing
- Screen printing
- Digital textile printing
- Flexo textile printing
- Discharge Printing

Block printing

This process is the earliest, simplest and slowest of all printing methods. A design is drawn on, or transferred to, prepared wooden blocks. A separate block is required for each distinct color in the design. A blockcutter carves out the wood around the heavier masses first, leaving the finer and more delicate work until the last so as to avoid any risk of injuring it when the coarser parts are cut. When finished, the block has the appearance of a flat relief carving, with the design standing out. Fine details, difficult to cut in wood, are built up in

strips of brass or copper, which is bent to shape and driven edgewise into the flat surface of the block. This method is known as coppering.

The printer applies color to the block and presses it firmly and steadily on the cloth, striking it smartly on the back with a wooden mallet. The second impression is made in the same way, the printer taking care to see that it registers exactly with the first. Pins at each corner of the block join up exactly, so that the pattern can continue without a break. Each succeeding impression is made in precisely the same manner until the length of cloth is fully printed. The cloth is then wound over drying rollers. If the pattern contains several colors the cloth is first printed throughout with one color, dried, and then printed with the next.

Block printing by hand is a slow process. But it's an interesting thing to do.It is, however, capable of yielding highly artistic results, some of which are unobtainable by any other method. William Morris used this technique in some of his fabrics.

Perrotine printing

The perrotine is a block-printing machine invented by Perrot of Rouen in 1834 and is now only of historical interest.

Roller, cylinder, or machine printing

This process was patented by Thomas Bell in 1785, fifteen years after his use of an engraved plate to print textiles. Bell's patent was for a machine to print six colours at once, but, probably owing to its incomplete development, it was not immediately successful. One colour could be printed with satisfactorily; the difficulty was to keep the six rollers in register with each other. This defect was overcome by Adam Parkinson of Manchester in 1785. That year, Bells machine with Parkinson's improvement was successfully employed by Messrs Livesey, Hargreaves and Company of Bamber Bridge, Preston, for the printing of calico in from two to six colors at a single operation.

Roller printing was highly productive, 10,000 to 12,000 yards being commonly printed in one day of ten hours by a single-color machine. It is capable of reproducing every style of design, ranging from the fine delicate lines of copperplate engraving to the small repeats and limited colors of the perrotine to the broadest effects of block printing with repeats from 1 in to 80

inches. It is precise, so each portion of an elaborate multibcolor pattern can be fitted into its proper place without faulty joints at the points of repetition.

Stencil printing

The art of stenciling on textile fabrics has been practiced from time immemorial by the Japanese, and found increasing employment in Europe for certain classes of decorative work on woven goods during the late 19th century.

A pattern is cut from a sheet of stout paper or thin metal with a sharp-pointed knife, the uncut portions representing the part that will be left uncolored. The sheet is laid on the fabric and color is brushed through its interstices.

The peculiarity of stenciled patterns is that they have to be held together by ties. For instance, a complete circle cannot be cut without its centre dropping out, so its outline has to be interrupted at convenient points by ties or uncut portions. This limitation influences the design.

For single-color work a stenciling machine was patented in 1894 by S. H. Sharp. It consists of an endless stencil plate of thin sheet steel that passes continuously over a revolving cast iron cylinder. The cloth to be ornamented passes between the two and the color is forced onto it through the holes in the stencil by mechanical means.

Screen-printing

Screen printing is by far the most common technology today. Two types exist: rotary screen printing and flat (bed) screen printing. A blade (squeegee) squeezes the printing paste through openings in the screen onto the fabric.

Digital textile printing

Digital textile printing is often referred to as direct-to-garment printing, DTG printing, or digital garment printing. It is a process of printing on textiles and garments using specialized or modified inkjet technology. Inkjet printing on fabric is also possible with an inkjet printer by using fabric sheets with a removable paper backing. Today, major inkjet technology manufacturers can offer specialized products designed for direct printing on textiles, not only for sampling but also for bulk production. Since the early 1990s, inkjet technology and

specially developed water-based ink (known as dye-sublimation or disperse direct ink) have made it possible to print directly onto polyester fabric. This is mainly related to visual communication in retail and brand promotion (flags, banners and other point of sales applications). Printing onto nylon and silk can be done by using an acid ink. Reactive ink is used for cellulose based fibers such as cotton and linen. Inkjet technology in digital textile printing allows for single pieces, mid-run production and even long-run alternatives to screen printed fabric.

Flexo textile printing

Flexo textile printing on textile fabric was successful in China in the last 4 years. Central Impression Flexo, Rubber Sleeves as the printing plate in round engraved by laser (Direct Laser Engraving), Anilox in Sleeve technologies are applicated in the area. Not only the solid, but also 6 to 8 colors in fine register, higher resolution ratio and higher productivity which are the outstanding advantages extraordinary different from the traditional screen textile printing. Aerospace Huayang, Hell system, SPG Prints and Felix Bottcher contributed their technologies and efforts.

Other methods of printing

Although most work is executed throughout by one or another of the seven distinct processes mentioned above, combinations are frequently employed. Sometimes a pattern is printed partly by machine and partly by block, and sometimes a cylindrical block is used along with engraved copper-rollers in an ordinary printing machine. The block in this latter case is in all respects, except for shape, identical with a flat wood or coppered block, but, instead of being dipped in color, it receives its supply from an endless blanket, one part of which works in contact with color-furnishing rollers and the other part with the cylindrical block. This block is known as a surface or peg roller. Many attempts have been made to print multicolor patterns with surface rollers alone, but hitherto with little success, owing to their irregularity in action and to the difficulty of preventing them from warping. These defects are not present in the printing of linoleum in which opaque oil colors are used, colors that neither sink into the body of the hard linoleum nor tend to warp the roller.

Lithographic printing has been applied to textile fabrics with qualified success. Its irregularity and the difficulty of registering repeats have restricted its use to the production of decorative panels, equal or smaller in size to the plate or stone.

Pad printing has been recently introduced to textile printing for the specific purpose of printing garment tags and care labels.

Calico printing

Goods intended for calico printing are well-bleached; otherwise stains and other serious defects are certain to arise during subsequent operations.

The chemical preparations used for special styles will be mentioned in their proper places; but a general prepare, employed for most colors that are developed and fixed by steaming only, consists in passing the bleached calico through a weak solution of sulphated or turkey red oil containing 2.5 to 5 percent fatty acid. Some colors are printed on pure bleached cloth, but all patterns containing alizarine red, rose and salmon shades are considerably brightened by the presence of oil, and indeed very few, if any, colors are detrimentally affected by it.

