Department of textile Engineering
Faculty of Engineering

Course Title: Industrial Attachment
Course Code: TE – 431

Industrial Attachment Report
On
RAHMAN KNIT GARMENTS LTD

Submitted by

Md.Mehedi Hasan
ID: 113-23-2785

Ali Hossain
ID: 113-23-2780

Supervised by

Sumon Mazumder
Assistant Professor

A report submitted in partial fulfillment of the requirements for the degree of Bachelor of Science in Textile Engineering.

Advance in Textile Wet Processing

Summer-2015

DECLARATION

We hereby declare that, this internship has been done by us under the supervision of **Sumon Mazumder, Assistant Professor**, Department of Textile Engineering, Faculty of Engineering, Daffodil international University. We also declare that, neither this report nor any part of this has been submitted elsewhere for award of any degree or diploma.

Md.Mehedi Hasan
ID: 113-23- 2785
Department of TE
Daffodil International University

Ali Hossain
ID: 113-23-2780
Department of TE
Daffodil International University

LETTER OF APPROVAL

28 July 2015

To
The Head
Department of Textile Engineering
Faculty of Engineering
Daffodil International University
102 Sukrabad, Mirpur Road, Dhaka 1207

Subject: Approval of Internship Report of B.Sc. in TE program.

Dear Sir

I am just writing to let you know that, this internship report is prepared by **Md. Mehedi Hasan (ID: 113-23-2785)** and **Ali Hossain (ID: 113-23-2780)** after accomplishing their two months internship at **Rahman Knit Garments Ltd**. The report is now completed for final evaluation. The whole report is prepared based on practical information, which were collected by the students during the tenure of internship. The students attentively worked in the industry with following the requirements and thus the report becomes vital to spark off much valuable information for the readers.

Therefore, it will highly be appreciated if you kindly accept this report and consider it for final evaluation.

Yours Sincerely,

28/07/2015

Sumon Mazumder
Assistant Professor
Department of Textile Engineering
Faculty of Engineering
Daffodil International University

ACKNOWLEDGEMENT

All pleasure goes to the Almighty Allah to give us strength and ability to complete our two months long industrial attachment at **Rahman Knit Garments Ltd**. It was a great opportunity for us to complete the industrial attachment with the assistance of persons employed in **Rahman Knit Garments Ltd**.

We feel grateful to our academic supervisor **Sumon Mazumder**, Assistant Professor, Department of Textile Engineering, Faculty of Engineering, Daffodil international University as well as to **Md. Golam Rabbani (DGM)**, our factory supervisor for their continuously guiding us about the development and preparation of this training report. They have enriched us with sharing necessary theoretical and practical ideas and supervised us to complete this report on time.

We would like to express our thanks to **Prof. Dr. Md. Mahbub ul Haque**, Head, Department of Textile Engineering, Faculty of Engineering, and Daffodil international University for his kind help to finish our training report. We would like to express our thanks to **Prof. Dr. Md. Zulhash Uddin**, Dean, BUTEX for providing us necessary information to complete the report.

We are also grateful to the supervisors, technicians, operators and all other staffs of **Rahman Knit Garments Ltd**, who were most cordial and helpful to us during the tenure of internship.

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 training report.

We dedicate our industrial attachment report to our family. A special feeling of gratitude to our loving parents, whose words of encouragement and push for tenacity ring in our ears.

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EXECUTIVE SUMMARY

Chapter-1
Executive summary

Rahman Knit Garments Ltd is a Composite knit Garment, having all state of the art facilities with incredible annual turnover last year. They have different types of Knitting, Dyeing, Cutting, Sewing, and Finishing machines supplied by mostly from China, Taiwan, Italy Spain, Belgium, UK, USA, France, Norway etc. All the chemicals and dyes used for dyeing and finishing are well branded.

They produce their product for their buyer and client those are coming from international market like UK, EU, France, USA, and Germany. Their customer profile is well and top end such as Seacotex Group, Madonna, JJB Sports, Isarporta, Reitsmans, Marks & Spencer, Tom Tailor, B&C, Kappa, K-mart, Solo, Tommy etc.

It has medium production where tons of Dyed and Finished yarn packages & fabrics are produced per day. The production is controlled by technical persons. All the decision of production factors are taken by highly qualified textile graduates.

We have started our industrial training from **5th May 2015 to 5th July 2015**. During the short period of training we are impressed by seeing their friendly & cordial behavior. We have learned many things from them both technical & real life issues. Their guidance & nursing fulfills our training.

During the time of training a schedule of tenure on different sections is given by Md.Golam Rabbani (DGM) of yarn dyeing division. The authority allowed us to gather practical knowledge from following section, soft winding, yarn dyeing lab, yarn dyeing floor, hard winding, packaging & finishing section of yarn dyeing division, knit manufacturing division, fabric inspection section of knit manufacturing, batch section, knit fabric dyeing lab, bulk knit dyeing floor, finishing section, quality control section & packaging & delivery section of knit dyeing. We are also allowed by the authority to observe WTP, ETP & maintenance department of Rahman Knit Garments Ltd.

CHAPTER-2

GENERAL INFORMATION ABOUT FACTORY

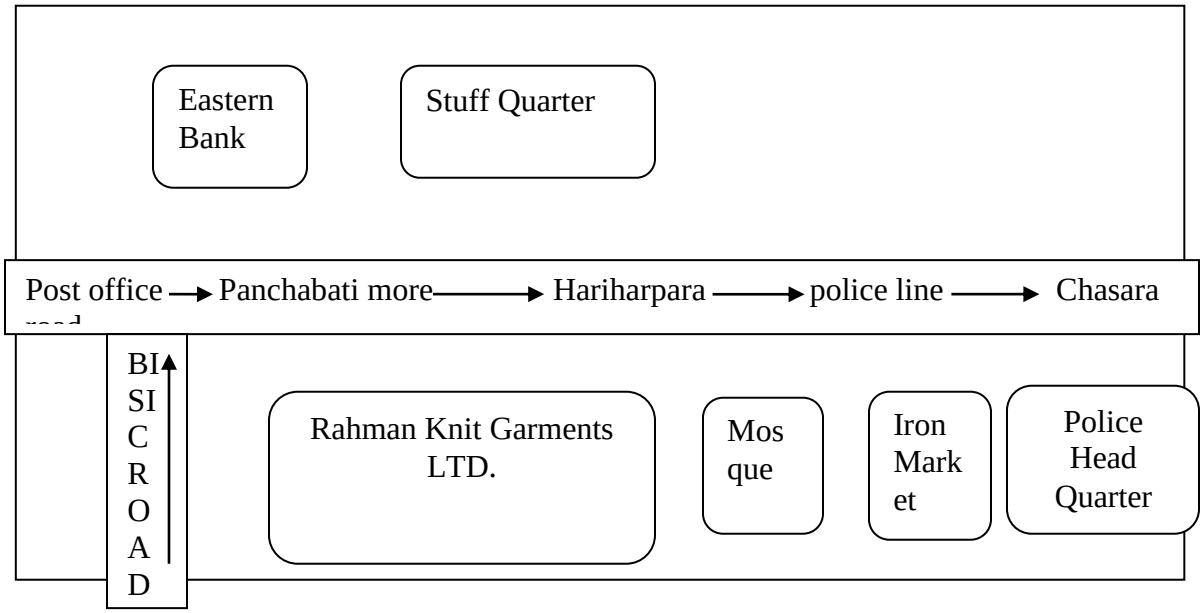
Chapter-2

General Information About Factory

2.1 Company profile

- Name of the factory: Rahman knit Garments Ltd.
- Factory type: 100% Export Oriented Factory
- Year of Establishment:1991
- Location: Panchabati, Fatullah
- Awards:
  - Prime Customer Award of Janata Bank 2003
  - Highest Personal Tax Payer 2008
  - Standard Chartered & Financial Express CSR Award 2009
- Factory address: West side of police station, Hariharpara, Panchabati, Fatullah
- Head Office: Panchabati, Fatullah
- Phone Number: 7671997,7670037
- Fax Number: +880-2-9751443
- E-mail Address: info@rkgltd.com
- Web page: www.rkgltd.com
- Capacity:
  - Yarn dyeing: 4.5 ton/day
  - Knit Manufacturing: 3ton/day
  - Knit dyeing: 10 ton/day
  - Garments Production: 25,000-30,000 PCS T-Shirts per Day. (Approx)
- Share partners: Sons of Md.Rahman

2.2 Location layout



2.3 Factory layout

2.4Different sections of the company

- Yarn Dyeing:
  - Soft winding

- Yarn dyeing lab
- Batching
- Yarn dyeing floor
- Quality control
- Hard winding
- Packaging
- Finishing
- Delivery

- Knitting:
  - Fabric manufacturing
  - Fabric lab
  - Batching
  - Fabric dyeing floor
  - Quality control
  - Packaging
  - Finishing
  - Delivery
- Garments section:
  - Merchandising
  - Sampling
  - Cutting section
  - Sewing section
  - Finishing section
  - Packaging section
  - Delivery section
- Maintenance section:
  - Electrical
  - Mechanical
  - Cleaning
- Store management
- Administration section

- Security section
- Marketing section
- Production planning & control
- Supporting departments:
  - City corporation
  - Narayangonj police station
  - Fire service & civil defense
    - Mondol Para
    - Hazigong
    - Postoghola
    - Demra
    - Port station
  - Industrial police
    - Narayangong zone 4
    - Fatullah camp
    - Police line
- RAB-11
- BGMEA
- BKMEA
- Narayangong hospital
- Rural clinic
- Emergency ambulance
- BISIC
- Titas gas
- Power house killarpul

2.5 Name of products company export

- T-shirt,
- PQ Polo shirt,
- Pull over,
- jeans pant,

- Twill pant etc.
- Sweater: any kinds of sweater.

2.6Membership certificates

- Oeko Tex
- BSCI Certificate
- Confidence in textile

2.7 List of Buyers

- Seacotex Group
- Madonna.EU
- JJB Sports
- Isarporta
- Reitsmans
- Marks & Spencer
- Tom Tailor
- B&C
- Kappa
- K-mart
- Solo

- Tommy
- C & A
- Young 4Ever
- V-Teac Fashion
- Knit Garden
- Heaven Knit
- Fashion Express
- Boras Knit Wear
- JAKS Fashion
- HN Apparel
- Maple Knit
- Sincere Knit
- Navy Hosiery
- Robust Apparel
- Unison Design
- Jams Apparel
- RIB Line Fashion
- M.S Ideal
- Pacific Export
- Century Apparels
- New R.S Hi Fashion
- Rose Garden
- Ever Green Tex
- Lexel Knitwear
- Saiful & Brother
- Jabon Apparels
- Yousuf Garments
- Karotoa Apparel
- Martin Knit
- Jamuna Knit
- Pushpa Knit

2.8Pictorial view of the company

CHAPTER-3

DETAILS OF THE COMPANY

Chapter-3

Details of the Company

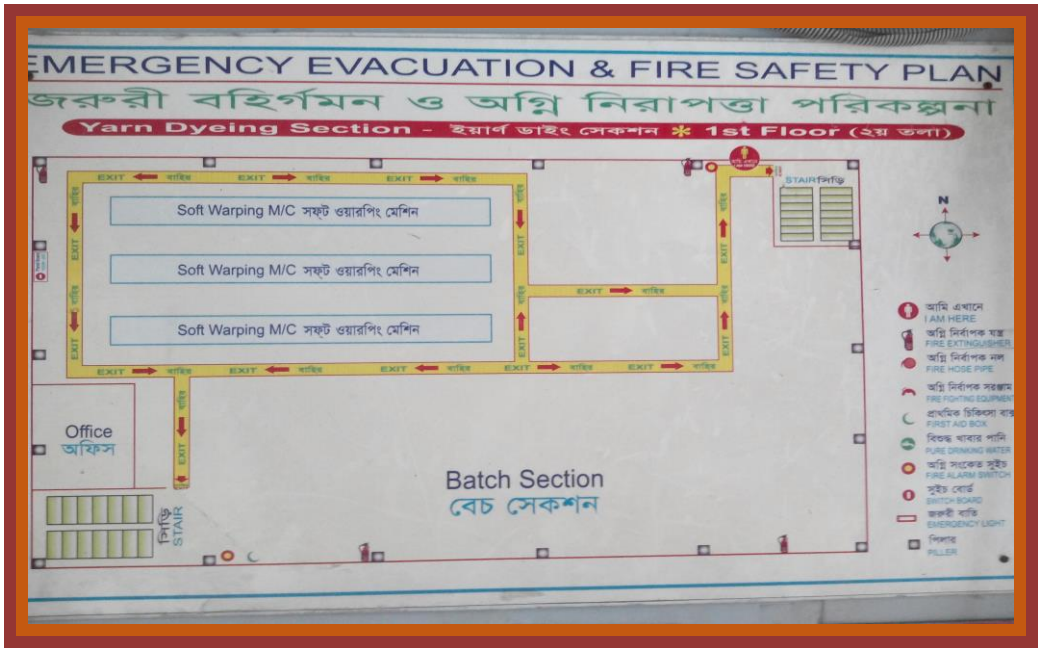
3.1. Soft winding:

3.1.1 Introduction:

Soft winding department is one of the most important departments in yarn dyeing division. They are using latest precision winding machines for soft winding purpose. It is situated in second floor; base floor is used for hard winding. The floor is divided into 3 parts. One portion of this large floor is used for storing goods, one is for storing finished soft packages & large portion is used for situating machines. Two desk, one for mechanical engineer & another for in-charge. One large balance is situated near in-charge desk. They have 4 precision winding machines with 95% efficiency.

All operators, supervisor, in-charge, & technician were very helpful to us. They shared their knowledge, experience & short cut formulas with us. They were very friendly and broad minded.

3.1.2 Section layout



3.1.3 Machine specification:

- ✓ Machine name: SSM precision soft winding machine
- ✓ Origin: Switzerland
- ✓ Manufacturer: Preciflex TM
- ✓ No of machines: 4 m/c
- ✓ Machine capacity: 32kg/spindle/day
- ✓ Machine efficiency: 95%
- ✓ Machine R.P.M:
    - 1200 (highest)
    - 100(lowest)
    - 1100(usual)
- ✓ Package weight:
    - 3.5 kg (highest)
    - 1.1kg (usual)
- ✓ No of spindle per m/c: 60
- ✓ Different parts:
    - Screen touch Monitor
    - Switch option for each motor
    - Package stand
    - Yarn guide
    - Feeder motor
    - Tension motor
    - Sell up pressure
    - Yarn sensor
    - Support roller
    - Poplar / traversing motion
    - Spin motor
    - Package holder
    - Cheese or package holder motor
    - Package handle
    - Air suction & blowing fan

3.1.4 Production parameters:

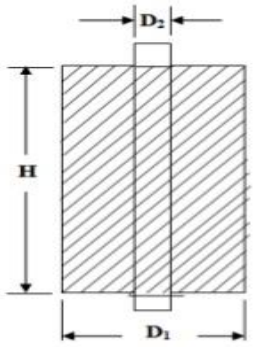
Following production parameters are used during production of a package. We have learned following parameters, which are described below

- **Density calculation:**

Package Density Calculation (Yarn Dyeing):

Formula

Total diameter of package = D_1
Diameter of spring = D_2
Diameter of the package = $D (D_1 - D_2)$
Height of the package = H
Weight of the total package = W_1
Weight of the spring = W_2
Weight of the package (W) = (W_1-W_2)



We know,
Package density (δ) = Package weight / Package volume

And volume of cylinder, $V = \pi r^2 H$
$= \pi (D/2)^2 H$

So package volume (V) $= \pi (D_1/2)^2 H - \pi (D_2/2)^2 H$
$= \pi /4 \times H \{(D_1)^2 - (D_2)^2\}$
$=$...X... cm^3

Now package density (δ) $= \dfrac{W (gm)}{\pi /4 \times H \{(D_1)^2 - (D_2)^2\}}$

$=$.....X.....gm/cm^3
$=$ .....X.....$gm/cm^3 \times 1000$
$=$.....X.....gm/dm^3.

Shortcut formula of density calculation:

$$\text{Density} = \frac{\Pi * 4 * W}{H * (\text{package dia})^2 - (\text{Bobbin dia})^2}$$

Where, H=height of package

W=weight of packages
(W=W1-W2)

- Density of higher count & single yarn will be higher.
- Density of lower count & double yarn will be less.
- Dye penetration will be higher, if package density is less & dye penetration will be lower, if package density is higher.
- If the diameter of package is high then it will be difficult to set in spindle of cylindrical carrier for dyeing.

- **Package yarn length calculation:**

Length Calculation in Package:

To maintain the constant package density same length of yarn should be wound to all the packages of a batch or lot. The dyeing machine capacity is calculated on weight, so it is necessary to maintain the uniform weight throughout the packages. To do this for a definite count of yarn following calculation is followed,

$$\text{Count (Ne)} = \frac{Length\,(L) \times Weight\ unit\,(w)}{Length\ unit\,(l) \times Weight\,(W)}$$

$$\text{L} = \frac{Ne \times l \times W}{w} = \frac{Ne \times 840 \times W}{453.6}\ \text{yds.}$$

$$= \frac{Ne \times W \times 840 \times 36 \times 2.54}{453.6 \times 100}\ \text{meter}$$

$$= \text{Ne} \times \text{W}_{\text{in Kg}} \times 1.693\ \text{m.}$$

In this machine length is pre selected. For different count of yarn different length of yarn is pre selected. This is due to maintain the constant package weight and package density.

Shortcut formula for measuring length of cheese package:

For Precision winding m/c $= \dfrac{\text{Count (Ne) * weight of package}}{0.61\text{(constant)}}$ meter

For non precision winding m/c $= \dfrac{\text{Count (Ne) * weight of package}}{0.5959\text{(constant)}}$ meter

Where.
Ne= yarn count
Weight op package= $(w_1\text{-}w_2)$
w_1=weight of package
w_2=weight of cheese

- **Time required for producing of a package:**

$$\text{Minute} = \frac{\text{Length of a package in meter}}{\text{Given or set R.P.M of machine}}\ \text{meter}$$

- **Count calculation from the length of a package:**

The following formula is used to calculate the yarn count

$$Yarn\,\text{Count} = \frac{590.5 \times 16.1}{S.L. \times Grey\,\text{GSM}}$$

$$Indirect\,Count = \frac{w \times L}{W \times l}$$

Where, W=weight of the sample
L=length of the sample
w=unit weight of the system
l=unit length of the system

$$Direct\,Count = \frac{W \times l}{w \times L}$$

Where, W=weight of the sample
L=length of the sample
w=unit weight of the system
l=unit length of the system

Numbering System	Unit Of Length (l)	Unit Of Weight (w)
English cotton count , Ne	840 yards (yds)	1 pound (lb)
Metric Count , Nm	1000 meters / 1km	1 kg
Woolen count (YSW)	256 yards	1 pound (lb)
Woolen Count (Dewsbury)	1 yard	1 ounce (oz)
Worsted Count , NeK	560 yards	1 pound (lb)
Linen count , NeL	300 yards	1 pound (lb)

- **Production calculation per spindle of SSM precision winding machine:**

Production per spindle= $\frac{\text{Rpm of spindle} \times 60 \times 24 \times 1.09}{840 \times 40 \times 2.2045}$ kg/day

We can calculate the total production capacity of a machine or Whole floor, the process is given below,

Total production=No of spindle per machine× No of machine× production per spindle per kg per day

Where,
1 meter =1.09 yds
1hour =60 min
1 day =24 hours
1kg =2.2046 lbs
Count =40 ne
1 hank =840 yds

Yarn weight= {(Total weight shown on screen of balance ÷ No of packages) - Cheese or spring weight} × No of packages

❖ **Process flow chart:**

Yarn in ring bobbin
↓
Guide
↓
Tension
↓
Yarn clearer device
↓
Stopping device
↓
Traversing guide
↓
Winding

❖ **Problem associated in soft winding:**

1. Lot mixing
2. Count mixing
3. Density: due to wrong setting of tension, angle of winding, overfeed speed is responsible for density variation
4. Hard or soft then requirement
5. Cleaning device: if cleaning device doesn't work properly then air dust will increase the tension
6. Yarn breakage: due to low strength & high tension
7. Electric problem: flyer becomes stop but supporting roller moves and yarn wound to tube as line because traversing is stopped.

