Faculty of Engineering
Department of Textile Engineering

Project (Thesis) on

EFFECT OF TIME ON THE CHARACTERISTICS OF REACTIVE DYED COTTON FABRIC

Course Code: TE-4214, **Course Title:** Project (Thesis)

Submitted by:

Md.Rakibul Islam Reza
ID: 192-23-725

Supervised by:

Mr. Tanvir Ahmed Chowdhury

Head,Department of Textile Engineering Faculty of Engineering

Daffodil International University

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Bachelor of Science in Textile Engineering

Advance in Wet Processing Technology

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DECLARATION

We hereby declare that, this project has been done by us under the supervision of**Mr. Tanvir Ahmed Chowdhury** Head, department of textile engineering, faculty of engineering, daffodil international university. we also declare that, neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

Rakibul

Md.Rakibul Islam Reza
ID: 192-23-725
Department of TE

Daffodil International University

LETTER OF APPROVAL

This project report prepared by Md.Rakibul Islam Reza (ID: 192-23-725) is approved in Partial Fulfillment of the Requirement for the Degree ofBACHELOR OF SCIENCE IN TEXTILE ENGINEERING. The said students have completed their project work under my supervision, During the research period I found them sincere, hardworking and enthusiastic.

Mr. Tanvir Ahmed Chowdhury

HEAD

DEPARTMENT OF TEXTILE ENGINEERING

FACULTY OF ENGINEERING

DAFFODIL INTERNATIONAL UNIVERSITY

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Firstly, we express our gratefulness to almighty Allah for his divine blessing makes us possible to complete this project successfully.

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Finally, we would like to express a sense of gratitude to our beloved parents and friends for their mental support, strength and assistance throughout writing the project report.

DEDICATION

This Project (thesis) report is dedicated to our beloved parent and honorable Teacher

Abstract

Time plays an important role in dyeing cotton fabric with reactive dye. The concentration of time has huge impact on exhaustion of dye during dyeing cotton fiber with reactive dye. The main objective of this research work was to know the effect of time concentration on the characteristics of reactive dyed cotton fabric.To conducted this research work single jersey, rib and fleece structured fabric were taken. These three types of fabric were dyed in the same recipe varying the concentration of time (85 g/L, 80 g/L, 75 g/L, 70 g/L and 65 g/L). It has been observed time concentration influence the fastness and depth of color.

Keywords: Reactive dye, single jersey,cotton fiber.

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CHAPTER-1
INTRODUCTION

1.1 **Introduction**:

The effect of time concentrations on the exhaustion of reactive dye and cotton fabric was investigated in this study. The cotton fabric is dyed using a standard process, and the dyeing curve is also included in this study. Variations in time concentration have a significant impact on the color fastness properties of cotton fabric dyed with reactive dye. This paper investigated and reported on the fastness (color fastness to wash, water, dry and wet rubbing, light) properties of cotton fabric. According to the findings, the effect of time concentration has a significant influence on the exhaustion of both types of dyes by cotton fabric.

Time is a mineral made up primarily of two elements, metallic element and chloride. The substance NaCl, composed of the textile substrate and dye molecule, does not have to have uniform properties to mix with one another. In such cases, we usually require a catalyst to facilitate the coloring action on the material. Time is an important catalyst. Time has a strong affinity for water. Time is important in three ways.

In the dyeing procedure, the fabric is first dyed. Second, the textile coloring procedure uses the most time, which depletes the dye molecules the most. Third, it facilitates absorption, sorption, and movement by acting as a nursing solution. The textile substance and the dye molecule become more and more attracted to one another over time. The surface of the material has a negative charge since both reactive and direct dye molecules are charged. Time reduces weariness by lessening the repulsion of negative-negative charges. A chromophore, a bridge, and a reactive group or team—which could be an activated double bond or a haloheteo cycle—are the three fundamental components of all reactive dyes.

1.2: The Study's Objectives

Broad Objective:

The broad objectives of this project was to know the impact of time on the characteristics of cotton knit fabric during dyeing with reactive dye.

Specific Objective:

The board objective the following specific objective were achieve:

- To Learn the impact of time on colorfastness to wash of cotton knit fabric.
- To learn the impact of time on rubbing to dry and wet test method of cotton knit fabric.
- To learn the impact of time on CMC (Color Measurement community) of cotton knit fabric.