The cloth is always brushed to free it from loose nap, flocks and dust that it picks up whilst stored. Frequently, too, it has to be sheared by being passed over rapidly revolving knives arranged spirally round an axle, which rapidly and effectually cuts off all filaments and knots, leaving the cloth perfectly smooth and clean. It is then stentered, wound onto a beam, and mounting on the printing machines.

Silk printing

The colours and methods employed are the same as for wool, except that in the case of silk no preparation of the material is required before printing, and ordinary dry steaming is preferable to damp steaming.

Both acid and basic dyes play an important role in silk printing, which for the most part is confined to the production of articles for fashion goods, handkerchiefs, and scarves, all articles for which bright colors are in demand. Alizarine and other mordant colors are mainly used for any goods that have to resist repeated washings or prolonged exposure to light. In this case the silk frequently must be prepared in alizarine oil, after which it is treated in all respects like cotton, namely steamed, washed and soaped, the colors used being the same.

Silk is especially adapted to discharge and reserve effects. Most of the acid dyes can be discharged in the same way as when they are dyed on wool. Reserved effects are produced by printing mechanical resists, such as waxes and fats, on the cloth and then dyeing it in cold

dye-liquor. The great affinity of the silk fibre for basic and acid dyestuffs enables it to extract coloring matter from cold solutions and permanently combine with it to form an insoluble lake. After dyeing, the reserve prints are washed, first in cold water to remove any color not fixed onto the fibre, and then in hot water or benzene to dissolve out the resisting bodies.

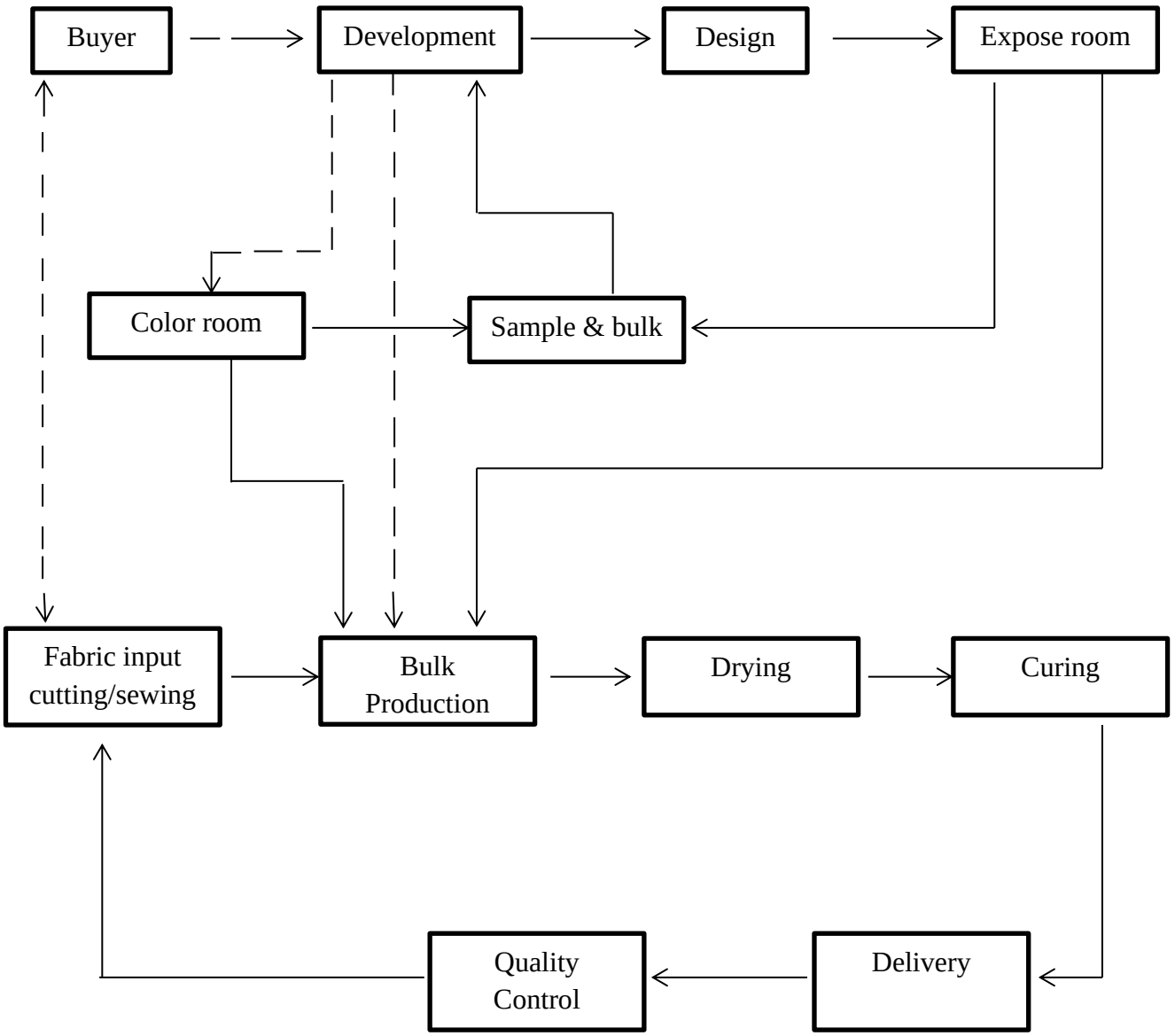
After steaming, silk goods are normally only washed in hot water, but those printed entirely in mordant dyes will stand soaping, and indeed require it to brighten the colors and soften the material.

Some silk dyes do not require heat setting or steaming. They strike instantly, allowing the designer to dye color upon color. These dyes are intended mostly for silk scarf dyeing. They also dye bamboo, rayon, linen, and some other natural fabrics like hemp and wool to a lesser extent, but do not set on cotton.