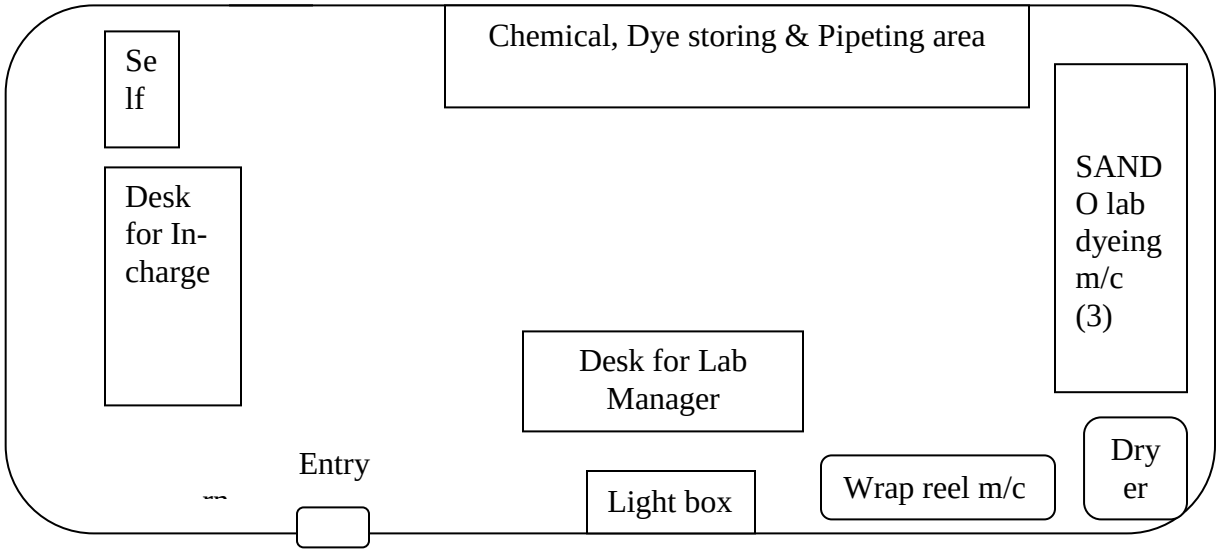
3.2. Yarn dyeing lab

3.2.1 Introduction:

Before bulk production sample dyeing must need. Normally a textile dyeing mill get offer through merchandiser**.** Merchandising department of dyeing mill send the swatch to the central dyeing lab. Then dyeing lab manager dyeing the sample by using 5 gm sample

All operators, supervisor, in-charge, & lab manager was very helpful to us. They shared their knowledge, experience & short cut formulas with us. They were very friendly and broad minded.

3.2.2 Layout of yarn dyeing lab:



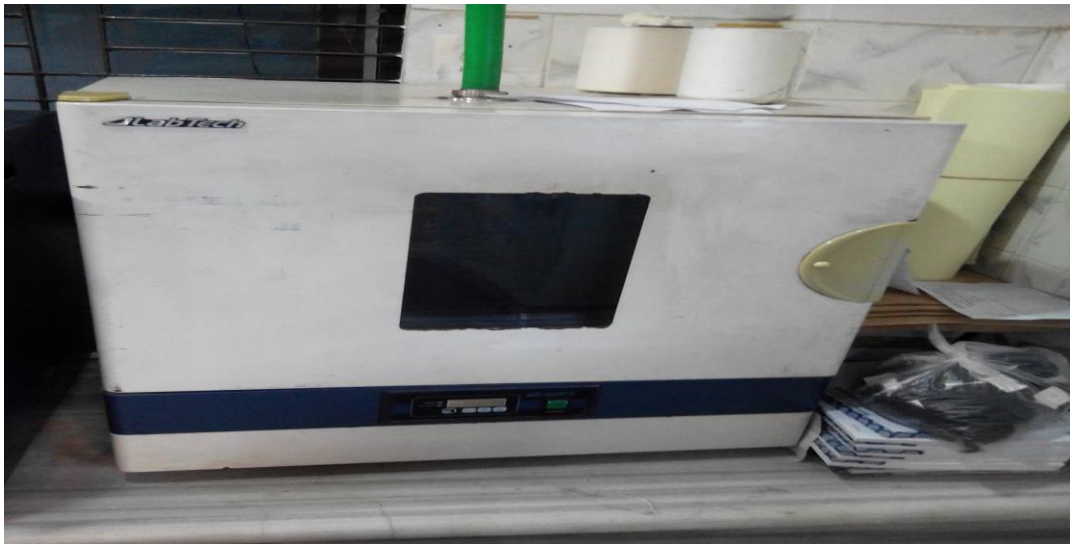
3.2.3 Organ gram:

Lab manager
⇩
Lab in charge
⇩
Lab assistant
⇩
Pipit man
⇩
Helper

3.2.4 Name of machines used in lab:

- Sando lab dyeing machine 3

- Electric dryer



- Wrap reel machine

- 1 lee=120 yds (per revolution= 1yds)

- Digital balance

- Light box

- Light option:
  - ✓ D 65 (color temp:6500° k , color rendering index: 98)
  - ✓ TL 84 (color temp:4000° k , color rendering index: 85)
  - ✓ F (color temp:2856° k , color rendering index: 100)
  - ✓ UV

- Digital pipit

3.2.5 Process procedure:

Sample Received
↓
Standard is checked with the Reference from the inventory
↓
If matched then sample prepared from that recipe
↓
If not matched than the color percentage is calculated by using Data Color
↓
Recipe Prepared
↓
Sample prepared according to recipe
↓
Standard (From Buyer) and Sample prepared is Compared
↓
If Okay then the sample is sent to Buyer
↓
Buyer approves the sample and order for the bulk production.

Sample Received: Buyer sends a sample which is considered as standard in whole process. Buyer also gives some requirements about the properties of the standard fabric. For example, Buyer wants good wash fastness, light fastness, rubbing fastness, pilling formation etc. The lab receives this standard to make this fabric according to buyer requirements.

Standard is checked with the Reference from the inventory: The factory dyed a lot of fabric in its running years. It also stores a lot of sample in its inventory. The standard is first checked with the samples kept in the inventory.

If matched then sample prepared from that recipe: If the standard is matched with the sample of inventory then the next process becomes easier. Because after matching the sample with standard previously maintained recipe is followed. If the sample does not match with the standard then the process goes to data color.

If not matched than the color percentage is calculated by using Data Color: If the standard does not match with the samples of inventory, then the standard percentage of color is found out from the data color machine.

Recipe Prepared: According to the results of data color machine the recipe is prepared to get the desired sample of that standard.

Sample prepared according to recipe: Following the procedure the sample is prepared.

Standard (From Buyer) and Sample prepared is Compared: After getting the sample is compared with the standard. And several tests are done to meet the buyer requirement.

If Okay then the sample is sent to Buyer: Sample is then sent to the buyer for the final approval.

Buyer approves the sample and order for the bulk production: When buyer gives the final approval the fabric is sent to production floor for the bulk production.

3.2.6 List of dyes used in yarn dyeing lab:

- Fucazol Yellow 3GL (Stock solution 0.5%)
- Fucazol Yellow UCF (Stock solution 1%)
- Fucazol Yellow UCX (Stock solution 1%)
- Synolon Yellow SPD(Stock solution 0.5%)
- Fucazol Orange D2R (Stock solution 1%)
- Fucazol Red D2B (Stock solution 1%)
- Fucazol Red UCX (Stock solution 1%)
- Fucazol Red USB (Stock solution 1%)
- Reacto Bond Red RR (Stock solution 0.5%)
- K/T Red ME6BL (Stock solution 1%)
- Remazol Blue NBF (Stock solution 1%)
- Remazol Blue USB (Stock solution 1%)
- Remazol Blue RR (Stock solution 0.5%)

- Remazol Blue RSPL (Stock solution 0.5%)
- Drimarine Blue RSPL (Stock solution 1%)
- Fucazol Black BG (Stock solution 1%)
- Fucazol Black CSG (Stock solution 5%)
- Tarquish Blue G (Stock solution 1%)
- 4BK

3.2.7 List of Chemical used in yarn dyeing lab:

- ✓ Mala WT (Detergent)
- ✓ AFK(Sequestering agent)
- ✓ Acetic acid(Neutralizer, reduce alkali condition pH-7)
- ✓ Exoline fast DFT(Leveling agent, control dye take up of fibre)
- ✓ HTS(Anti-foaming agent, remove foam formation in dye bath, which may cause uneven dyeing)
- ✓ Hydrogen Peroxide (universal bleaching agent, liberate H_2O_2 properly $H_2O_2 \longrightarrow H\dagger + HO2^-$)
- ✓ Stabilizer (control hydrolysis of H_2O_2, following reaction could occur if stabilizer is not used $2H_2O_2 \longrightarrow 2H_2O + O_2$)
- ✓ Na thiosulphate (Peroxide killer –$Na_2 SiO_3$) functional group of reactive dyes are very sensitive to peroxide, therefore it is must to neutral the action of peroxide after bleaching
- ✓ Lysol powder(Dispersing agent)
- ✓ Hydrose ($Na_2H_2SO_4$ reducing agent)
- ✓ Caustic soda (Neutralize acidic materials, saponify glycerides (waxes and oil, solubilize silicates)
- ✓ Texsof PE(softener, make yarn surface smoother)
- ✓ Tubingal (softener used for white color)
- ✓ Hydrocol sun (softener fixing agent)
- ✓ Soda ash

- ✓ Salt(Acts as electrolytes, remove electro negativity of fibre surface)
- ✓ Innocol RD(Soaping agent)

❖ **Formula for using salt & soda:**

Salt stock solution = 25%

Soda stock solution = 25%

M: L ratio = 1: 9

Total dyes	Salt	Soda
0.1	10 gm	5 gm
0.11- 0.3	20 gm	5 gm
0.31- 0.5	30 gm	10 gm
0.51- 1.0	40 gm	10 gm
1.01-2.0	50 gm	15 gm
2.01-3.0	60 gm	20 gm
3.01-4.0	70 gm	20 gm
4.01-5.0	80 gm	20 gm
5.01-6.0	90 gm	20 gm
6.0	100 gm	25 gm

❖ **Dyes & chemicals calculation formula for laboratory:**

➢ The amount of dye solution(ml) is calculated as follow-

- Amount of dye solution (ml) $= \frac{\text{Fabric Weight x Shade\%}}{\text{Stock dye solution\%}}$

Example**:**

In recipe, Fabric Weight= 5gm

Shade%= 2%

[If used stock solution of dyes] then,

Amount of dye solution (ml) = $\frac{5 \text{ x} 2}{1} = 10\text{gm}$

- The amount of chemical solution(ml) is calculated as follow-

- Amount of chemical solution (ml) = $\frac{\text{g/L x Total liquor}}{\text{1000 x Stock solution\%}}$

Example**:**

In recipe, Fabric Weight= 5gm
Salt = 15g/l
M: L = 1: 9
[If used 25% stock solution of salt] then,

Amount of chemical solution (ml) = $\frac{5 \times 9 \times 15}{1000 \times 0.25}$ = 3ml

- **Dilution of solution:**

For making 0.1% to 0.5% solution it is quite impossible to measure 1 mg dye in balance, therefore they make 1% stock solution and then converted to 0.1% stock solution by taking 1 ml dye solution from 1% stock solution to a beaker and add 9 ml water, for 0.2% they take 2 ml dye solution & 8 ml water. There is two equation for dilution one for g/l and another for %

For example, a solution of 50 ml contain 20g/l NaCl and if need to dilute it to 5g/I solution then how much of water need to add with this solution?

V_1 x g/l = V_2 x g/l
Or, 50mIx20g/I=V_2 x 5 g/l
or, V_2= 200 ml

Therefore, the required amount of water is (200mI-50mI) or, 150ml which need to add with 50 ml of 20 g/l solution to obtain 5 g/l concentration.

This relation can calculate as percentage as well. For example, a solution of 1.0% is to be diluted to 0.1%.If the volume of solution is 25 ml, then the relation is

V_1 x C_1= V_2 x C_2
Or, 25mI x 1.0%=V_2 x 0.1%
or, V_2= 250 ml

Therefore, the required amount of water will be (250mI- 25mI) or, 225 m1 which need to add with 25m1of1.0% solution to obtain 0.1% concentration.

3.3. Yarn dyeing floor

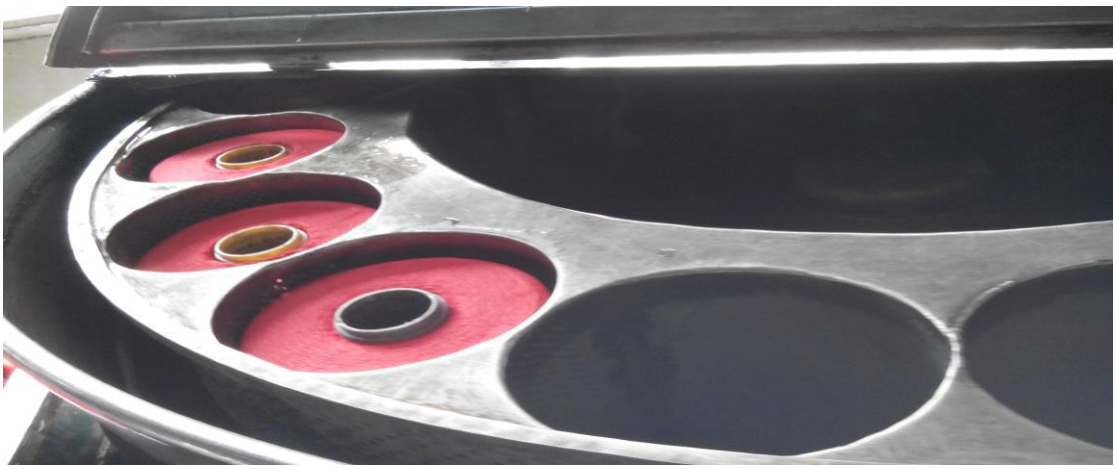
3.3.1 Layout of yarn dyeing floor:

3.3.2 Description of the Machines Used in Dyeing Floor

Machine Number	Machine Name	Model Name	Origin	Capacity	Built Year
1-2	TONG GENG (H.T.&H.P. Dyeing Machine)	Sample Dyeing Machine	China	5kg&6kg	2006
03	TONG GENG(H.T.&H.P. Dyeing Machine)	Dyeing Machine	China	30kg	2006
04	TONG GENG(H.T.&H.P. Dyeing Machine)	Dyeing Machine	China	50kg	2006
5&6	TONG GENG(H.T.&H.P. Dyeing Machine)	Dyeing Machine	China	100kg&100kg	2006
7&8	TONG GENG(H.T.&H.P. Dyeing Machine	Dyeing Machine	China	160kg&160kg	2006
9&10	TONG	Dyeing	China	310kg&310kg	2006

	GENG(H.T.&H.P. Dyeing Machine)	Machine			
11	TONG GENG(H.T.&H.P. Dyeing Machine)	Dyeing Machine	China	720kg	2006
12&13	TONG GENG(H.T.&H.P. Dyeing Machine)	Sample Dyeing Machine	China	15kg&15kg	2006

- **Hydro extractor:**



- **STALAM Dryer:**

Manufacturer : STALAM (RF Dryer)
Origin : Italy
Machine type : Yarn dryer
Model No : RF 105KW

Installed Power	: 165 KVA
Max power current	: 250A
Short circuit current	: 100KA
Weight of m/c	: 3300kg
Voltage	: 400v (+5v,-5v)
Phrase	: 3 Earth
Frequency	: 50HZ (+2,-2)
Length of bell	: 9 meter
Temp	: 80-95 ^{0}c

3.3.3 Raw Materials for Yarn Dyeing floor:

Raw materials used in the dyeing section are-

- Grey Yarn
- Dyes
- Chemicals

Following types of grey yarn are dyed-

- ✓ Cotton
- ✓ Polyester
- ✓ Viscose
- ✓ Mélange
- ✓ Polyester Cotton (PC)
- ✓ Chief Value of Cotton (CVC)

❖ **Dyes & chemicals Measuring Formula for Yarn Dyeing Floor:**

Amount of dye = Fabric Weight x Shade%

Example:

Fabric weight=512kg
Shade%=.85%
Amount of dye=512 x.85% =4kg352gm

$$\text{Amount of chemical} = \frac{\text{Total Liquor x Recipe amount}}{1000} \text{ gm}$$

Example:

Total liquor=700kg
Salt =25g/l

$$\text{Amount of chemical} = \frac{700\text{kg} \times 25}{1000}\ \text{gm}$$

=17kg 500gm

3.3.4 Flow Chart of Yarn Dyeing

Preparatory process

Soft winding
↓
Batching
↓
Batch loaded
↓
Demineralization (50˚C, 20 min; PH=4.5)
↓
Scouring & bleaching (100˚C×40 min.)
↓
Drain
↓
Rinse
↓
Drain
↓
Neutralization with acid (50°C ×20 min)
↓
Hot Wash with peroxide killer (60˚C,20 min.)
↓
Drain
↓
Dyeing
↓
Leveling agent & Salt (60° × 20 min; PH=6)
↓
Color dosing (60°C×20 min.)
↓
Run time = 10 min. (60°C)
↓
Color migration (80°C × 20 min.)
↓
Cooling (60°C)
↓
Level Check

↓

Soda dosing (60°C×30 min.)

↓

Dyeing run (Dark-60°C×60 min;Medium-60°C×40 min;Light-60°C×30 min)

↓

Dyeing sample check

↓

(If Ok)

↓

Drain

↓

After-treatment

↓

Rinse (with cold Water)

↓

Neutralization after dyeing (50°C×20 min.)

↓

Drain

↓

Soaping (Hot wash)

↓

Drain

↓

Rinse

↓

Add finishing chemical(60°C×20 min)

↓

Drain

↓

Unload

1. Recipe for Cotton Yarn Dyeing (Light Shade)

Color: Light Red M: L-1:9

Recipe for Scouring& Bleaching:

Marla Wt (Wetting agent& Detergent)	:0.5 g/l
AFK (Sequestering agent)	:0.5 g/l
Caustic Soda (Alkali)	:1.0 g/l
Hydrogen per Oxide (Bleaching agent)	:2.0 g/l
Stabilizer	: 0.3 g/l

Recipe for Neutralization:

Na thiosulphate (Peroxide Killer)	: 0.1 g/l
Acetic Acid	: 0.5 g/l

Recipe for Dyeing:

AFK (Sequestering agent)	: 0.5 g/l
DLRD, Exoline Fast (Leveling agent)	: 0.5 g/l
HTS (Anti-foaming agent)	: 0.3 g/l

Dyes:

F/Z Orange D_2R	: 0.08%
F/Z Red D_2R	: 0.28%
F/Z Red DCX	: 0.36%

Salts& Alkali:

Na Sulphate (Na_2SO_4)	: 10 g/l
Soda Ash	: 10 g/l

Recipe for Neutralization:

Acetic Acid	: 0.5 g/l

Recipe for After Treatment& Softening:

RD (Soaping agent for hot wash)	: 0.2 g/l
Acetic Acid	: 0.5 g/l
Texsof PE	: 2.0 g/l
Hydro cal sun (Fixing agent)	:1.5 g/l

⊙ **Process Flow Chart for Cotton yarn Dyeing (Light Shade):**

Package Loading
↓
Water fill
↓
Rinsing
↓
Drain out
↓
Water fill
↓
Scouring& Bleaching Chemicals
(105^0C, 40min)
↓
Hot wash
(80^0C, 10min)
↓
Neutralization
(50^0C, 15min)
↓

PH Check

↓

Leveling chemicals

(60^0C, 10min)

↓

Adding Salt

(60^0C, 20min)

↓

Adding Dyes

(Color mix, 60C, 20min & Dozing, 60^0C, 20min

↓

Running

(80^0C, 20min)

↓

Package check& Add soda

(60^0C, 45min-Dozing)

↓

Dyeing for

(60^0C, 30min or 40min)

↓

Shade Match

↓

(If ok)

↓

Rinsing

↓

Neutralization

(50^0C, 15min)

↓

Rinsing

↓

Soaping Wash

(95^0C, 20min)

↓

Rinsing

↓

Hot Wash (80^0C, 10min)

↓

Sample Cutting

↓

Shade Match

↓

Ok

↓

Neutralization

(50^0C, 15min, p^H5.5-6.5)

↓

Apply Softener

(45, 10min-Dozing, Run 45^0,20min)

↓

Package Unload

2. Recipe for Cotton Yarn Dyeing (Dark Shade)

Color: Ecru M: L-1:9

Recipe for Scouring:

Marla Wt (Wetting agent& Detergent)	:0.5 g/l
AFK (Sequestering agent)	:0.5 g/l
Caustic Soda (Alkali)	:1.0 g/l

Recipe for Neutralization:

Acetic Acid	: 0.5 g/l

Recipe for Dyeing:

AFK (Sequestering agent)	:0.5 g/l
DLRD, Exoline Fast (Leveling agent)	:0.5 g/l
HTS (Anti-foaming agent)	:0.3 g/l

Dyes:

F/Z Orange D_2R	:0.88%
F/Z Red D_2R	:0.8%
F/Z Red DCX	: 0.6%

Salts& Alkali:

Na Sulphate Na_2SO_4	:60-20% g/l
Soda Ash Na_2CO_3	:20 g/l

Recipe for Neutralization:

Acetic Acid	: 0.5 g/l

Recipe for After Treatment& Softening:

RD (Soaping agent)	:0.5 g/l
RD (Soaping agent)	:0.5 g/l
RD (Soaping agent)	:0.5 g/l
Hot Wash	
Acetic Acid	: 0.5 g/l
Texsof PE	: 2.0 g/l
Hydro cal sun (Fixing agent)	:1.5 g/l

⊙ **Process Flow Chart for Cotton Yarn Dyeing (Dark Shade):**

Package Loading
↓
Water Loading
↓
Wash with cold water or rinsing
↓
Drain out
↓
Water fills up
↓
Scouring& Bleaching Chemicals
(95^0C, 30min)
↓
Hot wash
(80^0C, 10min)
↓
Neutralization
(50^0C, 15min)
↓
PH Check
↓
Leveling chemicals
(60^0C, 10min)
↓
Adding Salt
(60^0C, 20min)
↓
Adding Dyes
(Color mix, 60C, 20min & Dozing, 60^0C, 20min)
↓
Running
(80^0C, 20min)
↓
Package check& Add soda
(60^0C, 45min-Dozing)
↓
Dyeing for
(60^0C, 30min or 40min)
↓
Shade Match
↓
Ok
↓
Rinsing

↓

Neutralization
(50^0C, 15min)

↓

Rinsing

↓

Soaping Wash
(95^0C, 20min)

↓

Rinsing

↓

Hot Wash (80^0C, 10min)

↓

Sample Cutting

↓

Shade Match

↓

Ok

↓

Neutralization
(50^0C, 15min, p^H5.5-6.5)

↓

Apply Softener
(45, 10min-Dozing, Run 45^0,20min)

↓

Package Unload

3. Recipe for Cotton Yarn Dyeing (White Shade)

Color: Ecru M: L-1:9

Recipe for Scouring& Bleaching:

Marla Wt (Wetting agent& Detergent)	:0.5 g/l
AFK (Sequestering agent)	:0.5 g/l
Acid	: 0.5 g/l
Caustic Soda (Alkali)	:1.0 g/l
Hydrogen per Oxide (Bleaching agent)	:2.0 g/l
Stabilizer	: 0.3 g/l
Optical Brightener (4BK)	:0.4%

Recipe for Dyeing:

AFK (Sequestering agent)	:1.0 g/l
DFK, Exoline Fast (Leveling agent)	:1.0 g/l

Acid : 0.5 g/l

Recipe for After Treatment& Softening:

AFK : 0.5 g/l

Texsof PE : 2.0 g/l

Tubingal (Fixing agent) :0.4%

⊙ **Process Flow Chart for Cotton Yarn Dyeing (White Shade):**

Package Loading
↓
Water Loading
↓
Wash with cold water or rinsing
↓
Drain out
↓
Water fills up
↓
Scouring- Bleaching Chemicals & Optical Brightener (105^0C, 40min)
↓
Hot wash (80^0C, 10min)
↓
Neutralization (50^0C, 15min)
↓
PH Check
↓
Leveling chemical (60^0C, 20min)
↓
Shade Match
↓
Ok
↓
Rinsing
↓
Soaping Wash (95^0C, 20min)
↓
Rinsing
↓
Hot Wash (80^0C, 10min)
↓
Sample Cutting
↓
Shade Match
↓
Ok

↓

Neutralization (50^0C, 5min, p^H5.5-6.5)

↓

Apply Softener (45, 10min-Dozing, Run 45^0,20min)

↓

Package Unload

4. Recipe for Polyester Yarn Dyeing (Light Shade)

Recipe for Dyeing:

Lyocol Powder (Dispersing agent)	:1.0 g/l
DFT (Leveling agent)	:0.1 g/l
Acetic acid	: 0.5 g/l

Dyes:

F/Z Yellow 4G	: 0.24%
F/Z Yellow RPSL	: 0.06%
F/Z Blue 60	:0.0005%

Reduction Cleaning:

Hydrose	: 1.5 g/l
Caustic	: 1 g/l

Reduction Cleaning:

Hydrose	: 1.5 g/l
Caustic	: 1 g/l

Hot Wash

Neutralization:

Acetic acid	: 0.5 g/l

⊙ Process Flow Chart for Polyester yarn Dyeing (Light Shade):

Package Loading

↓

Water Loading

↓

Wash with cold water or rinsing

↓

Drain out

↓

Water fills up

↓

Leveling Chemical (Run 70^0c, 20min)

↓

Adding Dyes
↓
Running (Run 130^0c, 50min)
↓
Reduction Cleaning (80^0c, 20min) Two times
↓
Hot Wash (80^0c, 10min)
↓
Cold Wash 5min
↓
Neutralization (50^0C, 5min)
↓
Unloaded Package

5. Recipe for Polyester Yarn Dyeing (Dark Shade)

Recipe for Dyeing:

Lyocol Powder (Dispersing agent)	:1.0 g/l
DFT (Leveling agent)	:0.1 g/l
Acetic acid	: 0.5 g/l

Dyes:

F/Z Yellow 4G	: 5.05%
F/Z Yellow RPSL	: 0.16%
F/Z Blue 60	:0.15%

Reduction Cleaning:

Hydrose	: 1.5 g/l
Caustic	: 1 g/l

Reduction Cleaning:

Hydrose	: 1.5 g/l
Caustic	: 1 g/l

Hot Wash

Neutralization:

Acetic acid	: 0.5 g/l

⊙ Process Flow Chart for Cotton yarn Dyeing (Dark Shade):

Package Loading
↓
Water Loading

↓

Wash with cold water or rinsing

↓

Drain out

↓

Water fills up

↓

Leveling Chemical (Run 70^0c, 20min)

↓

Adding Dyes

↓

Running (Run 130^0c, 60min)

↓

Reduction Cleaning (80^0c, 20min) Two times

↓

Hot Wash (80^0c, 10min)

↓

Cold Wash

↓

Neutralization (50^0C, 5min)

↓

Package Unloaded

6. Recipe for Polyester Yarn Dyeing (White Shade)

Recipe for Dyeing:

Lyocol Powder (Dispersing agent)	:1.0 g/l
DFT (Leveling agent)	:0.1 g/l
Acetic acid	: 0.5 g/l

Brightener:

4BK	:0.66%

Hot Wash

Neutralization:

Acetic acid	: 0.5 g/l

⊙ Process Flow Chart for Polyester yarn Dyeing (White Shade):

Package Loading

↓

Water Loading

↓

Wash with cold water or rinsing

↓

Drain out

↓

Water fills up

↓

Leveling Chemical (Run 70^0c, 20min)

↓

Adding Dyes

↓

Running (Run 130^0c, 50min)

↓

Hot Wash ((80^0c, 10min)

↓

Cold Wash (5min)

↓

Neutralization (50^0C, 5min)

↓

Unload Package

7. Recipe for Mélange Yarn Dyeing:

Color: Ecru M: L-1:9

Recipe for Scouring& Bleaching:

Marla Wt (Wetting agent& Detergent)	:0.5 g/l
AFK (Sequestering agent)	:0.5 g/l
Caustic Soda (Alkali)	:1.0 g/l
Hydrogen per Oxide (Bleaching agent)	:2.0 g/l
Stabilizer	: 0.3 g/l
Optical Brightener (4BK)	:0.4%

Recipe for Dyeing:

AFK (Sequestering agent)	:1.0 g/l

Neutralization:

Acetic acid	: 0.5 g/l

Recipe for After Treatment& Softening:

Acid	: 0.5 g/l
Texsof PE	: 2.0 g/l

Process Flow Chart for Mélange yarn Dyeing:

Package Loading

↓

Water Loading

↓

Wash with cold water or rinsing

↓

Drain out

↓

Water fills up

↓

Leveling Chemical (Run 80^0c, 15min or20min)

↓

Sample Check

↓

AFK Wash (80^0c, 10min)

↓

Cold Wash (5min)

↓

Neutralization (50^0C, 15min &P^H Check)

↓

Apply Softener (45^0c, 10min-Dozing, Run 45^0,20min)

↓

Package Unload

8. Recipe for Viscose Yarn Dyeing (Light Shade)

Color: Ecru M: L-1:9

Recipe for Scouring& Bleaching:

Marla Wt (Wetting agent& Detergent) :0.5 g/l

AFK (Sequestering agent) :0.5 g/l

Acetic acid : 0.5 g/l

Recipe for Neutralization:

Acetic Acid : 0.5 g/l

Recipe for Dyeing:

AFK (Sequestering agent) :0.5 g/l

DLRD, Exoline Fast (Leveling agent) :0.5 g/l

HTS (Anti-foaming agent) :0.3 g/l

Dyes:

F/Z Orange D_2R :0.008%

F/Z Red D_2R :0.18%

F/Z Red DCX : 0.45%

Salts& Alkali:

Na Sulphate (Na_2SO_4)	:40
Soda Ash	: 20

Recipe for Neutralization:

Acetic Acid	: 0.5

Recipe for After Treatment& Softening:

RD (Soaping agent)	:0.2 g/l
Hot Wash	
Acetic Acid	: 0.5 g/l
Texsof PE	: 2.0 g/l
Hydro cal sun (Fixing agent)	:1.5 g/l

⊙ Process Flow Chart for Viscose yarn Dyeing (Light Shade):

Package Loading
↓
Water Loading
↓
Wash with cold water or rinsing
↓
Drain out
↓
Water fills up
↓
Scouring& Bleaching Chemicals (105^0C, 40min)
↓
Hot wash (80^0C, 10min)
↓
Neutralization (50^0C, 15min)
↓
PH Check
↓
Leveling chemicals (60^0C, 10min)
↓
Adding Salt (60^0C, 20min)
↓
Adding Dyes (Color mix, 60C, 20min & Dozing, 60^0C, 20min
↓
Running (80^0C, 20min)
↓
Package check& Add soda (60^0C, 45min-Dozing)
↓
Dyeing for (60^0C, 30min or 40min)

↓

Shade Match Ok

↓

Rinsing

↓

Neutralization (50^0C, 15min)

↓

Rinsing

↓

Soaping Wash (95^0C, 20min)

↓

Rinsing

↓

Hot Wash (80^0C, 10min)

↓

Sample Cutting

↓

Shade Match ok

↓

Neutralization (50^0C, 15min, p^H5.5-6.5)

↓

Apply Softener (45, 10min-Dozing, Run 45^0,20min)

↓

Package Unload

3.3.5 Dyeing cost for different color:

Sl.No.	Colors Name	Rate /kg($)	Rate /kg Bangle tk
01	Cotton white color	$1.0	78
02	Cotton light color	$1.4	115
03	Cotton deep color	$2.5	192
04	Cotton brightener	$1.0	78
05	Cotton mélange color	$2.5	192
06	Polyester light	$3.0	234
07	Polyester deep	$4-5	312-390
08	Viscose light	$2.5-3.0	192-234
09	Viscose deep	$3.5-4.0	270-312
10	Turkish cotton	$2.5-3.0	192-234
11	CVC polyester part	$4-5	312-390
12	CVC cotton part	$1-2.5	78-192
13	PC cotton part	$1-2.5	78-192
14	PC polyester part	$4-5	312-390

3.4. Hard winding section:

❖ Introduction:

Hard winding section is one of the most important parts in yarn dyeing division. They are using older version of non precision winding machines for hard winding purpose. It is situated in base floor; the floor is divided into 4 parts. One portion of this large floor is used for storing goods, one is for packaging finished hard packages & large portion is used for situating machines and last one is for sewing thread machine. One desk for in charge. One digital balance is situated near in-charge desk. They have 5 machines with 80% efficiency.

All operators, supervisor, in-charge, were very helpful to us. They shared their knowledge, experience & short cut formulas with us. They were very friendly and broad minded.

❖ Machine specification:

- ✓ Machine name :HWA CHING
- ✓ Origin : China
- ✓ No of machines: 5 m/c
- ✓ Machine capacity:1kg package/3hour
- ✓ Machine efficiency:80%
- ✓ Machine R.P.M:

- 1000 (highest)
- 100(lowest)
- 350(usual)

✓ Package weight:

- 1.1kg (usual)

✓ No of spindle per m/c: 60

✓ Different parts:

- Package stand: To set the packages on package stand.
- Yarn guide: Guides the yarn properly.
- Tension guide: To control hardness or smoothness of a package.
- Wax coating: Used as a lubricants for increasing smoothness of yarn, which helps to reduce friction of subsequent processes.
- Sell up pressure: To remove extra take up of waxes and dust from yarn surface.
- Yarn sensor: Separate package holder from traversing motion, when yarn breaks down.
- Stop stand: Helps to knot the yarn when it breaks down.
- Poplar / traversing motion: To wind a package uniformly by guiding yarn through traverse guide (30 spindles run by one motor).
- Package holder: To hold the packages.
- Complete package bearing stand: Situated over yarn package holder to keep the complete packages after winding.
- Overhead cleaner: Run by a motor via to and fro motion. Its function is to remove dirt dust from machine surface.

3.5 Packaging & finishing:

After winding the packages are cleaned by air blow and then a level is placed inside the cone and packed the packages by poly bag. At last 30 packages are loaded in a big bag and lot no, count, order no, color, gross weight, net weight are written by a permanent marker pen above the bag. Finally the packages are ready for delivery.

3.6 Knitting section

3.6.1 Introduction

Knitting:

Knitting is a method by which thread or yarn may be turned into cloth or other fine crafts. Knitted fabric consists of consecutive rows of loops, called stitches. As each row progresses, a new loop is pulled through an existing loop. The active stitches are held on a needle until another loop can be passed through them. This process eventually results in a final product, often a garment.

Knitting can be divided into two classes. These are

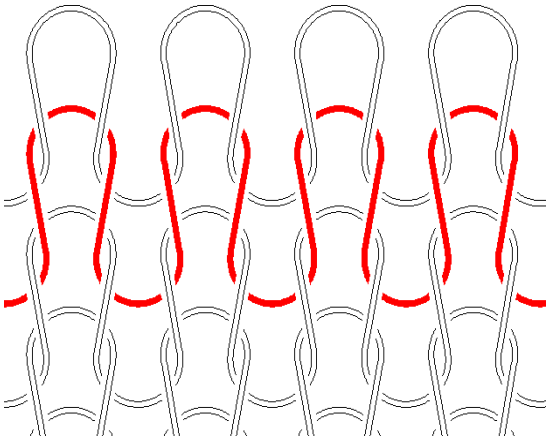
1. Circular Knitting
2. Flat Knitting

Circular knitting can be further classified into two ways. Most of the knitted fabric produces in this way.

The main forms of knitting are:

1. Weft Knitting
2. Warp Knitting

Weft Knitting: Weft knitting is a method of fabric forming in which the loops are made in horizontal way from a single yarns and intermeshing of loops takes place in a circular or flat form of across wise basis. In this method, feeding is one yarn at a time to a multiplicity of fashion. Most of the weft knitting is of tubular form. Weft knitting is a method of fabric forming in which the loops are made in horizontal way from a single yarns and intermeshing of loops takes place in a circular or flat form of across wise basis.



Firstly weft knitted fabric can be divided into two classes. These are

a. Single Jersey or Plain Jersey Fabric
b. Double Jersey

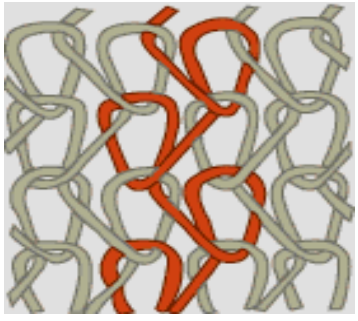
Double jersey fabric can be divided into two classes. These are

a. Rib Fabric
b. Interlock Fabric

There are lots of derivatives in single jersey fabric. Some important and popular derivative of single jersey fabric is given hereunder.

- Single Jersey 100%
- Single Lacouste
- Double Lacouste
- Double Pique/ Polo Pique
- Terry Fleece
- French Terry
- Fleece
- Thick Fleece
- Jersey Blister
- Popcorn, Etc

1. **Warp Knitting:** Warp knitting is a method of fabric forming in which the loops are made in a vertical way along the length of the fabric from each warp yarns and intermeshing of loops takes place in a flat form of lengthwise basis. Here, numerous ends of yarns are being fed simultaneously to individuals needles placed in a lateral fashion. Most of the knitted structure is flat or open width form.



Warp knit fabric

3.6.2 Organ gram

Senior knitting manager

⇩

Knitting manager

⇩

Marketing manager

⇩

Assistant marketing manager

⇩

Knitting master

⇩

Technician

⇩

Supervisor

⇩

Operator

3.6.3 Section layout

3.6.4 Machine specification

- **Single jersey**

Sl	Dia	Gauge	Attach	Brand	Origin	Set
1.	15”	24		FUKAHAMA	TAIWAN	1
2.	17”	24		FUKAHAMA	TAIWAN	1
3.	18”	24		PAILUNG	TAIWAN	1
4.	19”	24		PAILUNG	TAIWAN	1
5.	19”	24		FUKAHAMA	TAIWAN	1
6.	20”	24	LYCRA	PAILUNG	TAIWAN	3

7.	21”	24		PAILUNG	TAIWAN	2
8.	21”	24		FUKAHAMA	TAIWAN	1
9.	22”	24		FUKAHAMA	TAIWAN	1
10.	22”	24/28	LYCRA	PAILUNG	TAIWAN	1
11.	23”	24		FUKAHAMA	TAIWAN	1
12.	24”	24		FUKAHAMA	TAIWAN	1

- **Rib /interlock machine with lycra attachment**

SL	DIA	GAUGE	ATTCH	BRAND	ORIGIN	SET
1.	32”	18/24	LYCRA	PAILUNG	TAIWAN	1
2.	34”	18/24	LYCRA	PAILUNG	TAIWAN	1
3.	36”	18/24	LYCRA	PAILUNG	TAIWAN	1
4.	38”	18/24	LYCRA	PAILUNG	TAIWAN	2
5.	40”	18/24	LYCRA	PAILUNG	TAIWAN	1
6.	42”	18/24	LYCRA	PAILUNG	TAIWAN	1
7.	44”	18/24	LYCRA	FUKAHAMA	TAIWAN	1

- **Single jersey machine with lycra attachment**

SL	DIA	GAUGE	ATTCH	BRAND	ORIGIN	SET
1.	34”	24/28	LYCRA	PAILUNG	TAIWAN	1
2.	36”	24/28	LYCRA	PAILUNG	TAIWAN	1
3.	38”	24/28	LYCRA	PAILUNG	TAIWAN	1
4.	40”	24/28	LYCRA	PAILUNG	TAIWAN	1

4 types of circular knitting machines.