CHAPTER-2

LITERATURE REVIEW

2.1 Introduction of Time in Textile:

In the textile industry, "time" refers to a variety of time management concepts and how they impact design, production methods, and technical developments. Throughout the whole textile lifecycle—from the raw material stage to manufacture, distribution, and, eventually, product consumption—time is of the essence. The speed, cost, quality, sustainability, and even the cultural importance of fabric and apparel are all impacted by time in the textile industry.

Dyeing chemists are particularly interested in high time use and low reactive dye fixing. Strongly colored effluents and extremely complex dyeing procedures have raised serious environmental concerns. The use of soda and time is a physical-chemical prerequisite for reactive coloring, according to all experts. Because the color shift of the nursing exhaustion agent toward polysaccharide molecules is time-correlated, the alkali (soda ash) is a reactive color hydrolyzing/fixing agent.

2.1.1 Introduction Of Cotton :

Cotton is natural fiber that has been grown for hundreds of years and is vital to the global economy, particularly in the textile and clothing industries. It comes from the fluffy fibers that cover seeds of the cotton plant, which belongs to the family. Cotton one of the most widely utilized raw materials worldwide because of its softness, breathability, and versatility.

2.1.2HowTime Used in Dyeing Process:

The dyeing time has a significant impact on the end product's quality, color depth, and homogeneity. The length of a dyeing process depends on a number of factors, including the type of dye, the material being dyed, the dyeing technique, and the desired color intensity.

2.1.3 Time's Role in the Dyeing Process:

Time is a crucial part of the dyeing process and affects the final color's quality, consistency, and depth on a substrate (such fabric, yarn, or fiber). The following categories can be used to categorize its function:

1. Pre-treatment Stage

- **Preparation of fabric**: Before dying, fabric is often subjected to pre-treatment processes such as washing, bleaching, or scouring (impurity removal). The duration of this operation might range from 30 minutes to several hours, depending on the fabric and the intended outcome.

2. Reaction Time

• During chemical dyeing processes, such as reactive or vat dyeing, certain chemical interactions take place between the dye and the fiber. Enough time is required to ensure that these reactions are finished, enhancing the color's fastness and durability.

• The color may fade or wash out more quickly due to weak bonding brought on by slower reaction times.

3. Temperature and Time Interplay

• Dyeing often occurs at controlled temperatures, and the length of time relies on maintaining optimal thermal conditions. Longer death durations, however, might be required to achieve the same outcome at lower temperatures.

For example, higher temperatures typically speed up the absorption of dyes, but they also run the danger of causing fiber damage if they are kept for a long period of time.

Factors Influencing Dyeing Time

Fiber Type: Natural fibers like cotton and wool usually take longer to absorb the dye than synthetic fibers like polyester, which may need higher temperatures but require less dyeing time overall.

Dye Type: Certain dyes, such acid dyes for protein fibers (like silk and wool), require a more controlled process with longer durations, even though reactive or direct dyes might work faster.

Temperature and Agitation: Higher temperatures and constant agitation often speed up the dyeing process, but this needs to be balanced to avoid damaging the fabric or uneven dyeing.

- **Desired Color Intensity**: If the color is deeper and more vibrant, the fabric typically needs to stay in the dye bath for a longer amount of time. More layers or higher dye concentrations might be required for richer colors.
- **Method of Dyeing**: Industrial dyeing technologies, such as continuous dyeing or garment dyeing, may be quicker than traditional hand-dying methods, which might take longer since they include more manual steps and smaller quantities.

2.1.4The influence of time on dyeing properties:

The impact of time on dyeing properties is a significant topic in textile and material sciences. Below is a summary of how time impacts dying qualities:

1. Dye Absorption

- **Longer Dyeing Time**: Extending the dyeing time often allows for greater dye penetration into the fibers, leading to deeper and more uniform coloration.
- **Shorter Dyeing Time**: Insufficient dyeing time can result in uneven or lighter shades, as the dye molecules may not fully bind to the fibers.

2. Chemical Reactions

- **Fixation Reactions**: For reactive dyes, time influences the chemical bonding between the dye and fiber. Adequate time ensures complete fixation, while insufficient time can leave un- reacted dye, which washes out easily.
- **Degradation**: Overly extended dyeing times can sometimes lead to the degradation of dyes or fibers, especially at high temperatures.