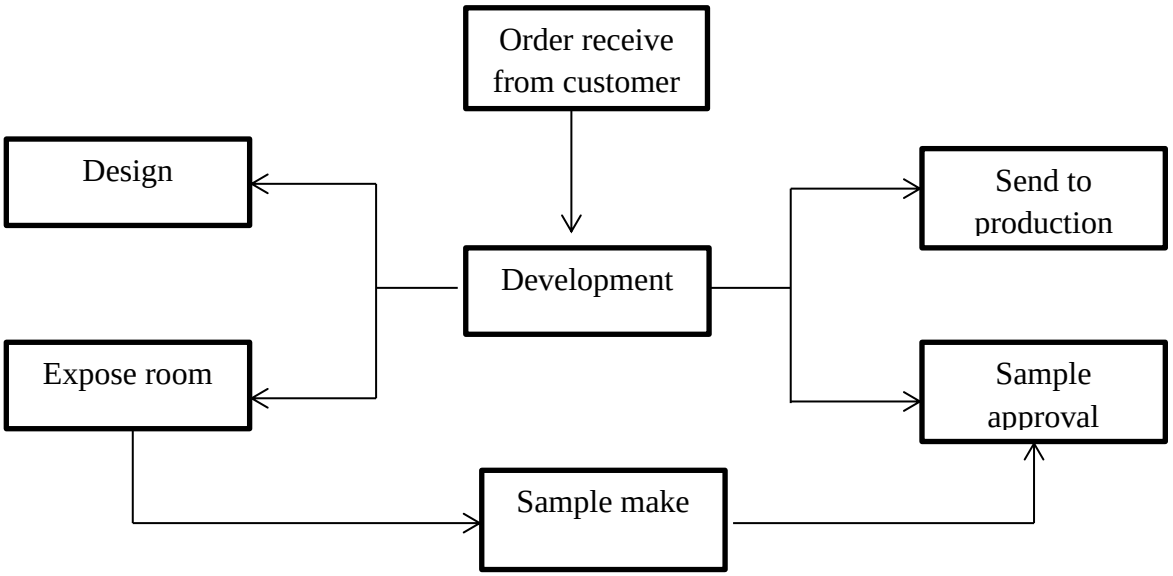
2.13 Machine Information of Viyellatex Group

Machine Type	**Category**	**No of Machine**	**Capacity (Pcs/hr/mc)**
Screen shot	Auto screen shot	4	32 (12 head)
	Manual screen shot	Table 25	33 (per table)
Drying	Auto dryer	4	800
	Hand dryer	100	600
Expose shot	Auto expose shot	1	70
	Manual expose shot	3	10
Heat Press	Depend on pressure & temperature range	6	240
Curing	Depend on temperature and belt speed	7	80

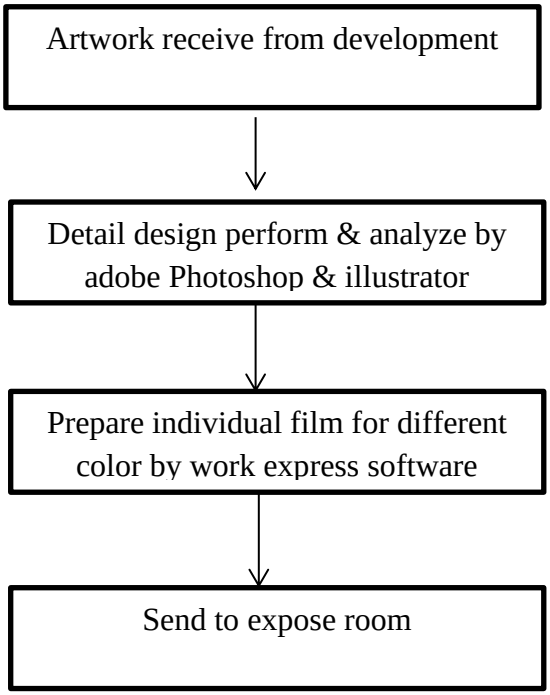
2.14 Work flow chart of printing:



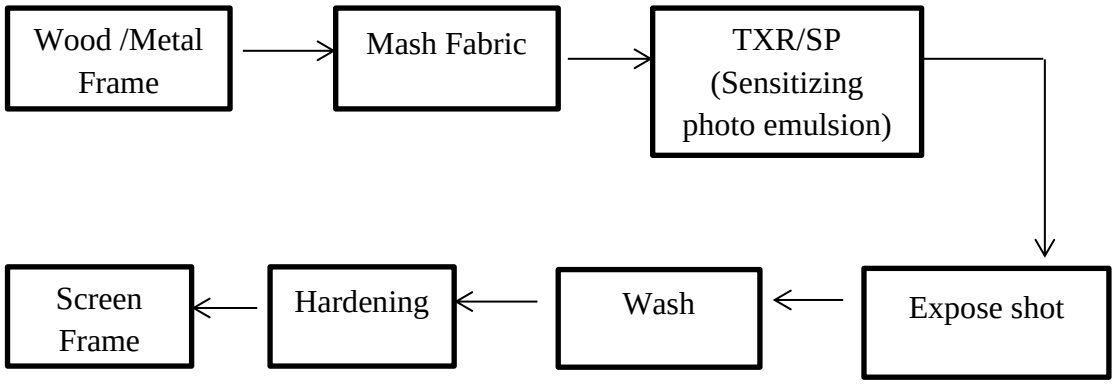
2.15 Work flow chart of development section:



2.16 Work flow chart of design section:



2.17 Work flow chart of Expose room:



2.18 Mash fabric number & print type:

Mash fabric number	**Print type**
10,12	Glitter
14	Afsan,Discharg,Pigment
16,20	Rubber,Puff,High Density,Foil,Gel,Plastisol,Reflective,Crack.

2.19 Feature of some machines of printing section

Auto screen shot

1. Faster production
2. High color combination
3. Immediate drying between two consecutive print
4. Not suitable for :

    a) Large & complete body print

    b) High-density, Flock & multiple color discharge print.

Manual screen shot

1. Generally all types of print are performed.
2. More time consuming.
3. During performed by hand & auto dryer.
4. Print quality depend on printer consciousness & sincerity.

Drying

1. Drying is performed by two ways,
   a) Hand drying
   b) Auto drying
2. It is performed to dry previous color temporarily.
3. Color migration occurred due to improper drying of previous color

Curing

- Curing is the ultimate drying of print.

2.20 Color fastness

Color fastness is one of the important factors in case of buyer demand. The outstandingly important property of a dyed or printed material is the fastness of the shade of color. Color fastness refers to the resistance of color to fade or bleed of a dyed or printed textile materials to various types of influences e.g. water,light,rubbing,washing,perspiration etc.to which they are normally exposed in textile manufacturing and in daily use.