* Single jersey or sinker body machines.
* Double jersey or interlock machines.
* Rib machines.
* Flat bed knitting machine

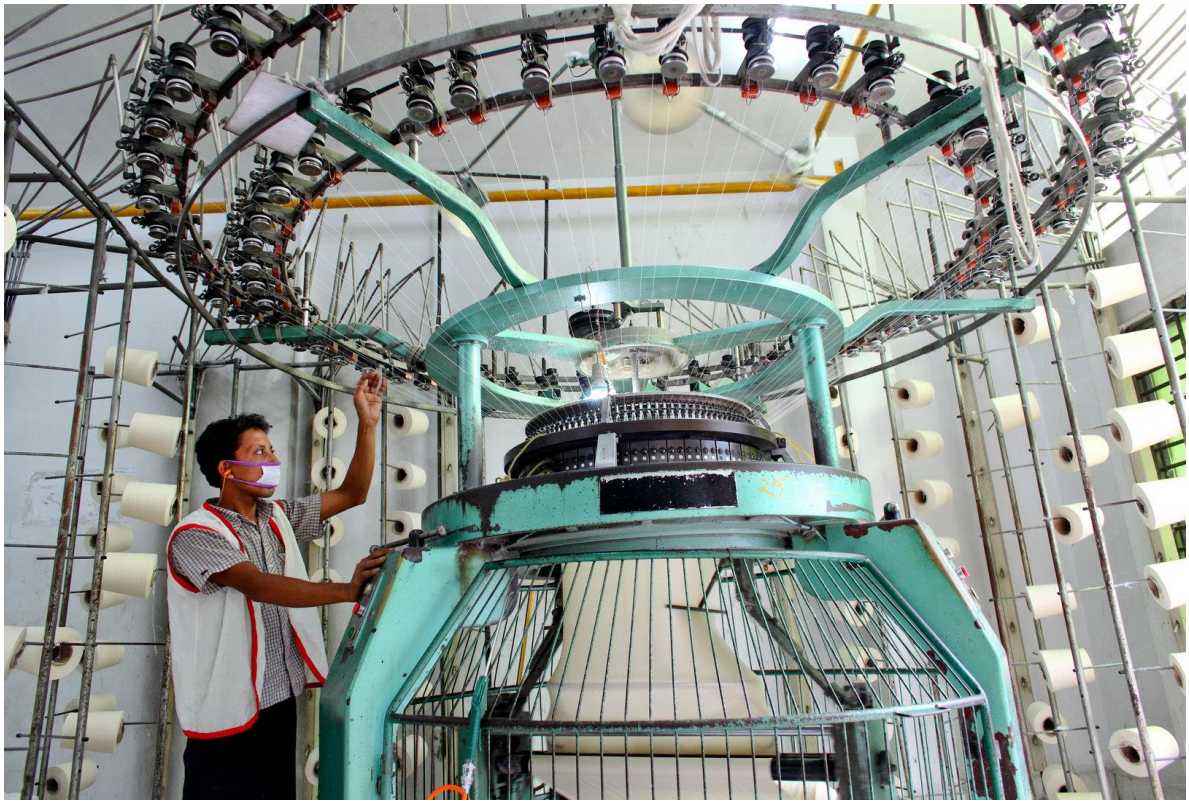


Figure 1: Single jersey knitting machine

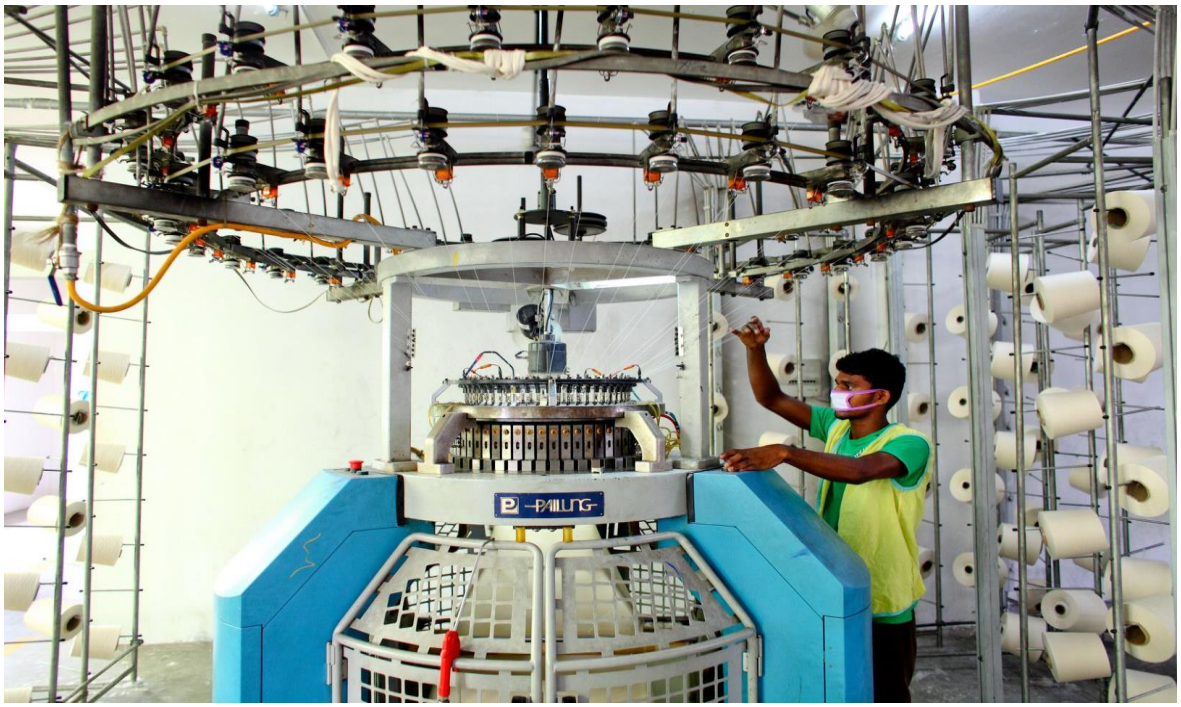


Figure 2: Double jersey knitting machine (rib)

Figure 3: Double jersey knitting machine (interlock)

❖ **Description of knitting machines**

- Creel
- Pipe

- ON/OFF Switch
- Power Switch
- VDQ Pulley
- Pulley belt
- Brush
- Knot Cather
- Tension Disk
- Inlet top motion
- Yarn guide
- MPF Wheel
- MPF
- Outlet stop motion
- Feeder ring
- Feeder
- Needle
- Sinker
- Automatic oiler
- Motor
- Machine motherboard
- Manual drive Cam
- Cam box
- Lycra attachment
- Lycra stop motion
- Cylinder/dial

Figure: creel

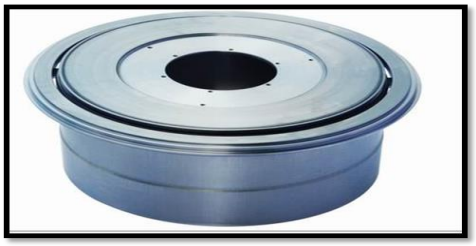


Fig. cylinder

Fig: needle

Fig: sinker

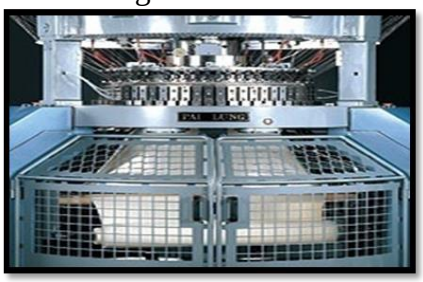


Fig: take up roller

Fig: adjustable fan

Fig: cam

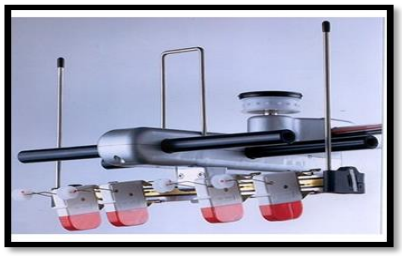


Fig: lycra feedingdevice

Fig: needle detector

⊙ Cam used for different types of fabric:

All designs are produced by using three types of cam

- Knit cam
- Miss cam
- Tuck cam

Fabric type/name	Cam used	Gauge used
Single jersey	Knit cam	24/28 gauge
1*1 rib	Knit cam	18 gauge
2*1 rib	No need of cam	
Pique	Knit + Tuck cam	
Lacouste	Knit + Tuck cam	
Interlock	Miss + Knit cam	
Fleece/ Felpa / French Terry	Knit + Tuck + Miss cam	

❖ **Types of yarn used**

- Cotton single & double ply.
- Polyester single & double ply.
- Viscose
- Nylon
- Mélange
- CVC & Pc
- Slub
- Neps
- Count (20/s,24/s,26/s,28/s,30/s,34/s,36/s,40/single,50double,20double)

❖ **Production calculation**

PRODUCTION CALCULATION:

A. Production/shift in kg at 100% efficiency

$$= \frac{RPM \times No.of\ Feeder \times No.of\ Needle \times SL(mm)}{3527.80 \times Yarn\ count}$$

B. Production/shift in meter

$$= \frac{Course/\min.}{Course/cm}$$

$$= \frac{RPM \times No.of\ Feeder \times 60 \times 12 \times Efficiency}{Course/cm \times 100}$$

C. Fabric width in meter:

$$= \frac{Total\ no.of\ wales}{Wales/cm \times 100}$$

$$= \frac{Total\ no.of\ Needles\ used\ inknitting}{Wales/cm \times 100}$$

3.6.5 Production parameters

- **Stitch length:**

Stitch length is theoretically a single length of yarn which includes one needle loop half the length of yarn (half of a sinker loop) between that needle loop and the adjacent needle loops on either side of it. Loop exists in coarse length and it is that which influence fabric dimensional and other properties including weight, to measure the stitch length they mark one end of fabric by pen and count 50 loops from the marking line and again marked by pen roughly. Then they open the yarn from fabric and measured the length by straighten the yarn in mm. then they use following equation

$$\text{Stitch length} = \frac{\text{Yarn length in mm (straight)}}{\text{No of loop counted (50)}}$$

Another formula can be used for measuring stitch length if KS value is known for different fabrics

$$\text{Stitch length} = \frac{\text{KS} * \text{Tex}}{\text{GSM}}$$

Where,

KS= constant

$$\text{Tex} = \frac{590.5}{\text{Ne}}$$

$$\text{KS} = \frac{\text{GSM} * \text{stitch length}}{\text{Tex}}$$

Where,

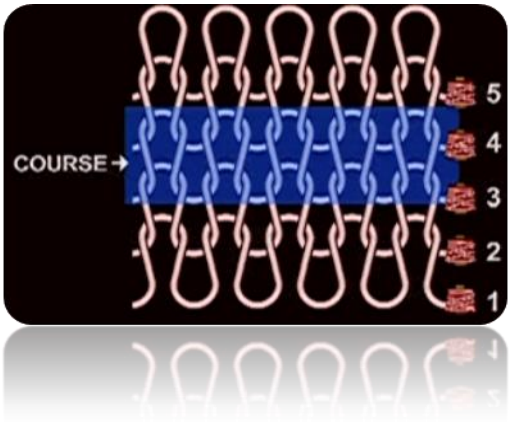
$$\text{Tex} = \frac{590.5}{\text{Ne}}$$

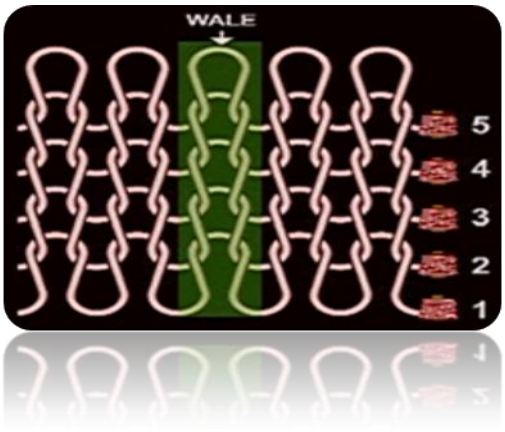
- **Ks value for different fabric:**

Type of fabric	*Finished KS value*	*Grey KS value*
Single jersey	**19.55**	**16.1**
Single lactose	**22.4**	**17.8**
Double Lacouste	**22.75**	**17.8**
Polo pique	**25**	**17.8**
Plain interlock	**39.3**	**27.1**
1*1 rib (light shade)	**24.5**	**18.1**
1*1 rib (dark shade)	**26.5**	**18.1**
2*1 rib	**28.3**	**18.1**
Flat back rib	**81**	-----
3 thread fleece	**40.92**	-----

- **Course and Wales**:

There are 2 things making the knit fabric. They are course and Wales. Wales is the vertical yarn. Course is the horizontal yarn





- **Needle gauge:**

The term refers to the number of Needles contained in one inch of the needle bed in knitting machine. A needle gauge makes it possible to determine the size of a knitting needle.

Total number of needles can be determined by the help of needle gauge. The formula is following.

Number of Needles = M/C Diameter * Needle Gauge * ∏ (3.1416)

- **Calculation for grey GSM**

Grey GSM = Finished GSM ÷ 1.245

- If buyer gives order to produce 180 GSM for deep color, then they reduce GSM 25-28 % from finished GSM. For example, in reactive dyeing the take up % of dye is 70%, after dyeing softener is also used, therefore the GSM of fabric will increase. Another factor is need to consider that after scouring the weight of fabric is decreased 4-8% and if enzyme wash is done then weight of fabric will also decreased.

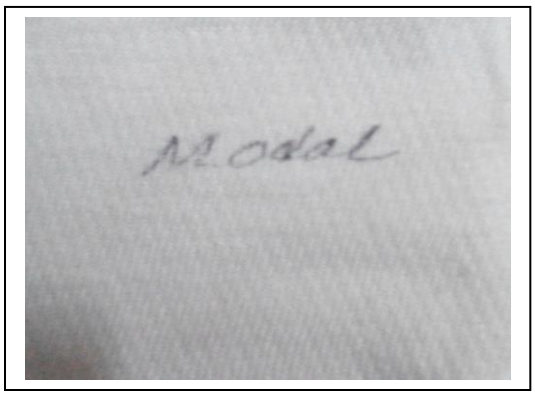
  For example for dyeing 5kg single jersey fabric (90 GSM) we need 300 gm dyestuff. If dye take up is 70% then 5kg fabric will absorb 210 gm & become 5kg 210gm after dyeing. After scouring, if the weight loss percentage is 4% then the weight of fabric after scouring will be 4kg 800 gm. Therefore I think there is no logic to decrease the finished GSM for light shade.

  If shade is darker more than 8%-12% then we can decrease the grey GSM.
- For white fabric they increase grey GSM 4-8% from finished GSM. Because after scouring, bleaching, & enzyme wash the weight of fabric will decrease.
- To increase the GSM of fabric during fabric construction the VDQ pulley has to move anticlockwise. As it moves anticlockwise the diameter of VDQ pulley increased and thus GSM increased.
- To decrease the GSM of fabric during fabric construction the VDQ pulley has to move clockwise. As it moves clockwise the diameter of VDQ pulley decreased and thus GSM decreased.

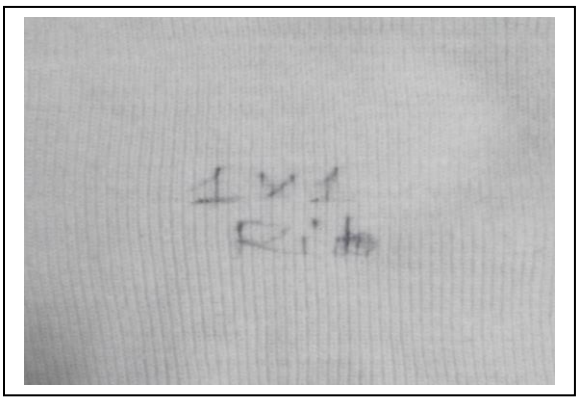
- **GSM cutter:**

It is circular of 100 cm^2 area with sharp blade attached to its edge. So 100 cm^2 of fabric can easily cut by it and weighted at the electric balance and multiply the result with 100 to get GSM reading in gm/m^2.

❖ End products



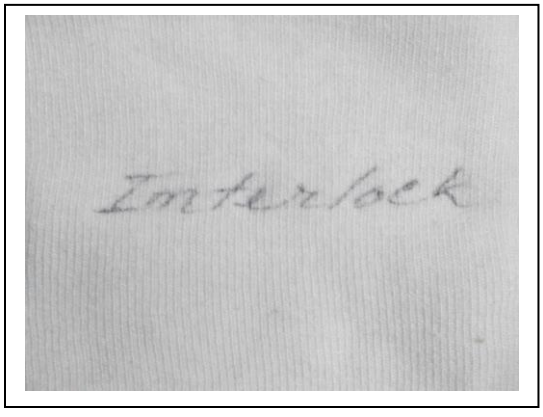
Modal



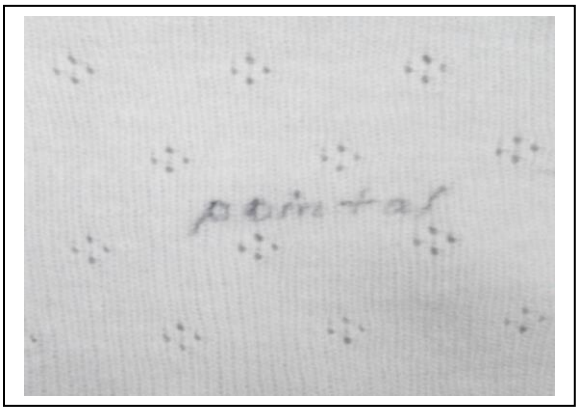
1×1 Rib

2×2 Rib

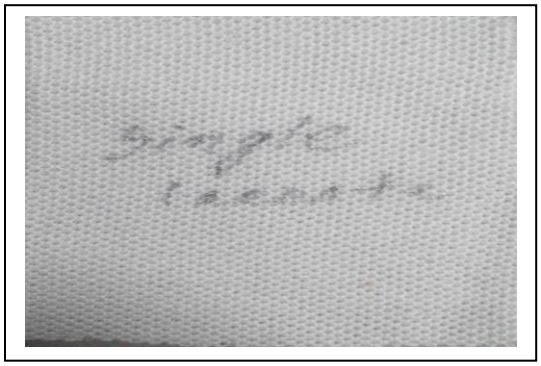
Fleece



Interlock

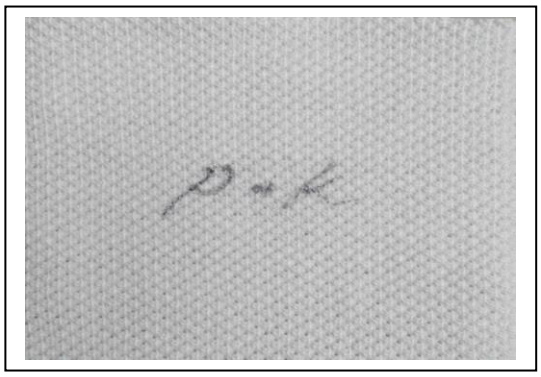


Pointal

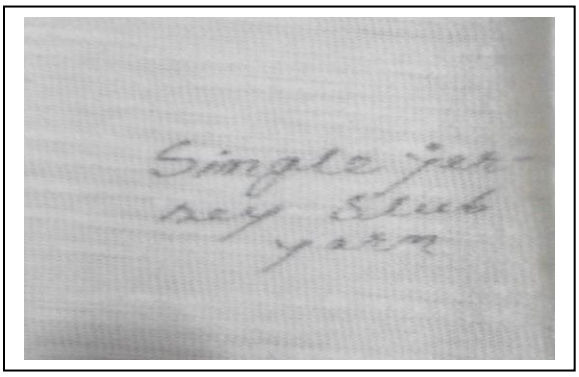


Single Lacouste

Double Lacouste



PK



Single jersey Slub yarn

❖ **Quality assurance system in knitting/weaving section**

➢ **Grey inspection:**

Inspection & grading of fabric quality is one of the important functions of quality control is the grey or finished state. The grading of fabric is difficult task, taking two primary considerations: as the frequency of effects & the seriousness of defects.

Grading has two primary functions: 1st to classify fabrics according to standard qualities based on the end use & customer demands & 2nd is to supply information as to the qualities actually being produced.

➢ **Inspection of Fabric by 4-point system:**

Inspection of Fabric is a procedure by which the defects of fabrics are identified & fabrics are classified according to degree or intensity of defects.