3. Dye Diffusion

• Over time, dye molecules have the ability to penetrate more into the fiber structure. Natural materials, such as cotton or wool, may require more processing time than synthetic fibers, such as polyester, due to their more complex structure.

4. Temperature-Time Relationship

• The time required for proper fading is directly influenced by temperature. High temperatures accelerate dye uptake and may reduce dying time, but there is a risk of fiber damage or color degradation.

5. Color Fastness

- Adequate dyeing time ensures better dye fixation and improves the fastness properties of the dyed material (resistance to washing, light, or rubbing).
- Insufficient time can lead to poor fastness, as dye molecules may not be securely bound to the fibers.

6. Environmental and Economic Impacts

- Optimizing dyeing time is crucial for sustainability. Excessive time increases water, energy, and chemical usage, while insufficient time can lead to reprocessing and waste.

Key Considerations:

- **Type of Fiber**: Natural vs. synthetic fibers respond differently to dyeing time.
- **Type of Dye**: Reactive, acid, disperse, or direct dyes have varying requirements.
- **Auxiliaries**: Additives like salts, alkalis, or leveling agents can influence the required dyeing time.

2.1.5How Benefits of Timein Textile :

The advantages of time in the textile business are illustrated by a variety of scenarios, including production procedures, strategic planning, and market timing. Cost-effectiveness, efficiency, product quality, innovation, and customer pleasure are all directly impacted by the textile industry's strategic use of time. Eventually, companies will be able to invest in sustainable practices, adjust to changes, and satisfy customer expectations. Textile companies may achieve industry standards, satisfy customers, and maintain their competitiveness by meticulously managing time across the production and supply chain processes.

2.2.1 Rubbing Fastness Test:

A technique for assessing a fabric's color resistance to rubbing or friction is the Rubbing Fastness Test. When a garment is brushed dry or wet, this test helps determine whether the dye will bleed or transfer onto nearby surfaces or materials.

Purpose

The test is essential for assessing the durability and quality of dyed or printed fabrics, especially for products like clothes, furniture, and carpets where frequent surface contact takes place. The ability of colored textile materials to transfer their color from one surface to another, typically from the same fabric to another surface (mostly bleached cotton cloth), is referred to as "rubbing fastness." It is tested with a crock meter. It can be driven by a motor or controlled by hand.Depending on the type of fiber, especially its tensile strength, the partner textile is stained by tiny, abraded colored fiber particles. Coarse fiber particles are not taken into consideration while determining the crocking fastness rating. Staining may also result from a water-soluble dye that is not well adhered to the fiber. Even dyeing techniques like vat dyeing, which have the best wet characteristics, have limited or restricted wet crocking fastness.

Figure 2.1: Rubbing fastness testing

2.3.1 Color Fastness of Washing :

The color of textile material is determined by the dye or pigment used to print on it. Over time and with repeated washings, these pigments or dyes degrade. Therefore, in order to assess the quality of the dye or pigment employed, it is essential to verify the fastness of any colored or printed material. To achieve the color fatness to washing, a textile specimen is mechanically swirled in a soap solution for a predetermined duration and temperature. It is cleaned and dried after coming into contact with one or two certain nearby materials. The grey scales are used to evaluate the specimen's color shift and the surrounding fabric's staining. In a single test that closely mimics a home or commercial laundry, the color loss and discoloration on adjacent material due to desorption and/or abrasion action is evaluated to determine the color fastness of washing.

Figure 2.2: Color Fastness to Washing test

CHAPTER - 3

EXPERIMENTAL DETAILS

Materials 3.1

For this research took 3 grey fabric samples. Specification of these samples is mentioned in Table

Table 3.1: Sample Specification

Sample No	Sample Name	Fabric GSM	SL(mm)
1	100% cotton Single Jersey	160	2.75
2	100% cotton Rib	250	2.7
3	100% cotton Fleece	280	2.8

In this research, we have been tracking the chemicals used. Details about the chemicals utilized are presented in the table.