2.21 Standards of color fastness

1. AATCC (American Association of Textile Chemist and Colorists

2. SDC (Society of Dyers and Colorists)

3. ISO (International Organization for Standardization)

2.22 Types of color fastness test

1. Color Fastness to Rubbing.
2. Color Fastness to Washing.
3. Color Fastness to Water.
4. Color Fastness to Perspiration.
5. Color Fastness to Light.

2.23 Definition of different color fastness test

1. Color Fastness to Rubbing: The test is designed to determine the degree of color which may be transferred from the surface of a colored fabric to specific test cloth for rubbing (Dry & wet).The crock meter provides a rubbing motion simulating the action of a human finger and forearm.

2. Color Fastness to Washing: This method is designed to determine the effect of washing on the color fastness of the textile. A specimen of the colored textile in contact with one or two specified adjacent fabrics is mechanically agitated under specified conditions of time and temperature in a soap solution,then rinsed and dried.The change in color of the specimen and the staining of the adjacent fabric are assessed with the gray scale.

The degree of fading and staining depends on:

1. Temperature
2. The types of detergent used
3. The amount of detergent used
4. Mechanical action (no steel ball used)
5. The washing liquor ratio
6. The hardness of water
7. The rinsing, drying or pressing method used to restore the sample after the washing

3. Color Fastness to Water: The garments which come into contact with water, may suffer serious local discoloration. This test is intended to determine the resistance of color of dyed or printed textile to the action of water .

4. Color Fastness to Perspiration: The garments 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. Determine the effect of acid & alkaline perspiration on the color fastness of textile material.

5. Color Fastness to Light: A specimen of the textile to be tested is exposed to artificial light under prescribed conditions, along with a set of blue wool references. The color fastness is assessed be comparing the change in color of the test specimen with that of the references used.

2.24 Factor affecting change in color and stunning

The color changes when dyed or printed textile are subjected to a particularly are due to one or both of the following two main causes. The first is the breakdown of the colorant itself inside , the fabric where by the it is converted colorless or differently colored compound. The second is the detachment of the as such from the fiber. There may be a change in color of the fibre which will lead to change in the color in the dyeing or printing point of view.

It is important to emphasize that colorfastness is a property of colored textile material and not a colorant in isolation.

The extent in the change in color of a colored textile material and staining of adjacent on expose to particular condition is determined by a number of characteristics of the colorant and fibre in association with each other in the dyeing or print.

There are certain factors which affect almost all the fastness tests. They are:

1. Chemical structure of the colorant
2. The state of the colorant in the fibre
3. The amount of the colorant in the fibre
4. The fibre
5. Foreign substance

In the case of fastness to light, there are few additional factors, they are

1. The spectral composition and intensity of the incident radiation
2. The external atmospheric condition
3. Relative humidity and air temperature
4. Contaminants such as oxides of nitrogen sulphure or ozone in the air

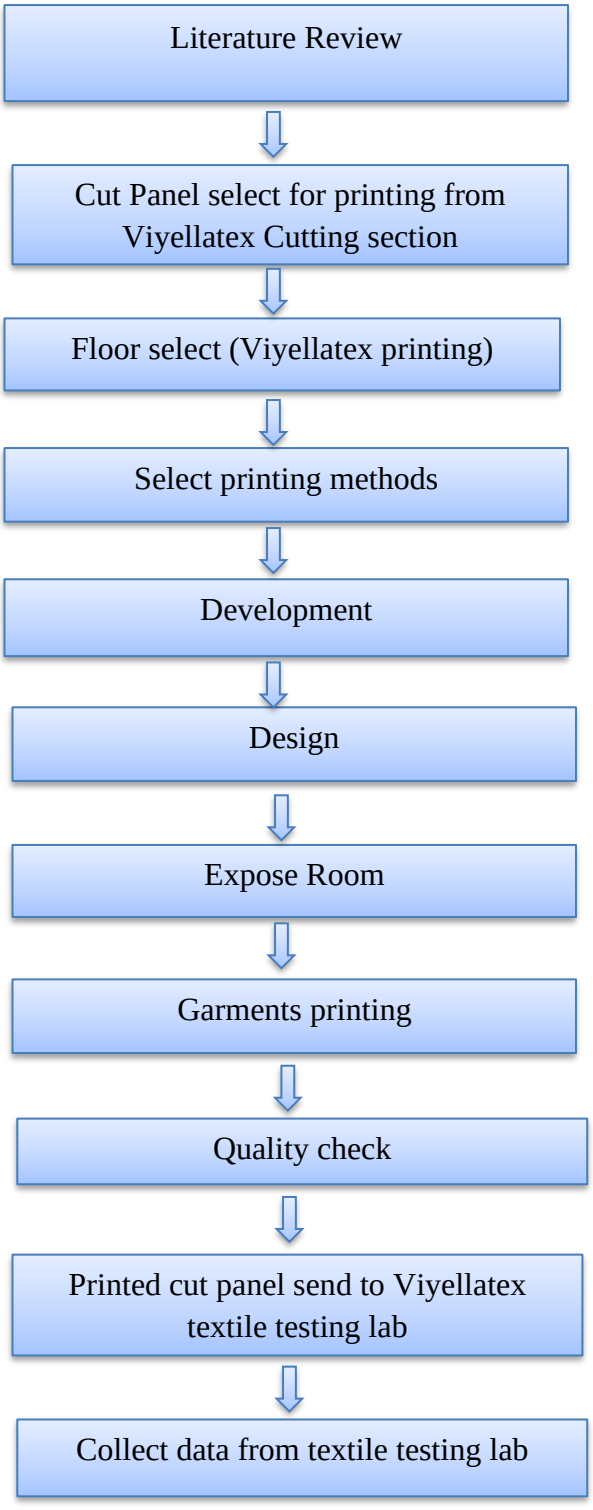
Fastness measurement by eyes is subjective, since it dependent on evaluation of the observer. Sometimes problems occur because the procedure and customer give different values to the same fastness test. To eliminate subjective perception of evaluating color fastness by eyes, instrumental color fastness measurement methods have been developed and it has been presented to the service of textile sector. The aim of this study is to evaluate the color fastness properties of various printing on cotton t shirt.

CHAPTR-3

METHODOLOGY

3.1 Methodology

The project work was done by collecting necessary information step by step. The data were collected by monitoring and recording throughout the period of implementation for analysis purposes. The impact of color fastness test was analyzed via discussing and observation of the personnel who were directly involved in the implementation process.