In Rahman knit garments Ltd. fabric inspection is done by 4-point inspection system. The details of it is given below--

Faults	Point
Band/ starting mark/shade bar	4-point
Lost end	4-point
Oil spots	Up to 5 mm dia = 1point Up to 10 mm dia = 2 point More than 10 mm dia = 4point
Slabs	1point
Embedded fly	4-point
Max. penalty point for any running yds(36" × fabric width)	4-point
All hole	1-4-point (according to fault size)
Faults in both warp & weft receive equal points	1-4-point(according to fault size)
Missing pick/double pick	Up to 0.05" = 1 point Over 0.50" = 2 point
Yarn contamination according to the size	1point
Knot	1point
Neps	Fabric dark crease may be rejected, Light crease may be considered
Crease mark	Up to 5 mm dia = 1point Up to 10 mm dia = 2 point More than 10 mm dia = 4point
Water drops	Up to 5 mm dia = 1point Up to 10 mm dia = 2 point More than 10 mm dia = 4point
Dye resist	Up to 5 mm dia = 1point Up to 10 mm dia = 2 point More than 10 mm dia = 4point
Dye stain	Up to 5 mm dia = 1point Up to 10 mm dia = 2 point More than 10 mm dia = 4point
Dirty mark	Up to 5 mm dia = 1point Up to 10 mm dia = 2 point More than 10 mm dia = 4point

Note for 4-point system:

1"-3" = 1 point
3"-6" = 2 point
6"-9" = 3 point
More than 9" = 4 point

$$\textbf{Points per 100 sq. yards} = \frac{\text{Total points} \times 100 \times 36}{\text{Total length in yards} \times \text{useable width in inch}}$$

❖ **Knitting/weaving cost for different fabrics**

Serial No	Fabric Types	Cost in Bangla Taka/ kg	
		24-32 count	20-22,34-40 count
01	Single jersey	15	17
02	Slub/ viscose single jersey	17	19
03	PK/ Lacouste	18	20
04	Double ply single jersey	25	27
05	Heavy jersey	20	22
06	Single jersey lycra 50%	20	22
07	Single jersey lycra 100%	26	28
08	PK/ Lacouste lycra	30	32
09	Double ply single jersey lycra 50%	30	32
10	Double ply single jersey lycra 100%	40	42
11	Fleece/terry fleece/ F-terry	20	22
12	Rib 1×1	18	20
13	Rib 1×1 Slub	22	24
14	Rib 2×1	25	27
15	Rib 2×2	28	30
16	Rib 1×1 lycra 50%	24	26
17	Rib 1×1 lycra 100%	28	30
18	Rib 2×1 lycra 50%, 100%	32	34
19	Rib 2×2 lycra 50%, 100%	37	39
20	Rib 1×1 double ply	30	32
21	Interlock	20	22
22	Interlock lycra	30	32
23	Plain collar & cuff one set	04	05
24	Tipping collar & cuff one set	06	07
25	Raising collar & cuff one set	05	06

1.7 Fabric Dyeing laboratory section

1.7.1 Introduction

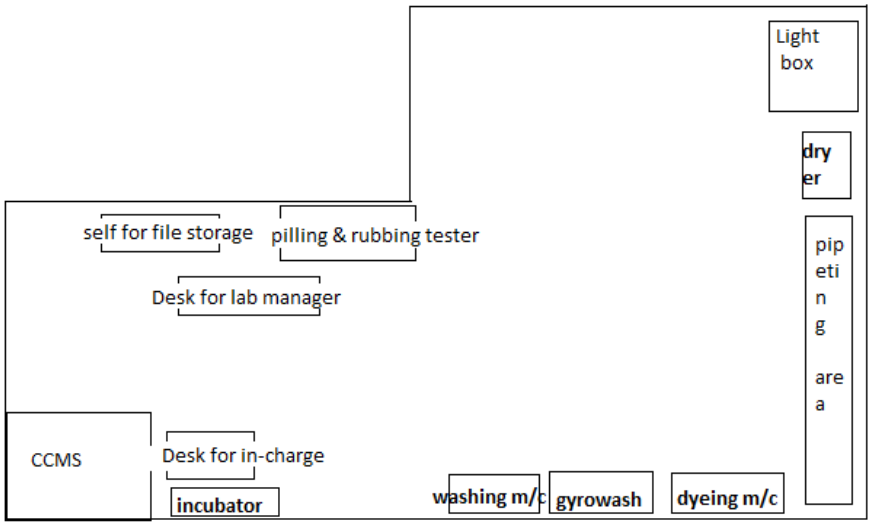
Before bulk production sample dyeing must need. Normally a textile dyeing mill get offer through merchandiser**.** Merchandising department of dyeing mill send the swatch to the central dyeing lab. Then dyeing lab manager dyed the sample by using 5 gm sample.

All operators, supervisor, & in-charge were very helpful to us. They shared their knowledge, experience & short cut formulas with us. They were very friendly and broad minded

1.7.2 Organ gram

Lab manager
⇩
Lab in charge
⇩
Lab assistant
⇩
Pipit man
⇩
Helper

1.7.3 Section layout



1.7.4 Machine specification:

1. Machine Name: **washing machine**

Origin : England

Model no : Wascator FOM71 CIS.

Producer : James H.Heal and co ltd.

RPM : 50-500

Function : Normal Washing

2. Machine Name: **Gyro wash**.

Origin : Halifax England.

Model no : 415/8 Gyro washes 220/240

Producer : James H.Heal and co ltd.

RPM : 45-60

Function : Color fastness to washing & also used for light shade dyeing.

3. Machine Name: **Crock master**

Origin : Halifax England

Model no : 570 Crock master

Producer : James H.Heal and co ltd.

Cycle time : 10 revelations in 10s

Function : Rubbing fastness tester.

4. Machine Name: **Lab dyeing machine**

Origin : Switzerland

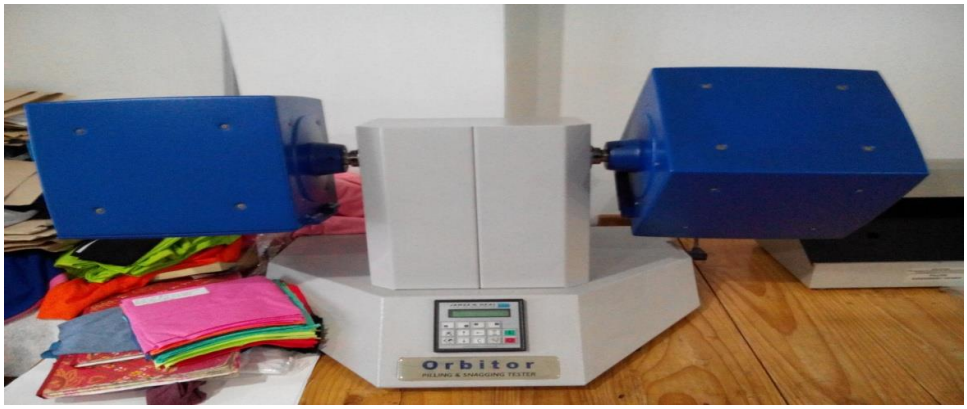
Model no : CH-8156 oberhasil

Producer : Mathis

RPM : 45

Function : Clock wise revaluation 50 s. Antic locks wise revaluation 50s.

5. Machine Name: **Pilling tester**



Origin : Halifax England

Model no : 516 orbitor

Producer : James H.Heal and co ltd

RPM : 60 rpm

Function : pilling tester.

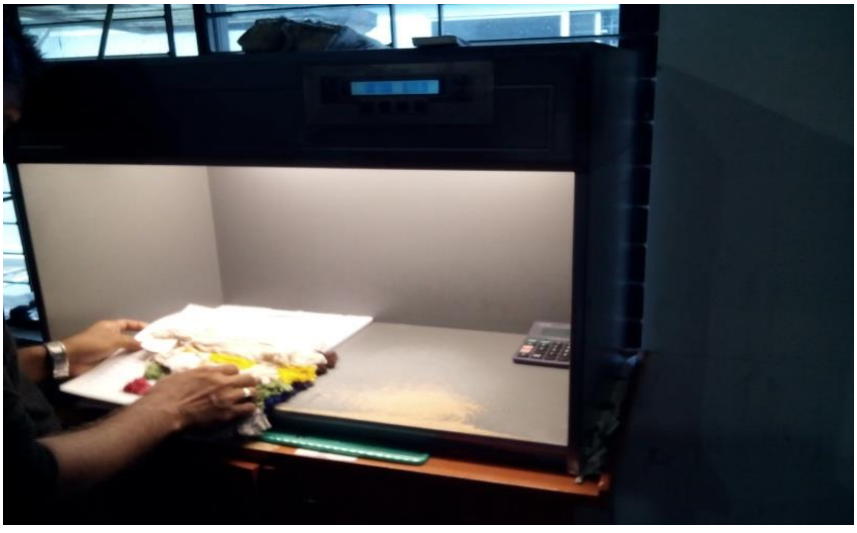
Revaluation required for test: 12000-18000

6. Machine Name: **Digital balance**

7. Machine Name: **Tumble Dryer**

8. Machine Name: **Incubator**

9. Machine Name: **Artificial light box**



10. Data color

1.7.5 Collection of lab dip samples with recipe

1.7.6 Chemical Tests

1. Color fastness to perspiration:

Perspiration solution preparation:

Chemicals	Solution alkali	Solution acid
L-histidine mono hydrochloride mono hydrate	0.5gm	0.5gm
Sodium chloride	5gm	5gm
Di-sodium hydrogen orthophosphate	2.5gm	2.2gm
Distilled water	1000ml	1000ml
pH	8	5.8

Procedure:

Sample cut (10×4) cm is taken

↓

Sample is placed & sewed between another 2 fabric

↓

One will be same fabric undyed & other will be a multifibre

↓

Solution are taken 50 times the sample for 30 min at room temperature

↓

Liquor is drained then sample is placed between glass plates

↓

4.5 kg pressure applied

↓

Keep pressure for 4 hours at temp $37^0c \pm 2^OC$ in incubator

↓

Sample takes out & washed with water and then unsowed

↓

Then compare with original sample by grey scale

2. Color Fastness to Washing:

The resistance to loss of color of any dyed material to washing is referred to as its wash fastness. If dye molecules have not penetrated in to the inter polymer chain space of fiber or have not attached to the fibers with strong attractive force, poor wash fastness results.

Method: ISO 105-C06

Required Apparatus:

- ✓ Multi-fiber fabrics.
- ✓ Grey scale.
- ✓ Washing machine.
- ✓ Dryer.
- ✓ Color matching cabinet.
- ✓ Sewing machine.
- ✓ Test sample

Recipe:

ECE Detergent : 4g/l

Anhydrous Na_2CO_3 : 1g/l

M: L : 1: 50

Time : 40 min

Temp : 60^0c

Procedure:

- ✓ Size of specimen: Cut sample & multifibre at (10 × 4) cm then sewed.
- ✓ Detergent: 4g/l ECE detergent (WOB) + 1g/l sodium per borate put in distilled water & cooled at 20°C & measured P^H (where necessary).
- ✓ Run the program in the following way: -

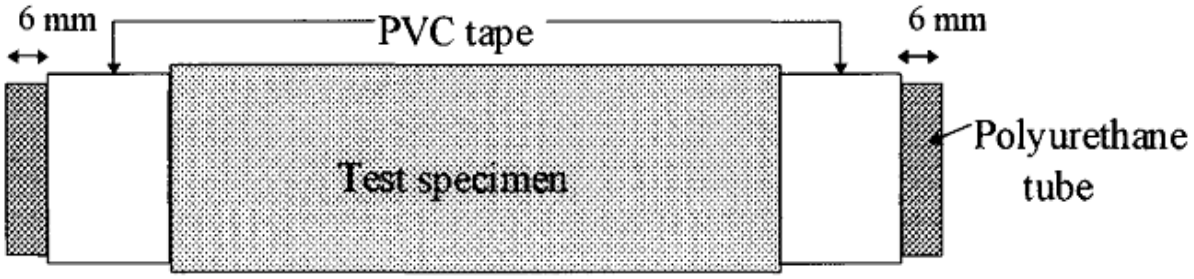
Test no	Temp °C	Liq volume (ml)	Time (min)	Steel balls	Adjust pH
A_2S	40°C	150	30	10	10.5±1

- ✓ Rinse the sample twice with cold water.
- ✓ Dry at 60°C by hanging or by flat iron pressing but temperature should not less more than 150°C.
- ✓ After that dyed sample are separate from the multifibre fabric by removing the stitch.
- ✓ Finally, Grey scale is used for grading.

3. Pilling Test

Sample preparation procedure:

1. For this test four specimens each 5 inch X 5 inch are cut from the fabric.
2. A seam allowance of 12mm is marked on the back of each square. In two of the samples the seam is marked parallel to the warp direction and in the other two parallel to the weft direction.
3. The samples are then folded face to face and a seam is sewn on the marked line.



7.4 The preparation of a pilling sample.

4. This gives two specimens with the seam parallel to the warp and two with the seam parallel to the weft.
5. Each specimen is turned inside out and 6mm cut off each end of it thus removing any sewing distortion.
6. The fabric tubes made are then mounted on rubber tubes so that the length of tube showing at each end is the same. Each of the loose ends is taped with poly (vinyl chloride) (PVC) tape so that 6mm of the rubber tube is left exposed as shown in Figure.
7. All four specimens are then placed in one pilling box.

8. The samples are then tumbled together in a cork-lined box as shown in Figure.
9. The usual number of revolutions used in the test is 18,000 which take 5 hrs.

Assessment

The specimens are removed from the tubes and viewed using oblique lighting. The samples are then given a rating of between 1 and 5 with the help of the descriptions in Table.

Rating	Description	Points to be taken into consideration
5	No change	No visual change
4	Slight change	Slight surface fuzzing
3	Moderate change	The specimen may exhibit one or both of the following: (a) moderate fuzzing (b) isolated fully formed pills
2	Significant change	Distinct fuzzing and/or pilling
1	Severe change	Dense fuzzing and/or pilling which covers the specimen.

3.7.7 Physical tests

4. Rubbing fastness:

Rubbing fastness is the resistance to fading of dyed textiles when rubbed against a rough surface. the fastness to crocking or rubbing is widely used on a variety of fabric to evaluate the transfer of surface dye from the test fabric when it is applied surface friction or rubbed against a rough surface, two types of rubbing test are done-

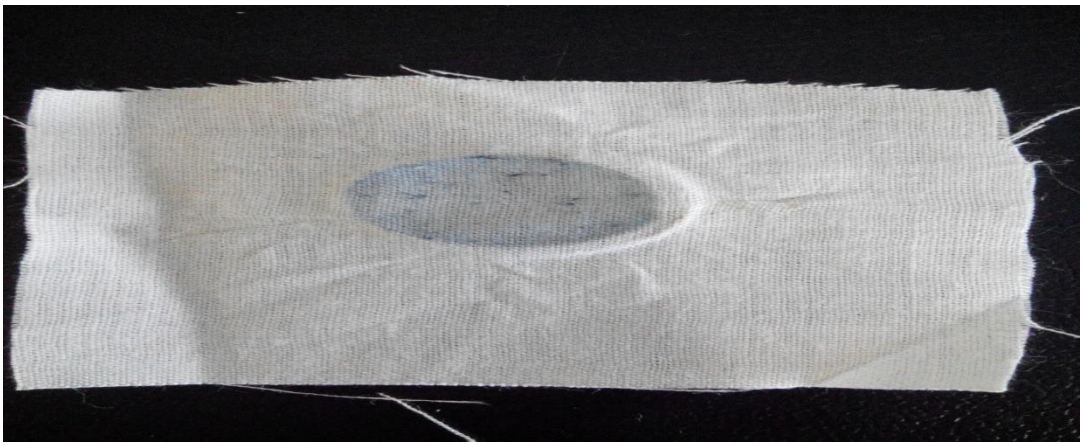
- ⊙ Dry
- ⊙ Wet

Apparatus:

- ⊙ Crock meter
- ⊙ Grey scale staining

Procedure:

- ✓ Test specimen 15cm x 5cm (may be more, it has no effect) is placed on the base of the Crock meter.
- ✓ A square of white test cloth (5cm x 5cm) which is of plain weave, desized, bleached but without finished cotton fabric (as ready to dye) is taken.
- ✓ White test cloth is attached to the finger of the crock meter.
- ✓ This finger is used in rubbing action on the sample specimen.
- ✓ Rubbing is done, to and fro 10 cycles at 10seconds, i.e.20 rubs in 10s and finger pressure on the specimen is 9N.
- ✓ For testing dry and wet rubbing, separate sample is used.
- ✓ Rubbing test is done both for warp way and weft way.
- ✓ For wet rubbing, sample is dry but white test cloth is wet. For wetting, M: L ratio is maintained not less than 1:50, water is drained after wetting and not squeezed.



5. Shrinkage test of fabric:

Preparation of the specimen:

- The general procedures for preparing and marking out of samples are given according to British Standard.
- For critical work the recommended sample size is 500 mm X 500 mm and for routine work a minimum sample size is of 300 mm X 300 mm.
- The samples are marked with three sets of marks in each direction, a minimum of 350 mm apart and at least 50 mm from all edges as shown in Figure. In the case of the smaller sample the marks are made 250 mm apart and at a distance of 25 mm from the edge.
- For critical work it is recommended that the samples are preconditioned at a temperature not greater than $5O^0C$ with a relative humidity of between 10% and 25%. All samples are then conditioned in the standard atmosphere.

Washing:

After measurement the samples are washed in the suitable washing solution in a washing machine for a specified time.

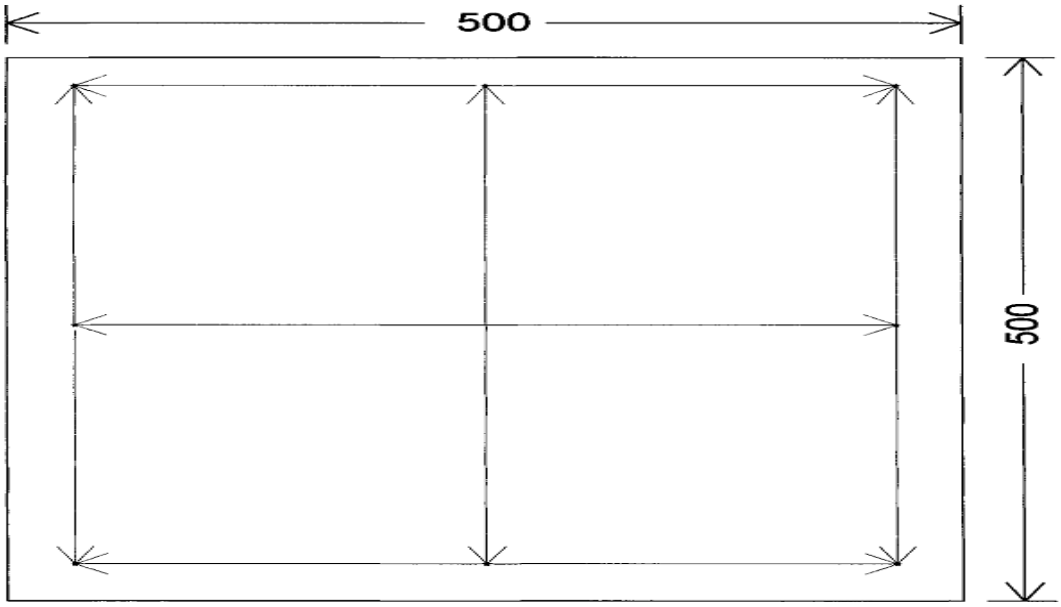
Drying:

After rinsing the surplus water is removed by centrifuge or by hand squeezing, rubber–cover roller wringer, or rolling in toweling. Then drying is completed by means of a flat handed press or a heated flat iron.

Conditioning and remeasuring:

After drying, the specimen is conditioned in a standard testing atmosphere and the distances between the markings remeasured. The percentage dimensional change calculated. The mean dimensional change and direction is reported:

$$\text{Shrinkage}=\frac{(original\ measurement - final\ measurement)}{original\ measurement} \times 100\%$$



3.10 Batching section

❖ **Introduction**

Batch preparation can be defined as a process where the visually Inspected gray fabric are divided into different batches. It is a part of dyeing process & it is done to feed the dyeing machines for fabric dyeing. It is very important to make a batch with maintaining a correct length of each nozzle.

The supervisor of batch section help us to consider the importance of batch section, he also helps to know the terms to be considered before batching. We have learned How to calculate batch for solid & assorted fabric, how to calculate the length of fabric which is batched, what will be the RPM of dyeing machine etc.

❖ **Batching criteria, distribution and management:**

⊙ **Batching criteria:**

1. Receive the grey fabric roll from knitting section or other source.
2. Turn the grey fabric if require.
3. Prepare the batch of fabric for dyeing according to the following criteria –

- Order sheet (Received from buyer).
- Dyeing shade (color or white, light or dark).

- Machine capacity.
- Machine available.
- Type of fabrics (100% cotton, PE, PC, CVC).
- Emergency.
- Send the grey fabric to the dyeing floor with batch card.
- Keep records for every previous dyeing.

⊙ **Distribution:**

In dyeing machines 1600 meters of fabric can be loaded in one nozzle through dyeing machines. Production is calculated by weight normally for fabric with higher GSM & large weight. Maximum load can be done while for fabric with less GSM & width .Minimum loading can be done considering the fabric quality.