Table 3.2: Types of chemicals used in the research

Name of the Chemical	Purpose of use
Reactive dye	Main substance to produce color
Anti-creasing Agent	To remove the tendency of the fabric to creases mark
Sequestering Agent	To reduce water Hardness
time	Used for electrolyte
soda	Maintain the PH
Leveling agent	For level the dye

Method 3.2

3.2.1 Method of 100% cotton Fabric Dyeing

Table 3.3 Typical Recipe:

Particular	Recipe
Reactive Red dye	**0.37 % (s.s 0.5%)**
Reactive yellow dye	**0.85 % (s.s 1%)**
Reactive black dye	**4.7 % (s.s 3%)**
Leveling Agent	**1g/l**
Anti-creasing Agent	**1g/l**
Sequestering Agent	**0.6g/l**
Time	**(85,80,75,70,65,60) g/l**
Caustic soda	**20g/l**
Sample weight	**6gm**
Temperature x Time	**65°C x 60**
M:L	**1:6**

Total liquor = (6x5) ml = 30 ml

Recipe Calculation 3.2.2

1. Required amount of reactive red dye = 0.37x5x100/100x 0.5 = 3.7 ml
2. Required amount of reactive yellow dye = 0.85x5x100/100x 1 = 4.25 ml
3. Required amount of reactive black dye = 4.7x5x100/100x 3 = 7.8 ml
4. Required amount of leveling Agent = 1x30/1000 = 0.03 ml
5. Required amount of Anti-creasing Agent = 1x30/1000 = 0.03 ml
6. Required amount of Sequestering Agent = 0.6x30/1000 = 0.018 ml
7. Required amount of time = 80x30 /1000 = 2.4 gm
8. Required amount of Caustic soda = 20x30/ 1000 = 0.6 gm

Total water required = {30 – (3.7+4.25+7.8+0.03+0.03+0.018)}

= (30-15.828)

=14.172 ml

Table 3.4: Apparatus used in the research

SL.No	Name of the Apparatus
1	Electronic balance
2	Beaker
3	Glass rod
4	pH meter
5	pod stand
6	Measuring cylinder
7	Dyeing m/c

In our research, we utilized the equipment listed in the table.

Process Curve:3.2.3

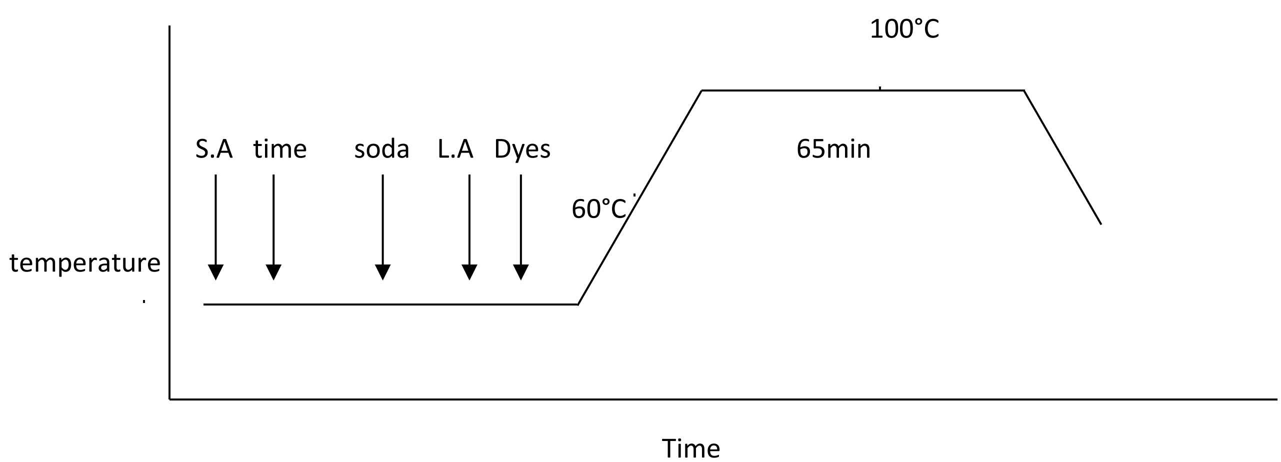

Figure: 3.1 process curve for 100% cotton fabric dyeing.