3.2 Printing Method used

1. Rubber print
2. Pigment print
3. Discharge print
4. Puff print
5. Foil print

3.3 Fabrics Used

<table>
<tr><td rowspan="5">  </td><td>Product Name</td><td>T-Shirt</td></tr>
<tr><td>Size Range</td><td>S,M,L,XL</td></tr>
<tr><td>Fabric Construction</td><td>Single Jersey</td></tr>
<tr><td>Fiber Composition</td><td>100 % Cotton</td></tr>
<tr><td>GSM</td><td>160</td></tr>
</table>

3.4 The material used for our work is as follows:

1. Balance
2. Dryer Machine
3. Crock meter for rubbing test
4. Perspiration tester
5. Perspiration oven
6. Launder O-meter for wash fastness
7. Crocking cloth
8. Beaker
9. Gray scale for color change
10. Gray scale for color staining
11. Glass or acrylic plate.

3.5 Procedure

1. A literature review has been made by studying journal, books, articles, report, blog, website, online newspaper and online magazine.

2. The cut panel have been select from Viyellatex sewing section.

3. After select the cut panel we collect the recipe of printing for different printing methods. The printing was done by following recipe.

Print Type: Rubber Print

Serial	**Print Paste Name**	**Percentage/Qty**
1	WXM White (300)	4 kg
2	CXM Clear (301)	2 kg
3	B.Z Yellow R.R	200 gm
4	B.Z Red K.G.C	200 gm
5	B.Z H.B.B	200 gm
6	Catalyzer Is	3 %

Print Type: Pigment Print

Serial	**Print Paste Name**	**Percentage/Qty**
1	ASU.Print EPG.ECO	10 kg
2	Print Perfect Lac.60	2 kg
3	B.Z Black D.W	200 gm
4	B.Z Blue R.R	300 gm
5	B.Z Violate K.B	100 gm
6	Catalyzer Is	4 %

Print Type: Discharge Print

Serial	Print Paste Name	Percentage/Qty
1	Print Perfect Dc FF White	6 kg
2	Print Perfect Dc FF Clear	4 kg
3	B.Z Yellow R.R	200 gm
4	B.Z Red K.G.C	200 gm
5	B.X.Z Red H.B.B	200 gm
6	Reductor H.113	8 %

Print Type: Puff Print

Serial	Print Paste Name	Percentage/Qty
1	WXM White (300)	2 kg
2	CXM Clear (301)	2 kg
3	Print Perfect EX. TS-2	4 kg
4	B.Z Black D.W	200 gm
5	B.Z Blue R.R	200 gm
6	B.Z Violate K.B	100 gm
7	Catalyzer	3%

Print Type: Foil Print

Serial	Print Paste Name	Percentage/Qty
1	Foil Paste-Bond-55	2 kg

4. The printing paste is prepared by following the recipe for each method. Then we prepared of design in development room. After that we collect the screen frame from the expose room.

5. The printing is done by using the screen frame .We pass the printed cut panels by dryer machine for drying the printed cut panel.

6. After quality check of the cut panels we send to textile testing lab. We tested the color fastness test of the printed cut panels.

7. Procedure of some color fastness tests are given below.

a) Procedure of color fastness to rubbing test

Dry crocking test:

i. First we take the sample.
ii. Then the cut panel is placed on the emery paper.
iii. Pinned specimen holder is used to hold the fabric.
iv. After that crocking cloth is about 5X5 cm has settled with finger by spring clip.
v. Loading unit is applied put the finger pinned the operating handle is operated by using of hand.
vi. We give 10 stocks the direction of every stock in 1 second.
vii. Then the sample is collected of composed with gray scale.
viii. Crocking cloth is collected and compound with scale

Wet crocking test:

In the case of wet crocking test crocking cloth in wetted with distilled water and excess water is sequences that it contains its own mass of water and then we go on the same of also.

b) Procedure of color fastness to washing test

Equipment used

i. Rotawash color fastness tester (Launder O-meter).
ii. Silver balls weighting 0.89g having a diameter of 0.7mm.
iii. Hot oven

Sample preparation for ISO method:

i. A 10X4 sample size is taken and stitched with a 10X4 multifibre from all sides.
ii. Multifibre consists of six fibres i e, acetate, cotton, nylon, polyester, acrylic and wool.

Procedure for ISO method

i. 25 silver balls were taken, along with the sample and put into the stainless steel container or Rotawash which is rotated for 30 min at 50℃.
ii. After 30 min sample is dried in 45℃-60℃
iii. Then finally mounting is done.

Sample preparation for AATCC method

i. A 5X15 sample size is taken and stitched with 6X 6 multifibre from all sides.
ii. Multifibre consists of six fibres i.e, acetate, cotton, nylon, polyester, acrylic and wool.

Procedure for AATCC method

i. 50 silver balls were taken, along with the sample and put into the stainless steel container of Rotawash which is rotated for 40 min at 50℃.
ii. After 30 min sample is dried in 45℃-60℃.
iii. Then finally mounting is done.

c) Procedure of color fastness to water test

Color fastness to water is designed to measure the resistance to water of dyed or printed colored textile fabric. The color fastness to water test method is carried out by two methods AATCC 107-1991 or ISO 105 E01.

Reagent: Distilled water or de-ionized water is used in this test method because natural (tap) water is variable in composition.

Sample preparation: we cut the specimen & multi fibre at 10X4 cm & sewn together.

Working procedure:

i. The specimen wet in distilled water at room temperature and it will suck water.
ii. Then we place it in acrylic resin plates and put the weight on to the plates.
iii. We keep it in oven and keep the temperature at 37 ± 2℃ for 4 hrs.
iv. Open the specimen and dry it in the air hot exceeding 60℃.
v. Change in color is assessed with the help of Gray scale.

d) Procedure of color fastness to perspiration test

This method is used to determine the resistance of the color of textile of all kinds and in all forms to perspiration.

Reagent: Solution freshly prepared containing 0.5g –histidine mono hydrochloride mono hydrate,5g sodium chloride and 2.5g disodium hydrogen ortho phosphate per litre brought to PH 8.0 with 0.1 N Sodium hydroxide.

Solution freshly prepared containing 0.5g 1-hidtidine mono hydrochloride mono hydrate,5g sodium chloride and 2.2g sodium dihydrogen ortho phosphate per litre brought to PH 5.5 with 0.1 N Sodium hydroxide.

