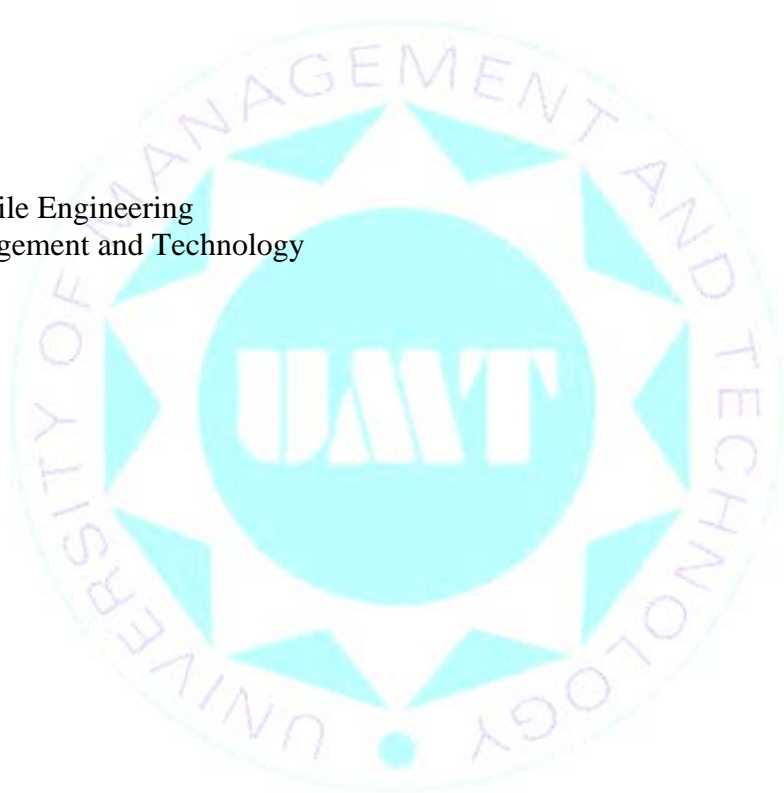


Investigating the fading of Indigo Dyed Denim Fabric by Washing with Potassium Permanganate in Local Industry

Capstone Project II

Department Of Textile Engineering
University Of Management and Technology
Lahore

Zaheer Hassan



Capstone Project II

**INVESTIGATING THE FADING OF INDIGO DYED
DENIM FABRIC BY WASHING WITH POTASSIUM
PERMANGANATE IN LOCAL INDUSTRY**

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Declaration Note

All the contents of this project are original without any plagiarism. All experimental work and the reported results are original. Sample book of project is maintained separately as a proof.

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Intellectual Property Rights

No part of this research work should be used by any means without taking the written permission from the project supervisor **Dr. Faheem Uddin**.

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Chapter 1

EXPERIMENTAL METHODOLOGY

1.1. Goal:

Investigating the indigo dyed denim fading through pinky wash (KMnO_4 washing).

1.2. Scope:

Evaluation on 100% cotton denim jeans through spray application of KMnO_4 aqueous solution.

1.3. Objectives:

The objectives of the project as below.

1. Selection of denim jeans.
2. Preparations of KMnO_4 wash liquor.
3. Selection of spraying machine.
4. Spray application method.
5. Neutralization method.
6. Drying and fading assessment.

1.4. Work plan:

Work plan of project as follow.

- 1) Arrange several pieces of indigo dyed denim jeans of medium shade.
- 2) Break down the selected jeans in defined specimen size.
- 3) Establish the control specimen.
- 4) Each experimental evaluation should be based 3 to 5 specimens.
- 5) Study the following factors in KMnO_4 spray:
 - i. KMnO_4 liquor variation.
 - ii. KMnO_4 liquor Temperature variation.

i. KMnO_4 liquor variation:

Influence of E-II one at a time

Concentration of E-II use in experiment = 5 gm, 10 gm, 15 gm and 20gm.

Influence of E-I one at a time

Concentration of E-I use in experiment = 5 gm, 10 gm, 15 gm and 20gm.