Procedure 3.2.4

Firstly, I dyed 100% cotton fabric following a standard recipe. All the chemicals taken

1.Reactive Red dye 3.5 ml

2.Reactive yellow dye 4 ml

3.Reactive black dye 8 ml

4. Leveling Agent 0.04 ml

5. Anti-creasing Agent 0.04 ml

6.Sequestering Agent 0.015ml

7. Time 2.5 gm

8. Caustic soda 0.7gm

After taking all the chemicals I took the sample and then gave it well.

Then dyeing it for 65 minutes at 60°C temperature in sample dyeing machine.

After dyeing, I washed the fabric with cold water.

After that I am doing hot wash with detergent and soaping agent at 100degree Celsius temperature for 15 minutes.

After that I washed again with cold water. next, I dried it with a woven dryer machine for 80°C temperature run time 15 minute.

I done this for three fabrics for 15 times

Then I have done some test and calculate the result

Color fastness to rubbing wet & dry test method 3.3

Method: ISO-105 CO 6

ATMOSPHERIC CONDITION: Temperature 25°C and Relative Humidity 65%

Instrument 3.3.1

1. Wet & dry bulb hygrometer

2. Crocking meter

3. Grey scale (etc)

Procedure: 3.3.2

The samples were first carefully trimmed to fit over the metallic mounting plate. I placed the sample with the tap underneath the metal mounting plate and clipped the crocking cloth pin in place. After that, the handle is rotated 20 times while being rubbed with a 9 Newton force. Then, using a grey scale from 1 to 5, I evaluate the contrast between untreated and treated white fabric using a light box.

Sample attachment:

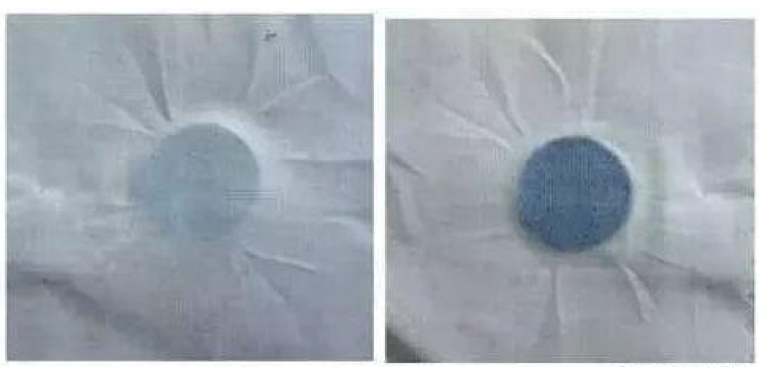

Fig 3.2:sample after rubbing test in wet condition.

Sample attachment:

Fig 3.3: sample after rubbing test in dry condition.

Color fastness to washing: 3.4

ISO-105 CO 6 test Method

ATMOSPHERIC CONDITION: Temperature 25°C and Relative Humidity 65%

Instruments:3.4.1

I. Rotawash / Gyro wash,,
II. Stainless still ball
III. Multi-fiber fabric
IV. Grey scale
V. Sewing machine
VI. Thermometer
VII. Color matching cabinet

Procedure:3.4.2

A sample of the material to be examined, measuring 10 by 5 centimeters, is cut off. Multicolored fabrics and end paints should use every color in the design. Cut a piece of multi-fiber that is 5 cm wide and 10 cm long. Align the test specimen with the multi-fiber and sew them together to form a composite specimen. After that, run at 40°C for 30 minutes..

Fig 3.4: Multi- fiber fabric

Sample Attachment:

Fig 3.5: sample after condition color fastness to washing test

CHAPTER-4

DISCUSSION OF RESULTS

Effect of time on rubbing fastness of single jersey fabric:4.1

Color fastness to rubbing for wet sample		
SL No	Time g/l	Color fastness grading
1	85	2
2	80	2/3
3	75	3
4	70	3/2
5	65	3/2

Table:4.1

I may conclude from the color fastness to rubbing wet sample test that wet rubbing color fastness explains the conditions in which dyed fabric fades and stains. How successfully the rubbing color fastness is assessed depends on how much the white fabric gets soiled. After testing, the white fabric is compared to staining sample cards to determine staining fastness. Rubbing color fastness is categorized into five degrees, just like washing color fastness. I can see that the color fastness grading result is 2 after processing single jersey sample 1.Color fastness is subpar in contrast. I can observe that the color fastness rating is 2/3 after treating single jersey sample 2. The color fastness rating is comparatively good when compared to sample 1. I can observe that the color fastness grading result for single jersey sample 3 is 3. Comparatively speaking, color fastness is worse than in samples 1 and 2.