Two cloths for each specimen each 6X6 cm of the same kind of fibre of the sample. Place the specimen between the two pieces of white cloth and sew along one side to form a sample.

Working procedure: Thoroughly wet one sample in a solution of PH 8.0 at the liquor ratio of 20.01 and allow it to remain in this solution at room temperature for 30 min. Pour off the solution and place the sample between two glasses plates measuring about 7.5X6.5cm under a force of about 4.5kg.

i. Treat the other sample in the same way but with the solution at PH 5.5
ii. Place the apparatus containing the samples in the oven for 4 hour at 37±2℃.
iii. Separate the sample from the white cloth and dry them apart in air at the temperature not exceeding 60℃.
iv. Assess the change in color of the specimen and the staining of the white cloth with the grey scale.

e) Procedure of color fastness to light test

This test measures the resistance to fading of died 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 and compare the change with original unexposed sample the changes are assessed by blue scale.

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

Procedure: The test is done step by step following step is maintained during measure the color fastness to light.

i. Cut the four piece of test specimens according to the length & width wise and attached with the specimen holder.
ii. Then the holder set in to the microsol light fastness tester.
iii. Then the experiment continued at 72 hours.
iv. After 72 hours later the specimen taken from the light fastness tester.
v. Then the test specimen compare with the Blue scale or computer color matching system.

8. We Followed all the procedure of the color fastness test and take the result in the data table.

CHAPTR-4

RESULT AND DISCUSSION

4.1 Color fastness test for Rubber Printing

Fabric Color	Print Type	Print Color	Fabric Composition	Detergent	Temperature
Medium Gray	Rubber	White	100% Cotton	ECE (A),S.Perborate	40 Degree C

Methods	Direction	Grade For Rubbing	Requirement
C/F to Rubbing	Dry Rub	3-4	4
	Wet Rub	2-3	2-3

C/F to Washing		CC	Acetate	Cotton	Nylon	Polyester	Acrylic	Wool	CC	CS
		N/A	N/A	N/A	N/A	N/A	N/A	N/A	4-5	3-4
C/F to Water		CC	Acetate	Cotton	Nylon	Polyester	Acrylic	Wool	CC	CS
		N/A	N/A	N/A	N/A	N/A	N/A	N/A	4-5	3-4
C/F to Perspiration	Form	CC	Acetate	Cotton	Nylon	Polyester	Acrylic	Wool	CC	CS
	Acidic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4-5	3-4
	Alkaline	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4-5	3-4

C/F to Light	Test standard	Grade	Requirement
	Blue wool	4	>4 (white or pastel color >3-4 & Turquise or Neon c).

Ref. Code	Test Name	Test Method
Pt65	Print Durability Test	ISO5077/ISO3759/ISO6330/+ISO16322

Observation point	After 1st washing	After 5th washing	After 10th washing
C. change of fabric	4-5	4-5	4-5
C. change of print	4-5	4-5	4-5
Cracking	Cracking not found	Cracking not found	Cracking not found
Fading	Negligible	Negligible	Negligible
Appearance after wash	Found okay	Found okay	Found okay

Comments : PT65 & General appearance of print is okay after 1st , 5th & 10th Wash.

4.1.1 Color fastness test result and discussion for Rubber Printing

Print Methods	Result		Discussion	Final Result
C/F to Rubbing	Dry Rub	4	In this method the requirement for Dry Rub is 4 and we found the test result is 4, For wet Rub requirement is 2-3 and the test result is 2-3.	Accepted
	Wet Rub	2-3		
C/F to Washing	Color Change	4-5	In this method the requirement for Color Change is 4-5 and we found the test result is 4-5, For Color Staining requirement is 3-4 and the test result is 3-4.	Accepted
	Color Staining	3-4		
C/F to Water	Color Change	4-5	In this method the requirement for Color Change is 4-5 and we found the test result is 4-5, For Color Staining requirement is 3-4 and the test result is 3-4.	Accepted
	Color Staining	3-4		
C/F to Perspiration	Color Change	4-5	In this method the requirement for Color Change is 4-5 and we found the test result is 4-5, For Color Staining requirement is 3-4 and the test result is 3-4.	Accepted
	Color Staining	3-4		
C/F to Light	White or pastel color	>4	In this method the requirement is >4 (white or pastel color >3-4 & Turquise or Neon c), we found the result >4 (white or pastel color >3-4 & Turquise or Neon c.	Accepted
	Turquise or Neon Color	>3-4		

4.2 Color fastness test for Pigment Printing

Fabric Color	Print Type	Print Color	Fabric Composition	Detergent	Temperature
Medium Gray	Pigment	White	100% Cotton	ECE (A),S.Perborate	40 Degree C

Methods	Direction	Grade For Rubbing	Requirement
C/F to Rubbing	Dry Rub	3-4	4
	Wet Rub	2-3	2-3

C/F to Washing		CC	Acetate	Cotton	Nylon	Polyester	Acrylic	Wool	CC	CS
		N/A	N/A	N/A	N/A	N/A	N/A	N/A	4-5	3-4
C/F to Water		CC	Acetate	Cotton	Nylon	Polyester	Acrylic	Wool	CC	CS
		N/A	N/A	N/A	N/A	N/A	N/A	N/A	4-5	3-4
C/F to Perspiration	Form	CC	Acetate	Cotton	Nylon	Polyester	Acrylic	Wool	CC	CS
	Acidic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4-5	3-4
	Alkaline	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4-5	3-4

C/F to Light	Test standard	Grade	Requirement
	Blue wool	4	>4 (white or pastel color >3-4 & Turquise or Neon c).

Ref. Code	Test Name	Test Method
Pt65	Print Durability Test	ISO5077/ISO3759/ISO6330/+ISO16322

Observation point	After 1st washing	After 5th washing	After 10th washing
C. change of fabric	4-5	4-5	4-5
C. change of print	4-5	4-5	4-5
Cracking	Cracking not found	Cracking not found	Cracking not found
Fading	Negligible	Negligible	Negligible
Appearance after wash	Found okay	Found okay	Found okay

Comments : PT65 & General appearance of print is okay after 1st , 5th & 10th Wash.