➢ **Product Quality Check:**

Following measures are taken to check the quality of product-

1) Each nozzle is of equal weights
2) The number & weight of each nozzle & roll for a particular batch is accurate as mention on the job & batch card
3) Total weight of a single batch is not more than individual machine capacity
4) Number of batch for a particular order is kept as minimum as possible
5) Yarn lot no. are same for batch both body & rib
6) Batch no. is not repeated
7) Special instruction (if any) is followed

❖ **Batch calculation:**

Batch (solid) = $\frac{\text{Required quantity of fabric to be dyed}}{\text{Total quantity of fabric to be dyed}}$ × machine capacity (which machine u want to use) Kg

Batch (assorted) = $\frac{\text{Required quantity of fabric to be dyed (Rib, interlock, collar, cuff Etc individual quantity)}}{\text{Total quantity of fabric to be dyed (Rib+interlock+collar+cuff etc total amount)}}$ kg

Fabric per nozzle = $\frac{\text{Batch quantity (solid or assorted that is calculated by above equation)}}{\text{No of nozzle in specific machine}}$ kg

The length of fabric that is batched by above calculation can be determined by following equation,

Fabric/rope length = $\frac{\text{Total fabric weight} \times 100 \times 1000}{\text{Dia of fabric} \times 2 \times 2.54 \times \text{GSM}}$ meter/nozzle

(average dia & GSM for assorted batch)

If you once able to find the length of fabric, you can easily calculate the RPM of winch machine, that is to be set for above length of fabric to avoid uneven color or dye take up, the equation is as follow

Reel RPM = $\frac{\text{Rope length per nozzle}}{\text{Standard cycle time (2.5)}}$

- Cycle time means, the time required for the length of fabric (the length of fabric that is given to reel)
- To complete one revolution. For winch dyeing machine standard cycle time is 2.5. To check either winch runs properly or not following equation is used

Cycle time = $\frac{\text{Weight of fabric feed in the machine} * 65.63}{\text{Fabric dia (average for assorted batch)} * \text{no of nozzle in m/c} * \text{GSM (average for assorted batch)}}$

⊙**Batch management**

- ⊙ Check production plan to set the priority
- ⊙ Select 7-8 batches/shift to prepare
- ⊙ Consult with previous shift stuff to get the required information about the batches
- ⊙ Check batch card & job card specification(e.g.-Yarn type,quality,weight etc) for fabric & collars/cuffs respectively
- ⊙ Calculate number of batches, nozzles & rolls to be prepared for each order & specify on the batch & job card. One should be very careful while calculating & entering such data on these cards.
- ⊙ Feed the fabric into the turning m/cs
- ⊙ Start batching operation & check the following information-
  - Machine no
  - Number of nozzle to be prepared.
  - Order no.
  - Customer number.
  - GSM.
  - Width.
  - Lot no.
  - Turning required or not.
  - Special instruction (if any).

⊙ Prepare the body fabric of specified weight. This weight must be accurate & each nozzle of same batch must weight equal to ensure even dyeing.

⊙ Calculate the number of collar/cuffs & attach the collars& cuffs with the body fabric.

⊙ Write down the weight of each roll on the back of batch card.

⊙ Check hole mark in each roll for identification.

⊙ Turn the roll (if required).

⊙ Calculate the total weight very carefully & write it down in the specific area of the batch card.

⊙ After completing of one batch, write "OK" as comments at the notes section of batch card & send the batch along with the card to the dyeing section.

❖ **Machines used in batching**

- Air turning m/c
- Over lock sewing machine

3.9 Dyeing section

1.9.1 Introduction

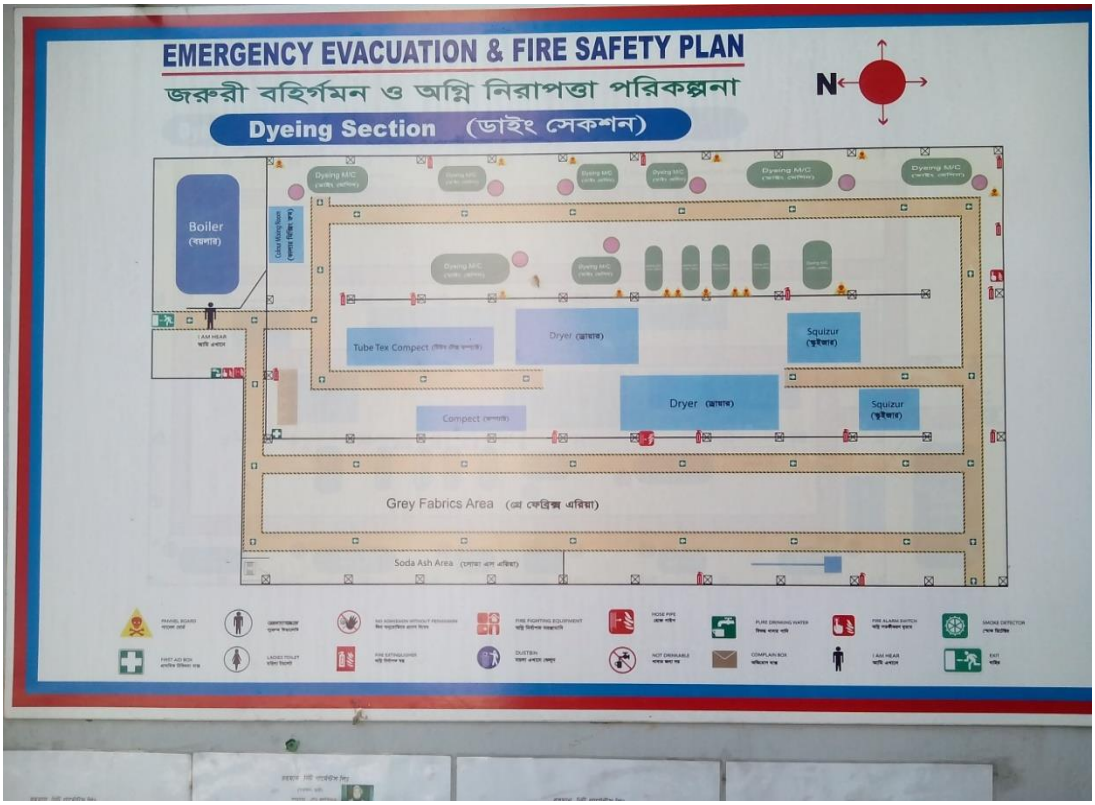
Knit dyeing floor is one of the most valuable parts of Rahman Knit Garments Ltd. They produce almost 10 tons of dyed & finished fabric. They have one latest SCLAVOS ATHENA TM machine with a capacity of 750 kg. They have some old version sample dyeing machine.

The floor is continuously guided by Nahid sir (GM of knit dyeing division) & Zulfiqar sir (Assistant Manager of knit dyeing division). All operators, supervisors help us a lot especially Zulfiqar sir helps us a lot to learn the things practically & accurately. His contribution is really remarkable for us. Thank u so much sir.

1.9.2 Organ gram

GM
↓
AGM
↓
ADM
↓
P.O
↓
Supervisor
↓
Asst. Supervisor
↓
Sr. Operator
↓
Operator
↓
Asst. Operator
↓
Assistant

1.9.3 Section layout



1.9.4 Machine specification

SL#	Name Of Machinery	Qty	Capacity/Machine
01.	ATYC (High Temperature)	01	600 Kg
02.	SCLAVOS ATHENA TM	01	750 Kg
03.	AK Dyeing Machine	02	800 Kg
04.	AK Dyeing Machine	01	600 Kg
05.	AK Dyeing Machine	03	400 Kg
06.	AK Dyeing Machine	01	200 Kg
07.	AK Dyeing Machine (High Temp)	01	50 Kg
08.	AK Dyeing Machine (High Temp)	01	25 Kg
09.	PMM Dyeing Machine	01	100 Kg
10.	PMM Dyeing Machine	01	25 Kg
12.	SANTEX Squeezer	01	10000 Kg
13.	SANTEX Dryer	01	8000 Kg
14.	Carino Squeezer	01	10000 Kg
15.	ENTEMA Dryer	01	10000 Kg
16.	TUBE TEX Compactor	02	6000 Kg
17.	DONGNUM Steam Setting	01	5000 Kg
18.	DONGNUM Air Turning	01	10000 Kg
19.	BIB COCHRAN Boiler	01	10000 Kg
20.	SCREW Type Compressor	02	Sufficient

1.9.5 Recipes & Dyeing process flowchart

1. Recipe for cotton light shade:

	Scouring & bleaching M:L Ratio 1:6						
S.L no	**Chemicals name**	**Function of chemicals**	**G/L & Shade %**	**Mixing time & temperature**	**Dozing**	**Run temp**	**Run time**
01	Marla wt	Detergent	0.3 G/L	60°C×5 min	Injection Dozing	98°C	60 minute
02	AFK	Sequesterin g agent	0.5 G/L	60°C×5 min			
03	Tex lube	Anti creasing	2.0 G/L	60°C×5 min			
04	Caustic	Alkali	1.5 G/L	60°C×5 min			
05	Stab SW	Peroxide stabilizer	0.2 G/L	60°C×5 min			
06	H_2O_2	Bleaching agent	1.8 G/L	60°C×5 min			
Sample check, if ok then bath drain &							

Rinsing with cold water until clear water appears (5min or more is usual)							
Peroxide killing or Neutralization process of H_2O_2 M:L Ratio 1:6							
07	Na thio sulphate (Na_2SiO_3)	Peroxide killer	0.1 G/L	60°C×5 min	Injection Dozing	80°C	20 minute
Rinsing with cold water until clear water appears (5min or more is usual)							
Alkali condition neutralization process M:L Ratio 1:6							
08	Acetic acid	Neutralization	0.5 G/L	40°C×5 min	Injection Dozing	55°C-60°C	15-20minute
Rinsing with cold water until clear water appears (5min or more is usual)							
Enzyme wash M:L Ratio 1:6							
09	Acetic acid	Maintain pH 4.5-5	0.7 G/L	40°C×5 min	Injection Dozing	55° C	5-10 minute
10	MC-500	Enzyme	0.25G/L				
Sample check, if ok then increase temperature to 80°C & hot wash to kill the enzyme at 80°C for 5 minute							
Dyeing M:L Ratio 1:6							
11	DLRD	Color leveling agent	0.5 G/L	60°C×5 min	Injection Dozing	60 °C	15minute
12	AFK	Sequestering agent	0.5 G/L	60°C×5 min			
13	Tex lube	Ant creasing agent	2.0 G/L	60°C×5 min			
14	Glouber Salt	Act as an electrolyte	63 G/L	40°C×5 min	Linear dozing	60 °C	20minute
15	F/Z Orange D2R	Dyes	0.18%	60°C×10 min	Linear dozing 60°C×10 min	60 °C	20minute
	F/Z Red UCX		0.20%				
	F/Z Blue EBL		0.00194%				
16	Soda Ash	Dye fixation	4.0 G/L	60°C×10 min	Progressive dozing 60°C×45 min	60 °C	30 min
Sample check & if ok then bath drain & Rinsing with cold water until clear water appears (5min or more is usual)							
After treatment & Softening M:L Ratio 1:6							
17	Acetic acid	Alkali condition neutralization	0.7 G/L	40°C×5 min	Injection Dozing	55°C-60°C	05-10 minute
Rinsing with cold water (5min or more is usual)							

18	Innocol RD	Soaping agent	0.4 G/L	60°C×5 min	Injection Dozing	95°C	20 min
Sample check & if ok then bath drain & Rinsing with cold water until clear water appears (5min or more is usual)							
19	Acetic acid	To control pH	0.2 G/L	45°C×5 min			
	Check pH 4.5-5.5 if varies then the amount of acetic acid is increased or decreased to control pH						
	Hydrocol SUN	Unfixed dye Fixing agent	0.25 G/L	45°C×5 min	Injection Dozing	45°C	20 min
Sample check & if ok then bath drain & Rinsing with cold water until clear water appears (5min or more is usual)							
20	Acetic acid	To control pH	0.07	45°C×5 min			
	Check pH 4.5-5.5 if varies then the amount of acetic acid is increased or decreased to control pH						
	AD	Softener	0.07	45°C×5 min	Injection Dozing	45°C	45° C
Sample check & if ok then bath drain & Rinsing with cold water until clear water appears (5min or more is usual)							

Process Flow Chart & recipe for Cotton knit Dyeing (Light Shade):

Fabric Loading
↓
Water fill
↓
Rinsing
↓
Drain out
↓
Water fill
↓
Detergent, Sequestering, Anti creasing, Stabilizer
(Dozing 60^0C, 10min, Runtime 5min)
↓
Caustic
(Dozing 70^0C, 10min, Runtime 5min)
↓
H_2O_2
(Dozing70^0C, 15min, Runtime 5min)
↓
Temp increase at 98^0C & continues for 60min
↓
Sample check
↓
Bath drain

↓

Water fill &Normal wash
(40^0C, 20min)

↓

Peroxide killer
(90^0C, 10min)

↓

Acetic wash (p^H7-8)
Runtime (50^0C, 15min)

↓

Enzyme was added& run for 60min at 55^0C

↓

Shade check

↓

Hot wash (80^0C, 5min)

↓

HTS (Dozing 60^0C, 5min, Runtime 60^0C, 5min)

↓

DLRD, AFK, Textube
(Dozing 60^0C, 5min, Runtime 60^0C, 5min)

↓

Dyes (Dozing 60^0C, 30min, Runtime 60^0C, 20min)

↓

Salt (Dozing 60^0C, 30min)

↓

Temp increase & run for 80^0C, 20min

↓

Soda dozing (60^0C, 50min)
Runtime (60^0C, 20min)

↓

Acetic wash (40^0C, 15min)

↓

Shade check (if ok)

↓

RD wash (98^0C, 5min)

↓

Fixing agent
(40^0C, 5min)

↓

Apply Softener
(45, 5min-Dozing, Run 45^0,10min)

↓

Fabric Unload

2. Recipe to produce cotton dark shade:

	Scouring & bleaching M:L Ratio 1:6						
S.L no	**Chemicals name**	**Function of chemicals**	**G/L & Shade %**	**Mixing time & temperature**	**Dozing**	**Run temperature**	**Run time**
01	Marla wt	Detergent	0.3 G/L	60°C×5 min	Injection Dozing	98°C	60 minute
02	AFK	Sequestering agent	0.5 G/L	60°C×5 min			
03	Tex lube	Anti creasing	2.0 G/L	60°C×5 min			
04	Caustic	Alkali	1.5 G/L	60°C×5 min			
05	Stab SW	Peroxide stabilizer	0.2 G/L	60°C×5 min			
06	H_2O_2	Bleaching agent	1.8 G/L	60°C×5 min			
Sample check, if ok then bath drain & Rinsing with cold water until clear water appears (5min or more is usual)							
Peroxide killing or Neutralization process of H_2O_2 M:L Ratio 1:6							
07	Na thiosulphate (Na_2SiO_3)	Peroxide killer	0.1 G/L	60°C×5 min	Injection Dozing	80°C	20 minute
Rinsing with cold water until clear water appears (5min or more is usual)							
Alkali condition neutralization process M:L Ratio 1:6							
08	Acetic acid	Neutralization	0.5 G/L	40°C×5 min	Injection Dozing	55°C - 60°C	15-20minute
Rinsing with cold water until clear water appears (5min or more is usual)							
Enzyme wash M:L Ratio 1:6							
09	Acetic acid	Maintain pH 4.5-5	0.7 G/L	40°C×5 min	Injection Dozing	55°C	5-10 minute
10	MC-500	Enzyme	0.25G/L				
Sample check, if ok then increase temperature to 80°C & hot wash to kill the enzyme at 80°C for 5 minute							
Dyeing M:L Ratio 1:6							
11	DLRD	Color leveling agent	0.5 G/L	60°C×5 min	Injection	60°C	15m
12	AFK	Sequestering	0.5 G/L	60°C×5 min			

		agent			Dozing		inute
13	Tex lube	Anti creasing agent	2.0 G/L	60°C×5 min			
14	Glouber Salt	Act as an electrolyte	63 G/L	40°C×5 min	Linear dozing	60°C	20minute
15	F/Z Orange D2R	Dyes	1.40%	60°C×10 min	Linear dozing 60°C×10 min	60°C	20minute
	F/Z Red UCX		3.40%				
	F/Z Blue EBL		0.00194 %				
16	Soda Ash	Dye fixation	4.0 G/L	60°C×10 min	Progressive dozing 60°C×45 min	60°C	30 min
Sample check & if ok then bath drain & Rinsing with cold water until clear water appears (5min or more is usual)							
After treatment & Softening M:L Ratio 1:6							
17	Acetic acid	Alkali condition neutralization	0.7 G/L	40°C×5 min	Injection Dozing	55°C - 60°C	05-10minute
Rinsing with cold water (5min or more is usual)							
18	Innocol RD	Soaping agent	0.4 G/L	60°C×5 min	Injection Dozing	95°C	20 min
Sample check & if ok then bath drain & Rinsing with cold water until clear water appears (5min or more is usual)							
19	Acetic acid	To control pH	0.2 G/L	45°C×5 min			
	Check pH 4.5-5.5 if varies then the amount of acetic acid is increased or decreased to control pH						
	Hydrocol SUN	Unfixed dye Fixing agent	0.25 G/L	45°C×5 min	Injection Dozing	45°C	20 min
Sample check & if ok then bath drain & Rinsing with cold water until clear water appears (5min or more is usual)							
20	Acetic acid	To control pH	0.07	45°C×5 min			
Check pH 4.5-5.5 if varies then the amount of acetic acid is increased or decreased to control pH							

	AD	Softener	0.07	45°C×5 min	Injection Dozing	45°C	45° C
Sample check & if ok then bath drain & Rinsing with cold water until clear water appears (5min or more is usual)							

Process Flow Chart for Cotton knit Dyeing (Dark Shade):

Fabric Loading
↓
Water fill
↓
Rinsing
↓
Drain out
↓
Water fill
↓
Detergent, Sequestering, Anti creasing, Stabilizer
(Dozing 60^0C, 10min, Runtime 5min)
↓
Caustic
(Dozing 70^0C, 10min, Runtime 5min)
↓
H_2O_2
(Dozing70^0C, 15min, Runtime 5min)
↓
Temp increase at 98^0C & continues for 60min
↓
Sample check
↓
Bath drain
↓
Water fill &Normal wash
(40^0C, 20min)
↓
Peroxide killer
(90^0C, 10min)
↓
Acetic wash (p^H7-8)
Runtime (50^0C, 15min)
↓
Enzyme was added& run for 60min at 55^0C
↓
Shade check
↓
Hot wash (80^0C, 5min)
↓

HTS (Dozing 60^0C, 5min, Runtime 60^0C, 5min)
↓
DLRD, AFK, Textube
(Dozing 60^0C, 5min, Runtime 60^0C, 5min)
↓
Dyes (Dozing 60^0C, 30min, Runtime 60^0C, 20min)
↓
Salt (Dozing 60^0C, 30min)
↓
Temp increase & run for 80^0C, 20min
↓
Soda dozing (60^0C, 50min)
Runtime (60^0C, 20min)
↓
Acetic wash (40^0C, 15min)
↓
Shade check (if ok)
↓
RD wash (98^0C, 5min)
↓
Fixing agent
(40^0C, 5min)
↓
Apply Softener
(45, 5min-Dozing, Run 45^0,10min)
↓
Fabric Unload

3. Recipe to produce cotton black shade:

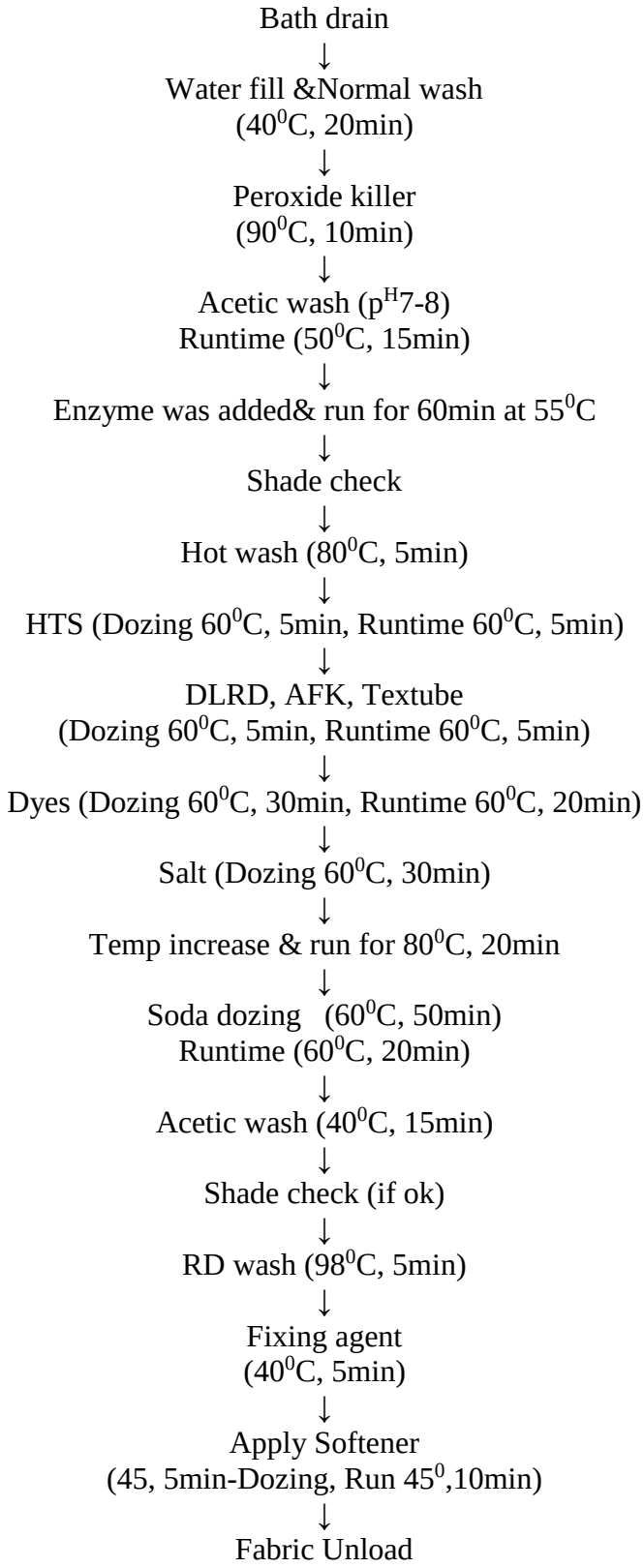
	Scouring & bleaching M:L Ratio 1:6						
S. L no	**Chemicals name**	**Function of chemicals**	**G/L & Shade %**	**Mixing time & temperature**	**Dozing**	**Run temperature**	**Run time**
01	Marla wt	Detergent	0.3 G/L	60°C×5 min	Injection Dozing	98°C	60 minute
02	AFK	Sequestering agent	0.5 G/L	60°C×5 min			
03	Tex lube	Anti creasing	2.0 G/L	60°C×5 min			
04	Caustic	Alkali	1.5 G/L	60°C×5 min			
05	Stab SW	Peroxide stabilizer	0.2 G/L	60°C×5 min			
06	H_2O_2	Bleaching agent	1.8 G/L	60°C×5 min			
Sample check, if ok then bath drain & Rinsing with cold water until clear water appears (5min or more is usual)							