Effect of time on rubbing fastness of RIB fabric:4.2

Color fastness to rubbing for wet sample		
SL No	Time g/l	Color fastness grading
1	85	2
2	80	2/3
3	75	3
4	70	3/2
5	65	3/2

Table:4.2

I may conclude from the color fastness to rubbing wet sample test that wet rubbing color fastness explains the conditions in which dyed fabric fades and stains. How successfully the rubbing color fastness is assessed depends on how much the white fabric gets soiled. After testing, the white fabric is compared to staining sample cards to determine staining fastness. Rubbing color fastness is categorized into five degrees, just like washing color fastness. We can see that the color fastness grading result is 2 after working with RIB sample 1. Color fastness is subpar in contrast. RIB sample 2 looks to have a color fastness grading value of 2/3 after treatment, which is comparatively excellent compared to sample 1.

I can observe that RIB sample 3 has a color fastness rating of three following treatment. The color fastness is not as good as it is in examples 1 and 2.

Effect of time on rubbing fastness of Fleece fabric:4.3

Color fastness to rubbing for wet sample		
SL No	Time g/l	Color fastness grading
1	85	2
2	80	2/3
3	75	3
4	70	3/2
5	65	3/2

Table: 4.3

The color fastness to rubbing wet sample test leads me to believe that wet rubbing color fastness explains why dyed fabric stains and fades. The degree to which the white fabric becomes dirty determines how well the rubbing color fastness is evaluated. To ascertain staining fastness,the white cloth tested and then compared to staining sample card. Similar to washing color fastness, rubbing color fastness is divided into five degrees. After treatment, fleece sample 1 has a color fastness grade of two, as far as I can tell. Color fastness is subpar in contrast.

In comparison to sample 1, fleece sample 2 has a color fastness grade of 2/3 after treatment, which is rather acceptable. I can see that fleece sample 3 has a color fastness rating of three after treatment. The color fastness is not as good as it was in samples 1 and 2.

Effect of time on rubbing fastness of single jersey fabric:4.4

Color fastness to rubbing for dry sample

SL No	Time g/l	Color fastness grading
1	85	4\5
2	80	4
3	75	4/5
4	70	5
5	65	4

Table:4.4

Based on the color fastness to rubbing dry sample test, I can say that the treated fabric has good color fastness quality. After treatment, I can see that single jersey sample 1's color fastness rating is 4/5, whereas the standard rating is 5.

Based on the color fastness to rubbing dry sample test, I can say that the treated fabric has better color fastness than a single jersey sample. 1. I can see that, after test sample 2, the color fastness grading result is 4, whereas the standard grade is 5.

I can conclude that the treated fabric's color fastness quality is standard based on the color fastness to rubbing dry sample test. Following test sample 3, I can observe that the color fastness grading result is 4/5, although the standard grade is 5.

Effect of time on rubbing fastness of Rib fabric:4.5

Color fastness to rubbing for dry sample

SL No	Time gm	Color fastness grading
1	85	4\5
2	80	4
3	75	4/5
4	70	5
5	65	4

Table:4.5

Based on the color fastness to rubbing dry sample test, I can say that the treated fabric has good color fastness quality. The color fastness grading result for RIB sample 1 is 4/5 after treatment, while the standard grade is 5.

I may conclude that sample 1's color fastness is better than the treated cloth's based on sample 2's color fastness to the rubbing dry test. After test RIB sample 2, I can see that the color fastness grading result is 4, even though the normal grade is 5. Moderate

Based on the color fastness to rubbing dry sample test, I can say that the treated fabric's color fastness quality is standard. After examining test sample 3, I can see that, despite the conventional grade of 5, the color fastness grading result is 4/5. The color fastness is good in comparison.

Effect of time on rubbing fastness of Fleece fabric:4.6

Color fastness to rubbing for dry sample

SL No	Time gm	Color fastness grading
1	85	4\5
2	80	4
3	75	4/5
4	70	5
5	65	4

Table:4.6

I can conclude that the treated fabric has good color fastness quality based on the color fastness to rubbing dry sample test. After treatment, fleece sample 1 received a color fastness rating of 4/5, which is lower than the average of 5.