4.2.1 Color fastness test result and discussion for Pigment Printing

Print Methods	Result		Discussion	Final Result
C/F to Rubbing	Dry Rub	4	In this method the requirement for Dry Rub is 4 and we found the test result is 4, For wet Rub requirement is 2-3 and the test result is 2-3.	Accepted
	Wet Rub	2-3		
C/F to Washing	Color Change	4-5	In this method the requirement for Color Change is 4-5 and we found the test result is 4-5, For Color Staining requirement is 3-4 and the test result is 3-4.	Accepted
	Color Staining	3-4		
C/F to Water	Color Change	4-5	In this method the requirement for Color Change is 4-5 and we found the test result is 4-5, For Color Staining requirement is 3-4 and the test result is 3-4.	Accepted
	Color Staining	3-4		
C/F to Perspiration	Color Change	4-5	In this method the requirement for Color Change is 4-5 and we found the test result is 4-5, For Color Staining requirement is 3-4 and the test result is 3-4.	Accepted
	Color Staining	3-4		
C/F to Light	White or pastel color	>4	In this method the requirement is >4 (white or pastel color >3-4 & Turquise or Neon c), we found the result >4 (white or pastel color >3-4 & Turquise or Neon c.	Accepted
	Turquise or Neon Color	>3-4		

4.3 Color fastness test for Discharge Printing

Fabric Color	Print Type	Print Color	Fabric Composition	Detergent	Temperature
Medium Gray	Discharge	White	100% Cotton	ECE (A),S.Perborate	40 Degree C

Methods	Direction	Grade For Rubbing	Requirement
C/F to Rubbing	Dry Rub	3-4	4
	Wet Rub	2-3	2-3

C/F to Washing		CC	Acetate	Cotton	Nylon	Polyester	Acrylic	Wool	CC	CS
		N/A	N/A	N/A	N/A	N/A	N/A	N/A	3-4	2-3
C/F to Water		CC	Acetate	Cotton	Nylon	Polyester	Acrylic	Wool	CC	CS
		N/A	N/A	N/A	N/A	N/A	N/A	N/A	4-5	3-4
C/F to Perspiration	Form	CC	Acetate	Cotton	Nylon	Polyester	Acrylic	Wool	CC	CS
	Acidic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4-5	3-4
	Alkaline	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4-5	3-4

C/F to Light	Test standard	Grade	Requirement
	Blue wool	4	>4 (white or pastel color >3-4 & Turquise or Neon c).

Ref. Code	Test Name	Test Method
Pt65	Print Durability Test	ISO5077/ISO3759/ISO6330/+ISO16322

Observation point	After 1st washing	After 5th washing	After 10th washing
C. change of fabric	4-5	4-5	4-5
C. change of print	4-5	4-5	3-4
Cracking	Cracking not found	Cracking not found	Cracking not found
Fading	Negligible	Negligible	Negligible
Appearance after wash	Found okay	Found okay	Found okay

Comments : PT65 & General appearance of print is okay after 1st , 5th & 10th Wash.

4.3.1 Color fastness test result and discussion for Discharge Printing

Print Methods	Result		Discussion	Final Result
C/F to Rubbing	Dry Rub	4	In this method the requirement for Dry Rub is 4 and we found the test result is 4, For wet Rub requirement is 2-3 and the test result is 2-3.	Accepted
	Wet Rub	2-3		
C/F to Washing	Color Change	3-4	In this method the requirement for Color Change is 3-4 and we found the test result is 3-4, For Color Staining requirement is 2-3 and the test result is 2-3.	Accepted
	Color Staining	2-3		
C/F to Water	Color Change	4-5	In this method the requirement for Color Change is 4-5 and we found the test result is 4-5, For Color Staining requirement is 3-4 and the test result is 3-4.	Accepted
	Color Staining	3-4		
C/F to Perspiration	Color Change	4-5	In this method the requirement for Color Change is 4-5 and we found the test result is 4-5, For Color Staining requirement is 3-4 and the test result is 3-4.	Accepted
	Color Staining	3-4		
C/F to Light	White or pastel color	>4	In this method the requirement is >4 (white or pastel color >3-4 & Turquise or Neon c), we found the result >4 (white or pastel color >3-4 & Turquise or Neon c.	Accepted
	Turquise or Neon Color	>3-4		

4.4 Color fastness test for Puff Printing

Fabric Color	Print Type	Print Color	Fabric Composition	Detergent	Temperature
Medium Gray	Puff	White	100% Cotton	ECE (A),S.Perborate	40 Degree C

Methods	Direction	Grade For Rubbing	Requirement
C/F to Rubbing	Dry Rub	3-4	4
	Wet Rub	2-3	2-3

C/F to Washing		CC	Acetate	Cotton	Nylon	Polyester	Acrylic	Wool	CC	CS
		N/A	N/A	N/A	N/A	N/A	N/A	N/A	3-4	2-3
C/F to Water		CC	Acetate	Cotton	Nylon	Polyester	Acrylic	Wool	CC	CS
		N/A	N/A	N/A	N/A	N/A	N/A	N/A	4-5	3-4
C/F to Perspiration	Form	CC	Acetate	Cotton	Nylon	Polyester	Acrylic	Wool	CC	CS
	Acidic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3-4	2-3
	Alkaline	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3-4	2-3

C/F to Light	Test standard	Grade	Requirement
	Blue wool	4	>4 (white or pastel color >3-4 & Turquise or Neon c).

Ref. Code	Test Name	Test Method
Pt65	Print Durability Test	ISO5077/ISO3759/ISO6330/+ISO16322

Observation point	After 1st washing	After 5th washing	After 10th washing
C. change of fabric	4-5	4-5	4-5
C. change of print	4-5	4-5	3-4
Cracking	Cracking not found	Cracking not found	Cracking not found
Fading	Negligible	Negligible	Negligible
Appearance after wash	Found okay	Found okay	Found okay

Comments : PT65 & General appearance of print is okay after 1st , 5th & 10th Wash.