Peroxide killing or Neutralization process of H_2O_2 M:L Ratio 1:6							
07	Na thiosulphate (Na_2SiO_3)	Peroxide killer	0.1 G/L	60°C×5 min	Injection Dozing	80°C	20 minute
Rinsing with cold water until clear water appears (5min or more is usual)							
Alkali condition neutralization process M:L Ratio 1:6							
08	Acetic acid	Neutralization	0.5 G/L	40°C×5 min	Injection Dozing	55°C - 60°C	15-20minute
Rinsing with cold water until clear water appears (5min or more is usual)							
Enzyme wash M:L Ratio 1:6							
09	Acetic acid	Maintain pH 4.5-5	0.7 G/L	40°C×5 min	Injection Dozing	55°C	5-10 minute
10	MC-500	Enzyme	0.25G/L				
Sample check, if ok then increase temperature to 80°C & hot wash to kill the enzyme at 80°C for 5 minute							
Dyeing M:L Ratio 1:6							
11	DLRD	Color leveling agent	0.5 G/L	60°C×5 min	Injection Dozing	60°C	15minute
12	AFK	Sequestering agent	0.5 G/L	60°C×5 min			
13	Tex lube	Anti creasing agent	2.0 G/L	60°C×5 min			
14	Glouber Salt	Act as an electrolyte	63 G/L	40°C×5 min	Linear dozing	60°C	20minute
15	F/Z Yellow UCF	Dyes	.30%	60°C×10 min	Linear dozing 60°C×10 min	60°C	20minute
	F/Z Blue UCX		.80%				
	F/Z Black CSG		7.60%				
16	Soda Ash	Dye fixation	4.0 G/L	60°C×10 min	Progressive dozing 60°C×45 min	60°C	30 min
Sample check & if ok then bath drain & Rinsing with cold water until clear water appears (5min or more is usual)							
After treatment & Softening M:L Ratio 1:6							
17	Acetic acid	Alkali condition neutralization	0.7 G/L	40°C×5 min	Injection Dozing	55°C-60°C	05-10minute

Rinsing with cold water (5min or more is usual)							
18	Innocol RD	Soaping agent	0.4 G/L	60°C×5 min	Injection Dozing	95°C	20 min
Sample check & if ok then bath drain & Rinsing with cold water until clear water appears (5min or more is usual)							
19	Acetic acid	To control pH	0.2 G/L	45°C×5 min			
	Check pH 4.5-5.5 if varies then the amount of acetic acid is increased or decreased to control pH						
	Hydrocol SUN	Unfixed dye Fixing agent	0.25 G/L	45°C×5 min	Injection Dozing	45°C	20 min
Sample check & if ok then bath drain & Rinsing with cold water until clear water appears (5min or more is usual)							
20	Acetic acid	To control pH	0.07	45°C×5 min			
	Check pH 4.5-5.5 if varies then the amount of acetic acid is increased or decreased to control pH						
	AD	Softener	0.07	45°C×5 min	Injection Dozing	45°C	45°C
Sample check & if ok then bath drain & Rinsing with cold water until clear water appears (5min or more is usual)							

Process Flow Chart for Cotton knit Dyeing (Black Shade):

Fabric Loading
↓
Water fill
↓
Rinsing
↓
Drain out
↓
Water fill
↓
Detergent, Sequestering, Anti creasing, Stabilizer
(Dozing 60^0C, 10min, Runtime 5min)
↓
Caustic
(Dozing 70^0C, 10min, Runtime 5min)
↓
H_2O_2
(Dozing70^0C, 15min, Runtime 5min)
↓
Temp increase at 98^0C & continues for 60min
↓
Sample check
↓



4. Recipe to produce cotton (Turquoise color):

	Scouring & bleaching M:L Ratio 1:6						
S. L no	**Chemicals name**	**Function of chemicals**	**G/L & Shade %**	**Mixing time & temperature**	**Dozing**	**Run temperature**	**Run time**
01	Marla wt	Detergent	0.3 G/L	60°C×5 min	Injection Dozing	98°C	60 minute
02	AFK	Sequestering agent	0.5 G/L	60°C×5 min			
03	Tex lube	Anti creasing	2.0 G/L	60°C×5 min			
04	Caustic	Alkali	1.5 G/L	60°C×5 min			
05	Stab SW	Peroxide stabilizer	0.2 G/L	60°C×5 min			
06	H_2O_2	Bleaching agent	1.8 G/L	60°C×5 min			
Sample check, if ok then bath drain & Rinsing with cold water until clear water appears (5min or more is usual)							
Peroxide killing or Neutralization process of H_2O_2 M:L Ratio 1:6							
07	Na thiosulphate (Na_2SiO_3)	Peroxide killer	0.1 G/L	60°C×5 min	Injection Dozing	80°C	20 minute
Rinsing with cold water until clear water appears (5min or more is usual)							
Alkali condition neutralization process M:L Ratio 1:6							
08	Acetic acid	Neutralization	0.5 G/L	40°C×5 min	Injection Dozing	55°C - 60°C	15-20minute
Rinsing with cold water until clear water appears (5min or more is usual)							
Enzyme wash M:L Ratio 1:6							
09	Acetic acid	Maintain pH 4.5-5	0.7 G/L	40°C×5 min	Injection Dozing	55°C	5-10 minute
10	MC-500	Enzyme	0.25G/L				
Sample check, if ok then increase temperature to 80°C & hot wash to kill the enzyme at 80°C for 5 minute							
Dyeing M:L Ratio 1:6							
11	DLRD	Color leveling agent	0.5 G/L	60°C×5 min	Injection Dozing	60°C	15minute
12	AFK	Sequestering agent	0.5 G/L	60°C×5 min			
13	Tex lube	Anti creasing agent	2.0 G/L	60°C×5 min			

14	Glouber Salt	Act as an electrolyte	63 G/L	40°C×5 min	Linear dozing	60°C	20minute
15	F/Z Blue RSPL	Dyes	.90%	60°C×10 min	Linear dozing 60°C×10 min	60°C	20minute
	F/Z Red UCF		.20%				
	F/Z T. Blue		1.94%				
16	Soda Ash	Dye fixation	4.0 G/L	60°C×10 min	Progressive dozing 60°C×45 min	60°C	30 min
Sample check & if ok then bath drain & Rinsing with cold water until clear water appears (5min or more is usual)							
After treatment & Softening M:L Ratio 1:6							
17	Acetic acid	Alkali condition neutralization	0.7 G/L	40°C×5 min	Injection Dozing	55°C - 60°C	05-10minute
Rinsing with cold water (5min or more is usual)							
18	Innocol RD	Soaping agent	0.4 G/L	60°C×5 min	Injection Dozing	95°C	20 min
Sample check & if ok then bath drain & Rinsing with cold water until clear water appears (5min or more is usual)							
19	Acetic acid	To control pH	0.2 G/L	45°C×5 min			
	Check pH 4.5-5.5 if varies then the amount of acetic acid is increased or decreased to control pH						
	Hydrocol SUN	Unfixed dye Fixing agent	0.25 G/L	45°C×5 min	Injection Dozing	45°C	20 min
Sample check & if ok then bath drain & Rinsing with cold water until clear water appears (5min or more is usual)							
20	Acetic acid	To control pH	0.07	45°C×5 min			
Check pH 4.5-5.5 if varies then the amount of acetic acid is increased or decreased to control pH							
	AD	Softener	0.07	45°C×5 min	Injection Dozing	45°C	45°C
Sample check & if ok then bath drain & Rinsing with cold water until clear water appears (5min or more is usual)							

Process Flow Chart for Cotton (Turquoise color):

Fabric Loading

↓

Water fill

↓

Rinsing

↓

Drain out

↓

Water fill

↓

Detergent, Sequestering, Anti creasing, Stabilizer
(Dozing 60^0C, 10min, Runtime 5min)

↓

Caustic
(Dozing 70^0C, 10in, Runtime 5min)

↓

H_2O_2
(Dozing70^0C, 15min, Runtime 5min)

↓

Temp increase at 98^0C & continues for 60min

↓

Sample check

↓

Bath drain

↓

Water fill &Normal wash
(40^0C, 20min)

↓

Peroxide killer
(90^0C, 10min)

↓

Acetic wash (p^H7-8)
Runtime (50^0C, 15min)

↓

Enzyme was added& run for 60min at 55^0C

↓

Shade check

↓

Hot wash (80^0C, 5min)

↓

HTS (Dozing 60^0C, 5min, Runtime 60^0C, 5min)

↓

DLRD, AFK, Textube
(Dozing 60^0C, 5min, Runtime 60^0C, 5min)

↓

Dyes (Dozing 60^0C, 30min, Runtime 60^0C, 20min)

↓

Salt (Dozing 60^0C, 30min)

↓

Temp increase & run for 80^0C, 20min

↓

Soda dozing (60^0C, 50min)

Runtime (60^0C, 20min)

↓

Acetic wash (40^0C, 15min)

↓

Shade check (if ok)

↓

RD wash (98^0C, 5min)

↓

Fixing agent

(40^0C, 5min)

↓

Apply Softener

(45, 5min-Dozing, Run 45^0,10min)

↓

Fabric Unload

5. Recipe for Polyester Fabric Dyeing (Light Shade)

Recipe for Dyeing:

Lyocol Powder (Dispersing agent)	:1.0 g/l
DFT (Leveling agent)	:0.1 g/l
Acetic acid	: 0.5 g/l

Dyes:

F/Z Yellow 4G	: 0.24%
F/Z Yellow RPSL	: 0.06%
F/Z Blue 60	:0.0005%

Reduction Cleaning:

Hydrose	: 1.5 g/l
Caustic	: 1 g/l

Reduction Cleaning:

Hydrose	: 1.5 g/l
Caustic	: 1 g/l

Hot Wash

Neutralization:

Acetic acid	: 0.5 g/l

⊙ **Process Flow Chart for Polyester Fabric Dyeing (Light Shade):**

Package Loading
↓
Water Loading
↓
Wash with cold water or rinsing
↓
Drain out
↓
Water fills up
↓
Leveling Chemical (Run 70^0c, 20min)
↓
Adding Dyes
↓
Running (Run 130^0c, 50min)
↓
Reduction Cleaning (80^0c, 20min) Two times
↓
Hot Wash (80^0c, 10min)
↓
Cold Wash 5min
↓
Neutralization (50^0C, 5min)
↓
Unloaded Package

6. Recipe for Polyester Fabric Dyeing (Dark Shade)

Recipe for Dyeing:

Lyocol Powder (Dispersing agent)	:1.0 g/l
DFT (Leveling agent)	:0.1 g/l
Acetic acid	: 0.5 g/l

Dyes:

F/Z Yellow 4G	: 5.05%
F/Z Yellow RPSL	: 0.16%
F/Z Blue 60	:0.15%

Reduction Cleaning:

Hydrose	: 1.5 g/l
Caustic	: 1 g/l

Reduction Cleaning:

Hydrose : 1.5 g/l

Caustic : 1 g/l

Hot Wash

Neutralization:

Acetic acid : 0.5 g/l

⊙ **Process Flow Chart for Cotton Fabric Dyeing (Dark Shade):**

Package Loading
↓
Water Loading
↓
Wash with cold water or rinsing
↓
Drain out
↓
Water fills up
↓
Leveling Chemical (Run 70^0c, 20min)
↓
Adding Dyes
↓
Running (Run 130^0c, 60min)
↓
Reduction Cleaning (80^0c, 20min) Two times
↓
Hot Wash (80^0c, 10min)
↓
Cold Wash
↓
Neutralization (50^0C, 5min)
↓
Package Unloaded

7. Recipe for Polyester Fabric Dyeing (White Shade)

Recipe for Dyeing:

Lyocol Powder (Dispersing agent) :1.0 g/l

DFT (Leveling agent) :0.1 g/l

Acetic acid : 0.5 g/l

Brightener:

4BK :0.66%

Hot Wash

Neutralization:

Acetic acid : 0.5 g/l

⊙ **Process Flow Chart for Polyester Fabric Dyeing (White Shade):**

Package Loading
↓
Water Loading
↓
Wash with cold water or rinsing
↓
Drain out
↓
Water fills up
↓
Leveling Chemical (Run 70^0c, 20min)
↓
Adding Dyes
↓
Running (Run 130^0c, 50min)
↓
Hot Wash ((80^0c, 10min)
↓
Cold Wash (5min)
↓
Neutralization (50^0C, 5min)
↓
Unload Package

8. Recipe for Mélange Fabric Dyeing:

Color: Ecru M: L-1:9

Recipe for Scouring& Bleaching:

Marla Wt (Wetting agent& Detergent) :0.5 g/l

AFK (Sequestering agent) :0.5 g/l

Caustic Soda (Alkali) :1.0 g/l

Hydrogen per Oxide (Bleaching agent) :2.0 g/l

Stabilizer : 0.3 g/l

Optical Brightener (4BK) :0.4%

Recipe for Dyeing:

AFK (Sequestering agent) :1.0 g/l

Neutralization:

Acetic acid : 0.5 g/l

Recipe for After Treatment& Softening:

Acid : 0.5 g/l

Texsof PE : 2.0 g/l

Process Flow Chart for Melange Fabric Dyeing:

Package Loading
↓
Water Loading
↓
Wash with cold water or rinsing
↓
Drain out
↓
Water fills up
↓
Leveling Chemical (Run 80^0c, 15min or20min)
↓
Sample Check
↓
AFK Wash (80^0c, 10min)
↓
Cold Wash (5min)
↓
Neutralization (50^0C, 15min &P^H Check)
↓
Apply Softener (45^0c, 10min-Dozing, Run 45^0,20min)
↓
Package Unload

1.9.6 Dyes, chemicals & auxiliaries used

- **List of dyes used in Knit dyeing floor:**

- Fucazol Black WNN (stock solution 2%)
- Arcafix G.Yellow MERL (stock solution 2%)
- Fucazol yellow UCX (stock solution 2%)
- Fucazol Red UCX (stock solution 2%)
- Fucazol Navy Blue (stock solution 2%)

- Fucazol OR.D2R (stock solution 2%)
- Fucazol Blue (stock solution 0.5%)
- Fucazol Red E5BN (stock solution 2%)
- Remazol yellow 3GL (stock solution 0.5%)
- Reacto Bond yellow RR (stock solution 0.5%)
- Reacto Bond Red RR (stock solution 0.5%)
- Reacto Bond Blue RR (stock solution 0.5%)
- Remazol Blue RSPL (stock solution 0.5%)
- Remazol OR.RR (stock solution 0.5%)
- Fucazol Red D2B (stock solution 0.5%)
- Fucazol Turkish Blue (stock solution 0.5%)
- Fucazol yellow 3GL (stock solution 0.5%)
- Remazol Turkish Blue G (stock solution 0.5%)
- Fucazol Red USB (stock solution 2%)
- Fucazol Red D2B (stock solution 2%)
- Fucazol Navy Blue USB (stock solution 2%)
- Fucazol yellow UCF (stock solution 2%)
- Don Blue RSPL (stock solution 2%)
- Fucazol Turkish Blue G (stock solution 2%)
- Fucazol yellow 3GL (stock solution 2%)
- Disperse Red 60 (stock solution 0.5%)
- Faro Scarlet SWF (stock solution 0.5%)
- Fucazol Black B/G (stock solution 2%)
- Fucazol Black CSG (stock solution 2%)

➢ **List of Chemical used in fabric dyeing lab:**

✓ Mala WT (Detergent)
✓ AFK(Sequestering agent)
✓ Acetic acid(Neutralizer, reduce alkali condition pH-7)
✓ Exoline fast DFT(Leveling agent, control dye take up of fabric)

- ✓ HTS(Anti-foaming agent, remove foam formation in dye bath, which may cause uneven dyeing)
- ✓ Hydrogen Peroxide (universal bleaching agent, liberate H_2O_2 properly $H_2O_2 \longrightarrow H\dagger + HO2^-$)
- ✓ Stabilizer (control hydrolysis of H_2O_2, following reaction could occur if stabilizer is not used $2H_2O_2 \longrightarrow 2H_2O + O_2$)
- ✓ Na thiosulphate (Peroxide killer –$Na_2 SiO_3$) functional group of reactive dyes are very sensitive to peroxide, therefore it is must to neutral the action of peroxide after bleaching.
- ✓ Lyocol powder (Dispersing agent)
- ✓ Hydrose ($Na_2H_2SO_4$ reducing agent)
- ✓ Caustic soda (Neutralize acidic materials, saponify glycerides (waxes and oil),solubilise silicates)
- ✓ Texsof PE(softener, make fabric surface smoother)
- ✓ Tubingal (softener used for white color)
- ✓ Hydrocol sun (softener fixing agent)
- ✓ Soda ash
- ✓ Salt(Acts as electrolytes, remove electro negativity of fiber surface)
- ✓ Innocol RD(Soaping agent)

1.9.7 Production parameters

- ➢ **Cycle time**: In winch machine the fabric is feeded as rope form & the time required for fabric rope to complete one revolution is called cycle time. Standard cycle time for winch machine is 2.5. It is a very important parameter for color matching. It has been observed that cycle time can vary from nozzle to nozzle and as a result shade variation occurs. To find out the running cycle time following equation is used,

$$\text{Cycle time} = \frac{\text{Fabric weight} \times 65.63}{\text{Fabric tube dia in inch} \times \text{No of nozzle} \times \text{Fabric GSM}} \text{ min}$$

- ➢ **Rope length**: The length of fabric that is feeded to each nozzle can be find out by following equation,

$$\text{Rope length} = \frac{\text{Fabric weight per nozzle} \times 100 \times 1000}{\text{Fabric tube dia} \times 2.54 \times \text{No of nozzle} \times \text{Fabric GSM}} \text{ meter}$$

- **Reel R.P.M**: To maintain standard cycle time, it is important to set the reel R.P.M accurately. There is a equation for measuring reel R.P.M to maintain standard cycle time and the equation is,

$$\text{Reel R.P.M} = \frac{\text{Rope length per nozzle}}{\text{Standard cycle time } 2.5}$$

- **Temperature gradient**: It is the result obtained from dyeing temperature minus room temperature divided by temperature gradient into cycle time. The result should be a full number (1, 2, 3 not 1.2, 0.3, 1.8 etc) otherwise dyeing problem could occur. If result does not come in a full number, then it is recommended to adjust the temperature gradient and cycle time to get a full number.

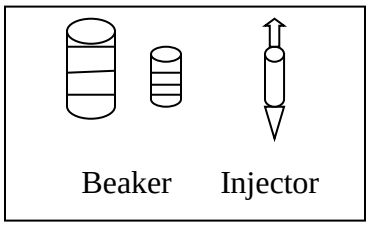
  It has been observed that if run time is divided by cycle time and if the result does not comes in a full number then bad dyeing or uneven dyeing could occur.

$$\frac{\text{Dyeing temperature} - \text{Room temperature}}{\text{Temperature gradient} - \text{cycle time}}$$

- **Measurement of hardness:**

  - Instrument model: Hanna.

