

“Evaluation & Controlling of Oxidation in Vat dyes (Indigo) for Denim Processing”



By

ZainQazi, ArhamSaeed, M. UzairSaeed&Haris Abdullah

A thesis submitted in fulfillment of

Requirement for the degree of

Textile Engineering (Chemical Processing)

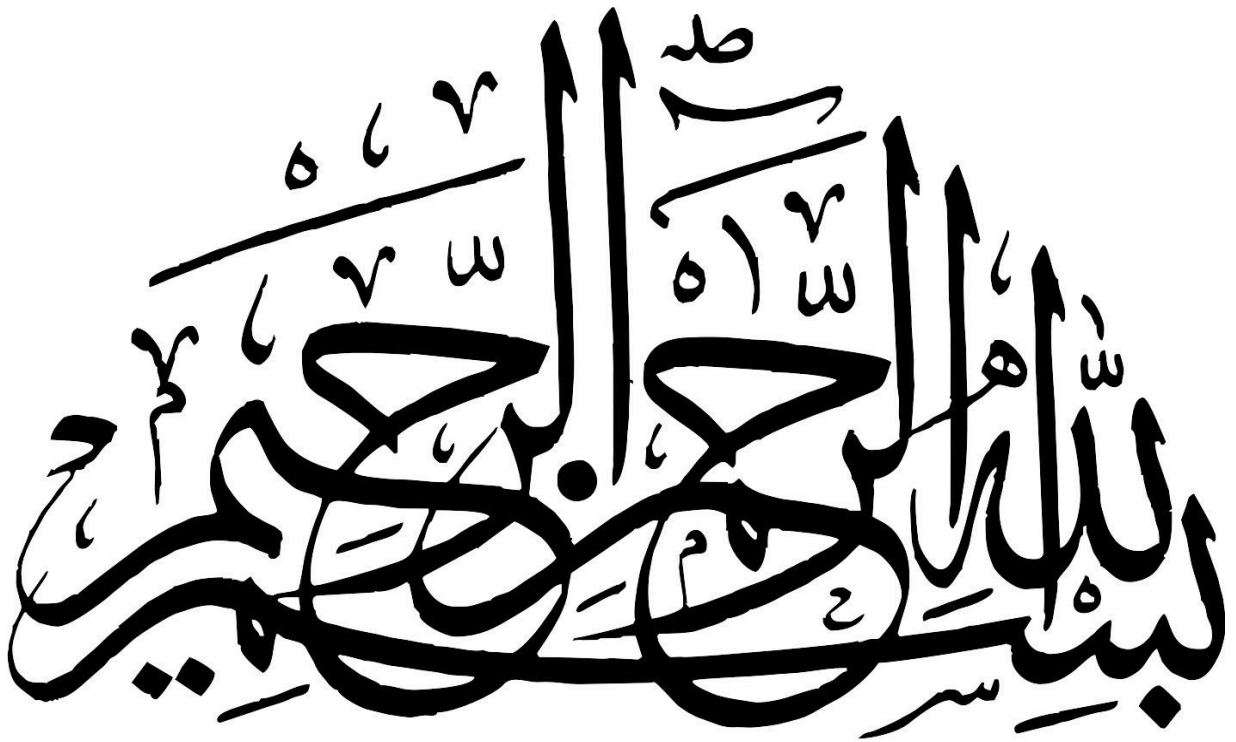
At

School of Textile & Design,

University of Management & Technology

Lahore, Pakistan

2014



In the name of Allah, The most Gracious , The most Merciful

**“Evaluation & Controlling
of
Oxidation in Vat dyes
(Indigo) for
Denim Processing”**

DECLARATION

We hereby declare that the contents of the thesis “Evaluation & Controlling of Oxidation in Vat dyes (Indigo) for Denim Processing”, no part has been copied from any publication source (except the references, standard mathematical or genetic models/equations/formulae/ protocols etc.).

We hereby certify that we have had performed the following work collectively and only using the specified literature, experimental techniques and testing methods. We further declare that this work has not been submitted for award of any other diploma/degree.

The University may take action if the information provided is found inaccurate at any stage. (In case of any default the scholar will be proceeded against as per HEC/PEC plagiarism policy).

SIGNATURE OF THE STUDENTS

Names: **ZainQazi**
 ArhamSaeed
 M. UzairSaeed
 Haris Abdullah

Project Completion Certificate

I certify that **Mr. Zain Qazi (101611-020), Arham Saeed (101611-022), M. Uzair Saeed (101611-038) and Haris Abdullah (101611-39)** Session 2010 to 2014 has carried out and completed the project entitled “**Evaluation & Controlling of Oxidation in Vat dyes (Indigo) for Denim Processing**” under my supervision for requirement for the award of Degree of **Bachelor in Textile Engineering (Chemical Processing)** by **University of Management and Technology**.