Depending upon the results of above work use of any other auxiliary may be evaluated for improved fading effect.

ii. KMnO_4 liquor Temperature variation:

Different temperatures

uses in the liquor of KMnO_4 spray are given below.

Room temperature (25C^0), 35C^0 , 45C^0 and 55C^0 .

- 6) Neutralization method.
- 7) Drying of denim through conventional method.

1.5. Assessment:

- i. Visual assessment in color cabinet.
- ii. Comparison with control.

1.6. References:

This experimental methodology is suggested by the advisor (**Dr. Faheem Uddin Associate Professor / Chairman, Department of Textile ,PhD Textile Printing & Finishing, University of Manchester (UK)**).

Chapter 2

MATERIALS AND MACHINES USED

2.1 Materials used:

All the materials that have been used in this project are listed below.

2.1.1 Fabric:

In this project use 100% cotton denim fabric of GSM 426gm/m². Fabric is plain weaved 3/1, three yarns in warp and one yarn in weft. The quality of the fabric is 57:58 that is length into birth.

We find the GSM of fabric in the University of Management and Technology textile lab by using the proper way;

Find the GSM

Cut the fabric from the cutter that is standard.

Weight of fabric = 4.265 gm

Diameter = 11.5 cm

Radius = 5.75 cm

= 5.75/100

= 0.0575 m

Formula = πr^2

= $22/7 * (0.0575)^2$

= 0.010 m²

Weight of 0.010 m² = 4.265 gm

Weight of 1 m² = 4.265/0.010

= 426.5 gm/m²

2.1.2 Chemicals used:

i. Potassium permanganate $KMnO_4$:

In all the experiments we have used potassium permanganate as an oxidizing agent received from Packages Pvt. Ltd Karachi. Molecular formula is $KMnO_4$, Molar mass is 158.03 g/mol, Appearance is purplish-bronze-gray needles and magenta-rose in solution.



Figure 2.1: $KMnO_4$
Source: MR.DENIM LIMITED

ii. Sodium meta bi sulfite:

This is the liquid of sodium Meta bi sulfite use for the neutralization purpose. Concentration of sodium meta bi sulfite was 65% made by PACKAGES P.V.T. limited Karachi Pakistan. Its molecular formula is $Na_2S_2O_5$. When we use the sodium Meta bi sulfite the color of the denim become white at that surface where the $KMnO_4$ solution is apply on the surface of denim fabric.

iii. Reagent E-II:

This is use to see the impact on fading of the surface of the indigo dyed denim fabric. It was of commercial grade received from SITARA CHEMICALS.

iv. Reagent E-I:

This is also use to see the impact on the surface of the indigo dyed denim where the potassium permanganate is applied by spray. It is locally buy from the local supplier.

v. Desizer:

This is use to remove the starch from the surface of the denim fabric. It is locally made desizer that is enzyme base desizer. Its concentration is 10%.

vi. Anti- back stain:

This is also use to remove the dust and dirt particle from the surface of the denim fabric. Another function is do not stick the bleed dyestuff on the back side of the denim surface during the washing process. The manufacturer of anti-back stain is ALKA POLE P.V.T. limited and its tread name is Alkapole BSD. It is nonionic in nature.

2.2 Machines used

2.2.1 Washer:

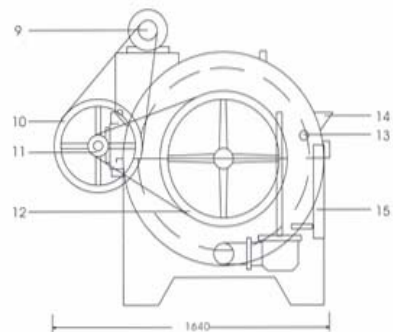
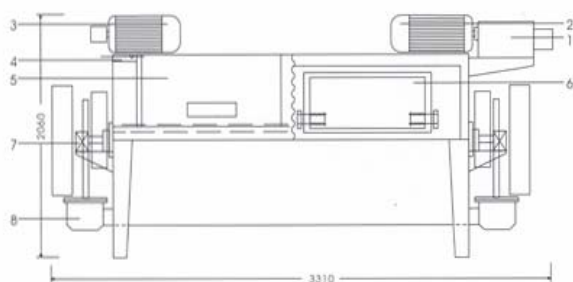
To do the washing process uses the washer. The manufacturer of this washer is “Green Mac’s Design” made in Singapore.