I may conclude that sample 1's color fastness quality is better than the treated cloth's based on sample 2's color fastness to the rubbing dry test. Examining fleece sample 2, I found that the color fastness rating was 4, even though the average grade was 5. Moderate

After the color fastness to rubbing dry sample test, i can say that the color fastness quality of the treated fabric is standard. We can see after test sample 3; color fastness grading result is 4/5 where standard grade is 5. Color fastness is comparatively good.

Effect of Time on Color Fastness to Washing:4.7

SL NO	Sample	Test No.	Temperature	Liquor volume ml	sodium permanganate	Time min	Number of steel ball	ph.	Grading Scales
1	Single Jersey	A2S	40	150	1g\l	35	10	4.5-5.5	4\5
2	RIB	A2S	45	145	1g\l	35	15	4.5-5.5	4
3	Fleece	A2S	50	140	1g\l	35	10	4.5-5.5	5

Table:4.7

Following the single jersey washing test, the ISO method A2S system was used, which included a 150 ml liquid volume, a temperature of 40 degrees Celsius, a pH of 4.5 to 5.5, a grading scale of 4/5, and around 10 steel balls and sodium permanganate for the final 35 minutes. We can conclude that the treated cloth has good washing fastness. The ISO method A2S system, which had a pH of 4.5 to 5.5, a liquid capacity of 145 ml, a temperature of 45 degrees Celsius, and an additional 35 minutes or so spent with about 15 steel balls and sodium permanganate, was employed after the RIB washing test. Make use of a four-point rating system.

As opposed to a single jersey grading system, we can say that the After Following the fleece washing test, we used the ISO method A2S system, which had a liquid capacity of 140 ml, a temperature of 50 degrees Celsius, and a pH of 4.5 to 5.5. For the final 35 minutes, we added roughly ten steel balls and sodium permanganate, and we graded on a 5-point scale. We may conclude that the treated fabric has a slandered washing fastness quality, which is superior to that of the single jersey and rib sample.

Effect of Time on CMC for single jersey fabric:4.8

Sample	TIME g/l	CMC DE	D L*	D a*	D b*	DC*	DH*	SHADE %
1	85	0.24	-0.17	-0.05	0.12	-0.16	-0.04	Darker
2	80	0.28	-0.07	-0.11	0.17	-0.24	-0.12	Darker
3	75	0.06	0.03	-0.03	0.02	-0.03	-0.04	Lighter
4	70	0.63	0.56	-0.07	-0.21	0.26	-0.13	Lighter
5	65	0.38	0.26	0.15	0.15	-0.15	0.25	Lighter

Table:4.8

I can observe that for application time 85 g/l, the color measurement combination DE becomes 0.24, and the dark lighter becomes -0.17 when I test sample 1 in the CMC machine. Dark chroma* -0.16, Dark hue -0.04, Shade Darker, Dark red green axis -0.05, Dark yellow blue axis *0.12. For sample 2, I can observe that the color measurement combination DE becomes 0.28 and the dark lighter -0.07 for applied time 80 g/l. Dark hue -0.12, Shade Darker, Dark chroma * -0.24, Dark yellow blue axis *0.17, and Dark red green axis -0.11. I can therefore see that every system has a different change time. Additionally, time changes should be continued for every modification. Lighter for sample 3. Lighter for sample 4. Lighter for sample 5.

Effect of Time on CMC for Rib fabric:4.9

Sample	TIME g/l	CMC DE	D L*	D a*	D b*	D C*	DH*	SHADE %
1	85	0.24	-0.17	-0.05	0.12	-0.16	-0.04	Darker
2	80	0.28	-0.07	-0.11	0.17	-0.24	-0.12	Darker
3	75	0.06	0.03	-0.03	0.02	-0.03	-0.04	Lighter
4	70	0.63	0.56	-0.07	-0.21	0.26	-0.13	Lighter
5	65	0.38	0.26	0.15	0.15	-0.15	0.25	Lighter

Table:4.9

When I test sample 1 in the CMC machine, I can see that the color measurement combination DE becomes 0.24 and the dark lighter becomes -0.17 for applied time 85 g/l. Shade Darker, Dark Red Green Axis -0.05, Dark Yellow Blue Axis *0.12, Dark Chroma* -0.16, Dark Hue -0.04. For sample 2, I can see that the dark light is -0.07 and the color measurement combination DE is 0.28 for applied time 80 g/l. Dark chroma * -0.24, Dark yellow blue axis *0.17, Dark hue -0.12, Shade Darker, and Dark red green axis -0.11. I can therefore see that every system has a different change time. Additionally, time changes should be continued after every modification. Lighter for sample 3. Lighter for sample 4. Lighter for sample 5.