Research Supervisor

Umair Mukhtar

Assistant Professor

UMT, Lahore

To

School of Textile and Design,
University of management and technology,
Lahore, Pakistan.

We, the Supervisory Committee, certify that the contents and form of thesis submitted by *Mr.ZainQazi(101611-020)*, *ArhamSaeed (101611-022)*, *M. UzairSaeed (101611-038)* and *Haris Abdullah (101611-39)*, have been found satisfactory and recommend that their research work\project must be processed for evaluation by the Controller Examiner(s) for the award of the degree.

SUPERVISORY COMMITTEE

Chairman

(Dr. Nabeel Amin)

Member

(Dr. Mudassar Abbas)

Member

(Prof. UmairMukhtar)

Dedication

To

Our Parents, Family

&

Respected Teachers

ACKNOWLEDGEMENT

All praises and thanks are for Allah Almighty, Who is the Beneficent, the most Merciful, whose blessing is the cherished fruit to our modest efforts to overcome the problems and difficulties. All respects are for His Holy Prophet Muhammad (Peace Be upon Him), who is forever, a torch of guidance and source of knowledge for entire humanity.

We would like to express our gratitude to all those who helped us during the entire of our project. We gratefully acknowledge the help of our supervisor; **Prof. Umair Mukhtar** who has offered us valuable suggestions in the academic studies.

We owe a profound debt of gratitude and appreciation to our project supervisor, **Prof. Umair Mukhtar**, Assistant professor, *School of Textile & Design, UMT, Lahore*, for his scholastic guidance, encouraging attitude and constructive criticism during the course of my investigation and under whose kind supervision the present study was accomplished.

We acknowledge the help of **Sir Majeed Asif Qazi**, Plant Head Dyeing\Finishing, *Artistic Denim Mills, Karachi*, for his masterly advices, keen interest, constructive criticism, encouragement, and help during our research work.

We are also obliged to **Dr. Nabeel Amin**, Head of Department, School of Textile & Design, UMT, Lahore, for their kind help and cooperation in our research work.

Last but not least, deepest appreciation is extended to our parents for their ever encouraging and supporting role to get on the higher ideas of life. Words are lacking to express my obligation to our mostly affectionate fathers and our sweet mothers for their love, good wishes, inspiration and unceasing prayers without which, the present destination would have been a mere dream. We also owe immense feeling of love and respect for our caring uncles, Brothers and sisters for their humble prayers and good wishes.

Zain Qazi & Team

Table of Contents

Abstract.....1

Chapter # 1

1 - IntroductionError! Bookmark not defined.

- 1.1 - Textile Industry of Pakistan.....**Error! Bookmark not defined.**
- 1.2 - Denim Industry of Pakistan**Error! Bookmark not defined.**
- 1.3 - Steps involve in Textile Production.....**Error! Bookmark not defined.**
- 1.4 - Denim Manufacturing.....**Error! Bookmark not defined.**
- 1.5 - Denim Fabric (Illustration).....**Error! Bookmark not defined.**
- 1.6 - Types of Indigo.....**Error! Bookmark not defined.**

Chapter # 2

2 - MethodologyError! Bookmark not defined.

- 2.1 - Rope Dyeing Procedure.....**Error! Bookmark not defined.**
- 2.2 - Rope Dyeing Range (Specification).....**Error! Bookmark not defined.**
- 2.3 - Rope dyeing sections**Error! Bookmark not defined.**

Chapter # 3

3 - Evaluation of Indigo ShadeError! Bookmark not defined.

- 3.1 - Factors that effects Indigo Shade Dissimilarity.....**Error! Bookmark not defined.**
- 3.2 - Guidelines to obtain required shade**Error! Bookmark not defined.**
- 3.3 - The factors that occupy in variations.....**Error! Bookmark not defined.**
- 3.4 - Machine factors for consumption of reducing agent**Error! Bookmark not defined.**
- 3.5 - Computation of replenish Dye feed per min**Error! Bookmark not defined.**