4.4.1 Color fastness test result and discussion for Puff Printing

Print Methods	Result		Discussion	Final Result
C/F to Rubbing	Dry Rub	4	In this method the requirement for Dry Rub is 4 and we found the test result is 4, For wet Rub requirement is 2-3 and the test result is 2-3.	Accepted
	Wet Rub	2-3		
C/F to Washing	Color Change	3-4	In this method the requirement for Color Change is 3-4 and we found the test result is 3-4, For Color Staining requirement is 2-3 and the test result is 2-3.	Accepted
	Color Staining	2-3		
C/F to Water	Color Change	4-5	In this method the requirement for Color Change is 4-5 and we found the test result is 4-5, For Color Staining requirement is 3-4 and the test result is 3-4.	Accepted
	Color Staining	3-4		
C/F to Perspiration	Color Change	3-4	In this method the requirement for Color Change is 3-4 and we found the test result is 3-4, For Color Staining requirement is 2-3 and the test result is 2-3.	Accepted
	Color Staining	2-3		
C/F to Light	White or pastel color	>4	In this method the requirement is >4 (white or pastel color >3-4 & Turquise or Neon c), we found the result >4 (white or pastel color >3-4 & Turquise or Neon c.	Accepted
	Turquise or Neon Color	>3-4		

4.5 Color fastness test for Foil Printing

Fabric Color	Print Type	Print Color	Fabric Composition	Detergent	Temperature
Medium Gray	Foil	White	100% Cotton	ECE (A),S.Perborate	40 Degree C

Methods	Direction	Grade For Rubbing	Requirement
C/F to Rubbing	Dry Rub	3-4	4
	Wet Rub	2-3	2-3

C/F to Washing		CC	Acetate	Cotton	Nylon	Polyester	Acrylic	Wool	CC	CS
		N/A	N/A	N/A	N/A	N/A	N/A	N/A	3-4	2-3
C/F to Water		CC	Acetate	Cotton	Nylon	Polyester	Acrylic	Wool	CC	CS
		N/A	N/A	N/A	N/A	N/A	N/A	N/A	4-5	3-4
C/F to Perspiration	Form	CC	Acetate	Cotton	Nylon	Polyester	Acrylic	Wool	CC	CS
	Acidic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4-5	3-4
	Alkaline	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4-5	3-4

C/F to Light	Test standard	Grade	Requirement
	Blue wool	4	>4 (white or pastel color >3-4 & Turquise or Neon c).

Ref. Code	Test Name	Test Method
Pt65	Print Durability Test	ISO5077/ISO3759/ISO6330/+ISO16322

Observation point	After 1st washing	After 5th washing	After 10th washing
C. change of fabric	4-5	4-5	4-5
C. change of print	4-5	4-5	3-4
Cracking	Cracking not found	Cracking not found	Cracking not found
Fading	Negligible	Negligible	Negligible
Appearance after wash	Found okay	Found okay	Found okay

Comments : PT65 & General appearance of print is okay after 1st , 5th & 10th Wash.

4.5.1 Color fastness test result and discussion for Foil Printing

Print Methods	Result		Discussion	Final Result
C/F to Rubbing	Dry Rub	4	In this method the requirement for Dry Rub is 4 and we found the test result is 4, For wet Rub requirement is 2-3 and the test result is 2-3.	Accepted
	Wet Rub	2-3		
C/F to Washing	Color Change	3-4	In this method the requirement for Color Change is 3-4 and we found the test result is 3-4, For Color Staining requirement is 2-3 and the test result is 2-3.	Accepted
	Color Staining	2-3		
C/F to Water	Color Change	4-5	In this method the requirement for Color Change is 4-5 and we found the test result is 4-5, For Color Staining requirement is 3-4 and the test result is 3-4.	Accepted
	Color Staining	3-4		
C/F to Perspiration	Color Change	4-5	In this method the requirement for Color Change is 4-5 and we found the test result is 4-5, For Color Staining requirement is 3-4 and the test result is 3-4.	Accepted
	Color Staining	3-4		
C/F to Light	White or pastel color	>4	In this method the requirement is >4 (white or pastel color >3-4 & Turquise or Neon c), we found the result >4 (white or pastel color >3-4 & Turquise or Neon c.	Accepted
	Turquise or Neon Color	>3-4		

4.6 Discussion of test result

We considered the result for all printing methods and we found that the result of Rubber, Pigment, Discharge and Puff printing is better than Foil printing. Because those print methods contains different types of properties.

In Rubber printing the test result is always found very well. Any kind of fabric can be used in this printing method. Here fixing agent is use to fix the printing paste with the fabric .Print durability test , C/F to Rubbing test, C/F to washing test and other color fastness test is also found very well in Rubber printing.

Pigment printing is used in light color fabric. In light color fabric it shows us the original shade of color in the fabric.

Discharge printing is used for only the 100% Cotton fabric. But the fabric must be treated with dischargeable dye. Curing temperature is 400°F burning agents is used during printing. Puff printing is also having very good color fastness properties. Here curing temperature is about 350°F.

Foil printing is also used for all type of fabric. Here foil paper is used. Adhesive is used in this printing method for fixing the printing paste with the fabric. Heat press machine is used for this printing. Here plate temperature is about 150℃, time required 10-12 second with 6 kg pressure. The Color fastness properties of Foil printed fabric is not so well than other printing method. Here adhesive is used to fix the printing paste with the fabric. There is no fixing agent is used in the foil printing for this reason the fabric is look faded after washing.

Some printing methods like Rubber, Pigment, Discharge and Puff printing the printed fabric is passes through the curing and heat press machine with particular temperature and heat press machine pressure is 6 kg, time 5-7 second. In foil printing more time required than other printing. Then the printed fabric hanging in normal temperature for 24 hours then it sends to lab for test. If the procedure cannot be followed during test the test result can be vary.

CHAPTR-5

CONCLUSION

5.1 Limitations

- This project work was carried out in one factory. If the study took place for the same batch, same quantity then the result and findings may not be similar to these findings.
- As the combination system comprise of more steps, workers need to be trained and efficient.
- Due to busy schedule of the responsible persons, some necessary data and information could not be obtained.
- This study cannot be applied for more orders due to time constraint and lack of managerial permission and support.

5.2 Conclusion

During this thesis program we had tried to our best to done our duty. The officers co-operate us in every steps. It is completely a new experience in our life, which will be very effective in our service life.

In this period, we realized that practical experience is more valuable for service life. In this program contents some secret subject of factory is included. We learned about sample collection, sample development, printing paste preparation, design preparation, screen frame preparation. We learn how to complete a printing process. We learn how to control the color fastness properties of printed garments for different printing.

5.3 Future Scopes

This methodology is very effective for find out the color fastness properties of printed garments. We conducted this study to only one component of garment and for single jersey fabric. If this study carried out for different types of fabric and for three or more component garments, the result and findings will be more precise.

References:

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……..THE END……..