Effect of Time on CMC for Fleece fabric:4.10

Sample	TIME g/l	CMC DE	DL*	Da*	Db*	DC*	DH*	SHADE %
1	85	0.24	-0.17	-0.05	0.12	-0.16	-0.04	Darker
2	80	0.28	-0.07	-0.11	0.17	-0.24	-0.12	Darker
3	75	0.06	0.03	-0.03	0.02	-0.03	-0.04	Lighter
4	70	0.63	0.56	-0.07	-0.21	0.26	-0.13	Lighter
5	65	0.38	0.26	0.15	0.15	-0.15	0.25	Lighter

Table:4.10

When I test sample 1 in the CMC machine, the color measurement combination DE becomes 0.24 and the dark lighter becomes -0.17 for applied time 85 g/l. Darker Shade, Dark Yellow Blue Axis *0.12, Dark Hue -0.04, Dark Chroma* -0.16, and Dark Red Green Axis -0.05. For sample 2, I can see that the dark light is -0.07 and the color measurement combination DE is 0.28 for applied time 80 g/l. Dark chroma * -0.24, Dark yellow blue axis *0.17, Dark hue -0.12, Shade Darker, and Dark red green axis -0.11. As a result, I can observe that each system has a unique changing time. After each alteration, time changes should also be continued. Sample 3 is lighter, Sample 4 is lighter, and Sample 5 is lighter.

CHAPTER-5

CONCLUSION

5.1CONCLUSION:

This project on effect of the time on knitted fabric during dying. i take three fabric single jersey, Rib and fleece. to determine the effect i have done some test color fastness to rubbing, dry and wet and color fastness to washing also CMC. From the result i can say that when use different amount of time many properties vary, like when i increase the time percentage the for single jersey fabric color fastness for rubbing.Brings about some time change in the treated fabric. Fastness properties are adequate and quite comparable with conventionally dyed samples. The rubbing fastness of the dyed fabric change slightly. When dyeing the modified substrates, reactive Dyes can be much more efficiently exhausted and fixed onto Cellulosic fabric under neutral condition in the variation of Time concentration. The modified Dyeing don’t suffer either from a significant drop in wash fastness and perspiration fastness. There has significant effect on dyed fabric appearance and quality for the variation use of different concentration of time with reactive dyes. That was showed good all fastness properties for different types of structural fabric on time concentration.

Reference:

1. Hsieh, Y-L. (2007), The composition and properties of cotton. Gordon, S. and Hsieh, Y-L. (Eds).

Cotton: Science and Technology. Wood Head Publishing, UK..

2.https://www.researchgate.net/publication/294761690_Application_of_enzymes_in_ecofriendly_wet_processing_of_Cotton (Retrieved Time : 1:12 PM; Date: 02/11/2018)

3. NF-Dr. Hosne Ara Begum & Prof. Dr. Engr. Abu Bakr Siddique, Natural Fibers, HAFIZ BOOK CENTER, New Market, Dhaka. [Page No: 26,28,38,49]

4. Dr. A.S. Abu Bakr Siddique and Dr. Hosne Ara Begum, (2014) Introduction to Textile Engineering, Book Fair Publishing House, Nilkhet. [Page No: 130,140]

5. https://www.researchgate.net/publication/292827056_Enzymes_in_textile_wet_processing

(Retrieved Time: 12:47 PM; Retrieved Date : 27/02/2019)

6. http://www.engr.utk.edu/mse/Textiles/Cotton%20 fibers.htm (Retrieved Time: 9:12 PM

Date:02/12/2018

7.Nithyanandan, R. and M. Subramanian, Time& Alkali Free Reactive Dyeing, p. 1-5.

8.http://www.chromogenix.com/technology/basic-principles/chromogenic-substrates.aspx.