Figure 2.2: washing machine.
Source: MR.DENIM LIMITED

Part List

- 1、 Main Control Panel
- 2、 Motor
- 3、 2nd Motor
- 4、 Door Stopper
- 5、 Outer Door
- 6、 Inner Door
- 7、 Main Shaft
- 8、 Drain Valve
- 9、 Motor Pulley
- 10、 No 2 Pulley
- 11、 No 3 Pulley
- 12、 Main Shaft Pulley
- 13、 Water Inlet
- 14、 Chemical Inlet
- 15、 Water level Gauge



Model		GM-55	GM-65	GM-110	GM-200	GM-250	GM-350	GM-450	GM-550	GM-900
Capacity	LBS Kg	55 25	65 30	110 50	200 90	250 113	350 160	450 205	550 250	900 410
Inner Cylinder Inches	Inches mm	36×20 914×510	28×34 711×863	36×40 914×1016	40×54 1016×1372	42×56 1067×1422	42×68 1067×1727	42×88 1067×2235	48×88 1219×2235	57×113 1450×2580
Thickness of inner drum	mm	3	3	3	3	3	3	3	3	5
Outer Cylinder	Inches mm	42×25 1067×640	34×40 863×1016	42×46 1067×1168	46×60.5 1168×1540	48×64 1219×1626	48×76 1219×1930	48×96 1219×2438	54×96 1372×2438	64×111 1630×2830
Motor	Hp kW	1.5 1.1	1.5 1.1	3 2.2	4 3	4 3	5.5 4	7.5 5.5	10 7.5	20 15
Power Consumption	Amp	2.3	2.3	4	5.6	7.2	9.4	12.6	17	31.6
Steam Consumption	Hp Kg	2 31	2 31	4 62	6 93	7 109	9 140	11 172	15 234	25 390
Water Inlet	Inches mm	2×1 unit 50×1 unit	2×1 unit 50×1 unit	2×1 unit 50×1 unit	2×2 unit 50×2unit	2×2 unit 50×2 unit	2×2 unit 50×2 unit	3×2 unit 75×2 unit	3×2 unit 75×2 unit	3×2 unit 75×2 unit
Steam Inlet	Inches mm	1×1 unit 25×1 unit	1×1 unit 25×1 unit	1×1 unit 25×1 unit	1×2 unit 25×2 unit	1×2 unit 25×2 unit	1×2 unit 25×2 unit	1×2 unit 25×2 unit	1×2 unit 25×2 unit	1×2 unit 25×2 unit
Water Discharge	Inches mm	3×1 unit 75×1 unit	3×1 unit 75×1 unit	4×1 unit 100×1 unit	4×1 unit 100×1 unit	4×1 unit 100×1 unit	4×1 unit 100×1 unit	6×2 unit 150×2 unit	6×2 unit 150×2 unit	6×2 unit 150×2 unit
Overall Dimension (Length X Width X Height)	Inches mm	52×46×58 1310×1160× 1490	52×36×44 1620×980× 1270	64×46×54 1820×1480× 1370	90×51×54 2280×1480× 1800	94×53×70 2440×1480× 1820	110×53×70 2795×1480× 1820	128×53×75 3250×1540× 2010	130×63×83 3310×1640× 2060	150×81×94 3840×2210× 2420
Weight	LBS Kg	1326 600	1547 700	1812 820	2972 1345	3315 1500	3978 1800	5525 2500	6188 2800	13260 6000

Source :GREENMAC INTERNATIONAL PTE LTD placard

2.2.1.1. Washer Settings:

Before performing each experiment all the machine parameters are checked, like

Time	10 min
Temperature	25°C
Required water	150 litter

2.2.2 Centrifugal dryer:

Locally assembled dryer by the industry was used. Centrifugal dryer dry the fabric but there is water remain in the fabric. Time is taken as the required this is according to the samples quantity.



Figure 2.3: centrifugal dryer
Source: MR.DENIM LIMITED