Chapter # 4

- 4 - Controlling of Oxidation.....Error! Bookmark not defined.**
- 4.1 - Oxidation in denim processing.....Error! Bookmark not defined.**
 - 4.1.1 - Significance of Oxidation.....**Error! Bookmark not defined.**
- 4.2 - Testing and CalculationError! Bookmark not defined.**
 - 4.2.1 - Free Hydro (sulphite) and its concentration**Error! Bookmark not defined.**
 - 4.2.2 - Reaction and its Time**Error! Bookmark not defined.**
 - 4.2.3 - Softening Agent:.....**Error! Bookmark not defined.**
 - 4.2.4 - Drying.....**Error! Bookmark not defined.**
- 4.3 - Factors of rate of dye reduction.....Error! Bookmark not defined.**
 - 4.3.1 - Dye-related:**Error! Bookmark not defined.**
 - 4.3.2 - Auxiliary-related.....**Error! Bookmark not defined.**
 - 4.3.3 - Process related**Error! Bookmark not defined.**
- 4.4 - Oxidation factors:.....Error! Bookmark not defined.**
 - 4.4.1 - May results into the decrease with**Error! Bookmark not defined.**
- 4.5 - Over-reduction and over Oxidation Problems: ...Error! Bookmark not defined.**
 - 4.5.1 - Improper oxidation:**Error! Bookmark not defined.**
- 4.6 - Importance of Proper Oxidation:Error! Bookmark not defined.**
 - 4.6.1 - Significance**Error! Bookmark not defined.**
 - 4.6.2- Parameters**Error! Bookmark not defined.**
 - 4.6.3 - Oxidizing agents:.....**Error! Bookmark not defined.**
- 4.7 - PH consideration in oxidation:Error! Bookmark not defined.**
- 4.8 - Temperature management:.....Error! Bookmark not defined.**

Chapter # 5

- 5 – Sample and RecipesError! Bookmark not defined.**
 - 5.1 – Pretreatment (Same for both samples).....**Error! Bookmark not defined.**

5.2 - Recipe for both samples (Pure Indigo Shade)**Error! Bookmark not defined.**

Samples

“Sample Shirley dyed cotton”.....**Error! Bookmark not defined.**

Sample # 1.....**Error! Bookmark not defined.**

Sample # 2.....**Error! Bookmark not defined.**

Sample # 3.....**Error! Bookmark not defined.**

Sample # 4.....**Error! Bookmark not defined.**

Sample # 5.....**Error! Bookmark not defined.**

Sample # 6.....**Error! Bookmark not defined.**

Sample # 7.....**Error! Bookmark not defined.**

Sample # 8.....**Error! Bookmark not defined.**

Sample # 9.....**Error! Bookmark not defined.**

Sample # 10.....**Error! Bookmark not defined.**

Monetary benefit.....**Error! Bookmark not defined.**

Conclusion**Error! Bookmark not defined.**

Net saving:**Error! Bookmark not defined.**

Effluent water:**Error! Bookmark not defined.**

Eco system**Error! Bookmark not defined.**

Labour**Error! Bookmark not defined.**

Bibliography**Error! Bookmark not defined.**

Abstract

Denim is one of the world largest wearing stitched fabrics which are extensively not used in European countries but also in all Asiatic & Middle East states like India, China, Iran, Jordan, Saudi Arab, Pakistan, Malaysia etc. Denim has grown just about the most used outfits on the globe. Today jeans are an essential part of our lives. They are almost always washed a few times before being sold to give them their faded appearance.

Indigo is like a *soul of the body* in denim industry, without “indigo dye” denim is almost imperfect, having no look as compare to well indigo dyed denim. Now-a-days there are uncountable varieties and styles of denim, which are manufactured in all over textile sector of the world by keeping in view the increasing demand of fashion designers, brands and trend setters. Use of natural indigo is expensive and it is not easily available for the fulfillment the demand of denim manufacturing industries so researchers manufactured Indigo synthetically. Synthetic Indigo is reliable, easily available and most importantly it is cheaper than natural-indigo.

The denim is actually the combination of warp and weft, in which the warp is mainly dyed with indigo in the form of rope. These ropes are arranged before the dyeing machine in the form of balls (on 12-36 beams) and then passed from the rope dyeing machine before further processes.

Indigo Dyeing of rope is not an easy task for the dyers. It is performed under controlled conditions. This form of dyeing is also called *ring dyeing* because the yarn in the rope is dyed just from the outer side not from the center. The main color of denim is actually depends upon the amount of indigo penetration in the fibers of the yarn (rope), with the help of airing (skying) or oxidation process in air. As long as the dyed yarns ropes are remain in contact with air after dipping in indigo, the oxidation or airing occurs, as the result, the indigo fixation on the surface of yarn is more lasting. This procedure (oxidation) decides the color of the fabric; either it is darker or lighter one. For more rigid shades the ropes will have to be in contact with air for longer time period as compared to the non-rigid shades.

For better oxidation the regulation of air in indigo dyeing section/department is very essential. For the sake of regulation of air in dyeing department big fans, air blowers etc. can be placed which can regulate the air around the dyeing section.