- Origin: Romania.
- Method: German hardness scale.
- Chemical used in this set of instrument:
  - ✓ Buffer (Ammonium hydroxide + Ammonium Chloride)
  - ✓ Indicator (Trichrome black T)
  - ✓ EDTA (Ethylene Diamine Tetra Acetic acid)
- Amount of solution:
  - ✓ Water: 5 ml
  - ✓ Buffer: 5 droplet
  - ✓ Indicator: 1 droplet
- Instrument used:
  - ✓ Beaker: 2 one big & one small
  - ✓ Injector with a cap (1 mm)
- Process procedure:



Take 5 ml water in small beaker
↓
Add 5 droplet of buffer solution to water which will make water reddish purple
↓
Add one droplet of indicator to the solution and shake
↓
Add droplets of indicator & shake until the solution turns blue
↓
Take the reading from injector (the amount of indicator is given to the solution for example: 0.18 mm solution from 1 mm solution)
↓
Multiply the reading with 300 (constant), 0.18×300 = 54 ppm
↓
The scale of hardness is 54 ppm

1.9.8 Dyeing faults

1. Crack, rope & crease marks:

Causes:

- Poor opening of the fabric rope.
- Shock cooling of synthetic material.
- Incorrect process procedure.
- Higher fabric speed.

Remedies:

- Pre-Heat setting.

- Lower rate rising and cooling the temperature.
- Reducing the m/c load.
- Higher liquor ratio.
- Running at a slightly higher nozzle pressure.

2. Running shade:

Causes:

- Improper dozing of auxiliaries' chemicals & dyestuff.
- Too high material speed.
- Breakage of fabric rope.
- Inappropriate dozing of salt & soda.
- Lack of operator consciousness.

Remedies:

- Proper dozing of auxiliaries' chemicals & dyestuff.
- Balance material speed.
- Knot the fabric rope accurately.
- Appropriate dozing of salt & soda.
- Employ good operator & create awareness.

3. Uneven dyeing:

Causes:

- Uneven pretreatment (uneven scouring, bleaching & mercerizing).
- Uneven heat-setting in case of synthetic fibres.
- Quick addition of dyes and chemicals.
- Lack of control of dyeing m/c.

Remedies:

- By ensuring even pretreatment.
- By ensuring even heat-setting in case of synthetic fibres.
- By slow addition of dyes and chemicals.

- Proper controlling of dyeing m/c.

5. Shade variation (Batch to batch):

Batch to batch shade variation is common in exhumed dyeing which is not completely avoidable. Even though, to ensure a consistent batch to batch production of shade the following matters should be controlled carefully-

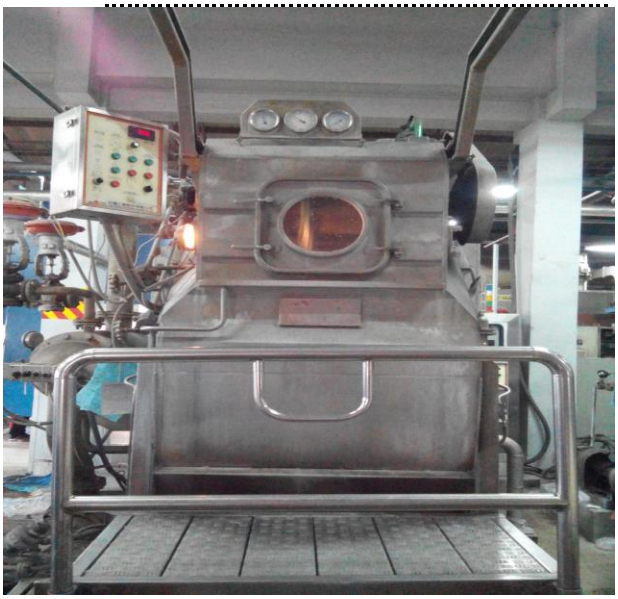
Causes:

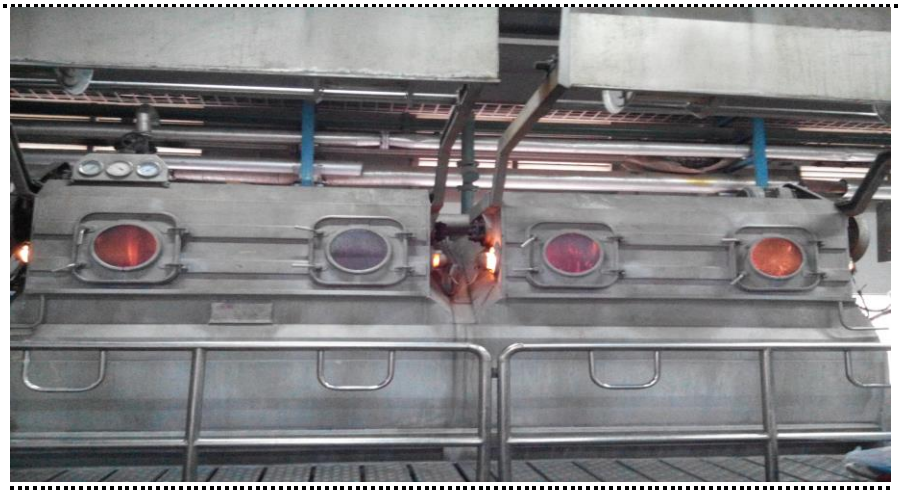
- Fluctuation of Temperature.
- Improper dosing time of dyes & chemicals.
- Batch to batch weight variation of dyes and chemicals.
- Dyes lot variation.
- Improper reel speed, pump speed, liquor ratio.
- Improper pretreatment.

Remedies:

- Use standard dyes and chemicals.
- Maintain the same liquor ratio.
- Follow the standard pretreatment procedure.
- Maintain the same dyeing cycle.
- Identical dyeing procedure should be followed for the same depth of the Shade.
- Make sure that the operators add the right bulk chemicals at the same time and temperature in the process.
- The pH, hardness and sodium carbonate content of supply water should check daily.

1.9.9 Pictorial view of dyeing machines





3.10 Finishing section

❖ Introduction

It is one of the most important operations in knit processing. Knit fabrics require finishing process after dyeing. During dyeing all knit fabrics are dyed in tubular form. According to buyers requirement dyed fabrics are finished in either Tubular form or Open-width form. Depending on which Finishing sections are separated into two sections – OPEN & TUBE section. Our industry has only tube section, therefore we will describe only about tube section.

❖ Machines arrangement in finishing section

De-watering machine
↓
Dryer
↓
Turning m/c
↓
Tube Compactor
↓
Q.C
↓
Delivery

❖ Machine specification

1. **De-watering machine:**
   Manufacturer: SANTEX, SWITZERLAND
   No. of m/c: 1
   Manufacturer: TUBETEX, USA
   No. of m/c: 1
2. **Dryer:**
   Manufacturer: SANTEX, SWITZERLAND.
   No. of m/c: 1
   Manufacturer: TUBETEX, USA

No. of m/c: 1

3. **Tube compactor:**

Manufacturer: SANTEX, SWITZERLAND

No. of m/c: 1

Manufacturer: TUBETEX, USA

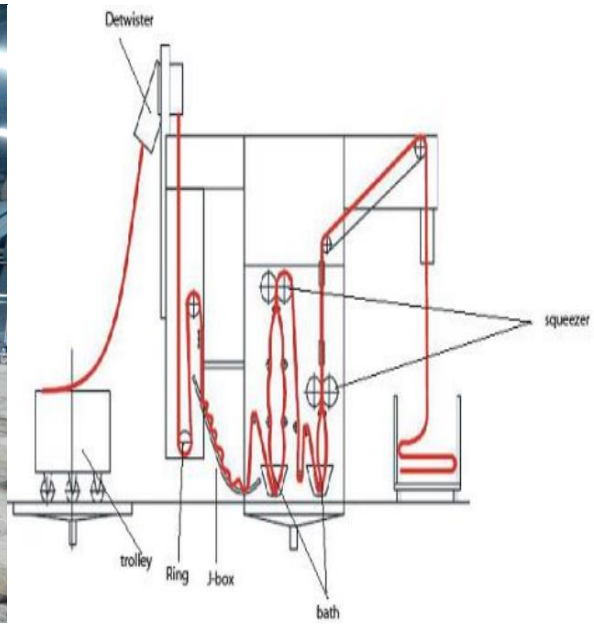
No. of m/c: 1

❖ **Description of finishing machines** (capture photos of different parts if possible)

◎ **<u>De-watering machine:</u>**

Function:

- To remove the excess water inherited by the fabric during Dyeing.
- To clean any unnecessary dirt or hairs from fabric surface.
- To soften the fabric, if required by using softening agent.
- Sight controlling of Dia of tube fabric by using „Shaper".



<u>Important Parts & Zones</u>:

- Detwister: Un-rove the roped form fabric after dyeing by twisting & turning.
- J-Box: Overfeeding zone, which ensures tension-free movement of fabric.
- Water & Softener bath: 1st bath is only water, 2nd one is for softener.
- Padder: Two pairs of padding rollers set at the top of each bath. They squeeze the excess water from the fabric.

- Ring & Ring Pulley: Works as a guide of fabric & maintain required Dia.

Technical Parameter:

1. Fabric Passing Speed:

Depends on count & GSM. For low GSM fabric – 60-65 m/min, for Medium - 55- 58 m/min, For High - 50-52 m/min

2. Overfeed regions:

J – Box, Before Padder 1 & Padder 2

3. Pressure in Padder:

Padder 1:– 4-5 bar Padder 2: – 3.5- 4 bar

4. Types of Softener used:

Anionic, Cationic & Silicon softeners are used. pH of bath should be 4.5-5.0

Concentration of softener – 10 g/l Bath is changed after every 100 kg fabric.

5. Dia of Shaper: Max. 52 inches

◎ **Dryer:**

Function:

- To dry the wet fabric.
- Control the shade & gsm slightly.

Main Parts:

- Feed unit: contains conveyor belt & number of rollers.
- Two drying sections: i) upper level (3 chambers) ii) Lower level (3chambers)

- Heating system: associated by steam Line & Nozzles.
- Blower: to spread the steam through-out the chambers.
- Exhaust air ventilator.

Technical Parameters:

- Temperature:

  For colored fabric – Chamber1: 140°c, Chamber2: 150°c, Chamber3: 130°c

  For White (bleached) - all chambers: 120°c
- Working width: 3000 mm
- Speed: 8-80 m/min
- Nozzle distance: 35-55 mm
- Power consumption: 140 kW

◎ **Tube compactor:**

Function:

- To control Dimensional stability of fabric.
- Control GSM of fabric.
- Make Shiny effect on fabric surface.

Main Parts of Compactor:

- Feed section: tension control & metal detector.
- Shape: Set according to the dia of fabric
- Steam zone.

- Take out & Plaiter zone
- Compacting Zone: It's a roller & shoe arrangement & the most important zone which consists of two rollers, the **Feed roller** (recarter roller) & the **Retard roller**. They are heated by **Shoe,** into which hot thermo-oil runs through.

Technical Parameters

- Speed of passing fabric: 22-40 m/min
- Shaper length: according to required Dia
- Overfeed ratio: Edge drive zone – 1.0-1.5
  Retard roller – 0.80-0.85
  Take-out zone – 0.85-0.90
  Conveyor belt – 1.0-1.05
  Plaiter – 0.80-0.85
- Compaction%: according to Shrinkage result
  S/J – 10-15%
  Rib – 10-12%
  Interlock – 8-10%
  Pique – 7-8%
- Shoe pressure: S/J – large dia – avg. 30 psi
  S/J – smaller dia – 10-15 psi
  Rib – 10-20 psi
  Lycra - <10 psi
- Power consumed: 80 kW
- Thermo-Oil temperature: 90°C

❖ **Pictorial view of finishing machines**

3.11 Utilities

❖ **Water:**

Water is supplied continuously in different sections by using submersible & centrifugal pumps.

Centrifugal pump for water supply for dyeing & other sections			**Capacity**
20 H.P Pedrollo pump (each pump: 1000L/min.)	2 units		2000L/min.
10 H.P Pedrollo pump (flow rate: 600L/min.)	1 unit		600 L/min.
5.5 H.P Pedrollo pump (pump flow rate: 50L/min.)	1 unit		350 L/min.
Spare pump motor pedrollo 20 H.P 1unit & 5.5 H.P	1 unit		1 L/min.
Johnson pump(30 H.P)	1 unit		25 m^3/hr
KSB pump(30 H.P)	1 unit		100 m^3/hr
Submersible pump KSB	46 kw		150 m^3/hr

❖ **Electricity:**

Machine description	Origin	No. of machine	Capacity
Caterpillar gas generator	USA	1 No.	1145 KW
Warsila gas generator	France	1 No.	952 KW
Prime power generator	Spain	1 No.	636 KW
Sub-station, PDB	Bangladesh	1 No.	1000 KVA

Prime power generator:

- **Brand name:** Guascor
- **Origin:** Spain
- **Model:** FGLD 480
- **Standby voltage:** 380V, 795 KvA
- **Prime voltage:** 636 KW, 1208 KvA
- **Phase:** 03
- **Weight:** 1845 Kg

Diesel generator:

- **Brand name:** CAD
- **Origin:** Singapore
- **Model:** EGS 630-3
- **Serial No:** 30112

- **Standby voltage:** 440KW, 550 KvA
- **Prime voltage:** 440 KW, 500 KvA
- **Phase:** 03
- **Frequency:** 50 Hz
- **Weight:** 3800 Kg

❖ **Air**

It is mainly used to deliver compressed air to different section as required. In Rahman knit Garment Ltd. 17 compressors are used to produce & deliver compressed air to different section.

Compressor specification:

- **Brand name:** COMBIMAX
- **No. of machines:** 17
- **Capacity:** 774 L/hr
- **Origin:** India
- **Company name:** Thermax Ltd.

❖ **Steam**

Boiler is mainly used to produce & deliver steam to different sections as required. In Rahman knit Garment Ltd. four boilers are used to produce & deliver steam to different sections.

Boiler specifications:

- **Brand name:** BIB COCHRAN boiler
- **No. of machines:** 02
- **Type:** Fire tube
- **Capacity:** 05 tons/hr
- **Working pressure:** 18 kg
- **Standby voltage:** 440KW, 550 KvA
- **Max:** 200 psi

3.12 Effluent Treatment Plant

❖ **Introduction**

Effluents are generated from different sections of a textile industry must be treated before they discharged to the environment. Various chemicals & physical means are introduced for this purpose.

❖ **Major sources of liquid discharge:**

c. Scouring chemicals,
d. Bleaching chemicals,
e. Washing chemicals,
f. Dyeing chemicals.

❖ **Characteristics of waste water**

- Biological oxygen demand(BOD) = 300 mg/L
- Chemical oxygen demand(COD) = 200 mg/L
- Suspended solid(SS) = 200 mg/L
- Color = Dark
- $_{P}H$ = 8-11.5

❖ **Sequence of waste water treatment**

- Process: Biological
- Capacity: 1500 m^3/day

Screening
(Removal of suspended solid)

↓

Homogeneous tank
(Uniform mixing of solids by air)

↓

Neutralization
($_P$H drop to 7-8 by H_2SO_4)

↓

Distribution tank
(Anti foamer NaOCl is used)

↓

Oxidation tank
(Air is pushed for oxidation)

↓

Clarifier tank
(Remove suspended solution & correction water color)

↓

Sludge return tank

↓

Thickener tank
(Polyelectrolyte is used)

↓

Filter press

❖ **Chemicals used in ETP with their purposes of use**

- Ferrous sulphate,
- Hydrochloric acid,
- Lime,

- Polymer,
- Sodium hypo-chloride,
- Urea fertilizer.

❖ **Final treated quality**

- pH = 7-8
- BOD = 30 mg/L
- COD = 160 mg/L
- Suspended solid = 30 mg/L
- Color = Colorless

❖ **Standard of waste water to be discharged outside**

Government of Bangladesh required:

- pH = 6-9
- BOD = 50 mg/L
- COD = 200 mg/L
- Suspended solid = 150 mg/L
- Color = Light brownish

3.13 Maintenance

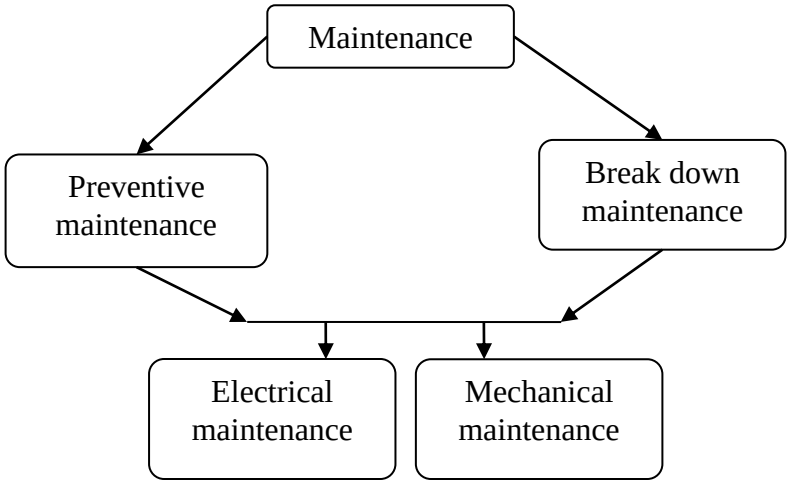
❖ **Introduction:**

Machine, buildings & other facilities are subjected to deterioration due to their use & exposure to environmental condition process of deterioration. If unchecked, culminates in rendering these service facilities unserviceable & brings them to a standstill. In industry, therefore has no choice but to attend them from time to time repair & recondition them so as to elongate their life to extend. It is economically & physically possible to do so.

Objectives:

- To keep the factory plants, equipments, machine tools in an optimum working condition,
- To ensure specified accuracy to products & time schedules of delivery to customer,
- To keep the production cycle within the stipulated range,
- To modify the machine tools to meet the need for production.

❖ **Types of maintenance**



Preventive maintenance:

It is a predetermined routine actively to ensure on time inspection/checking of facilities to uncover conditions that may lead to production break downs or harmful description.

Break down maintenance:

In this case, repairs are made after the equipment is out of order & it cannot perform its normal functions.

Routine maintenance:

Maintenance of different machines is prepared by expert engineer of maintenance department. Normally in case of dyeing machines maintenance after 30 days complete checking of different important parts are done.

❖ **Maintenance:**

Normally preventive maintenance should be done. During maintenance procedure following points should be checked.

Check list of different parts:

- **Maintenance:** Mechanical
- **Machine:** Dyeing machine

Sl. No.	Items needed to be checked & serviced
01	Crease the m/c bearing
02	Complete cleaning of m/c
03	Cleaning of drain valves, replace seals if require
04	Check air supply filters, regulators auto drain seals
05	Clean filters element & blow out
06	Greasing of unloading roller bearing
07	Checking of oil level & bolts of unloading roller gearbox
08	Checking of unloading roller coupling & packing
09	Checking & cleaning of main vessel level indicator
10	Checking of oil level of pump bearing & refill if required
11	Check the function of heat & cool modulation valves
12	Check all door seals

- **Maintenance:** Electrical
- **Machine:** Dyeing machine

Sl. No.	Items needed to be checked & serviced
01	Check & clean fluff &dirt from all motor fan covers
02	Check all motor's terminals
03	Check main panels
04	Check panel cooling fan & clean its filter
05	Check main pump inverter & its cooling fan
06	Check all circuit breaker, magnetic conductors & relays
07	Check current setting of all circuit breaker & motor over load
08	Visual checking of all power & control cables
09	Check all pressure switches
10	Check calibration of main vessel & all addition tanks
11	Check all pneumatic solenoids
12	Check calibration of heating/cooling modulation value
13	Check setting of tangle sensor
14	Check setting & operation of lid safely switches
15	Check all emergency switches
16	Check all indication lamps
17	Check all on/off switches
18	Check all signal isolators

CHAPTER-4

IMPACT OF THE INTERNSHIP

Chapter-4

Impact of the Internship

Being working with them we have not only earned valuable knowledge but was also inspired by their innovativeness, which helped to enrich our experience to a greater extent. We tried our best to gather all necessary information but it is true that within this short period of time it is impossible to achieve 100%. We learned following things from different sections

- From soft winding section we learn following parameters density calculation, shortcut formula of density calculation, package yarn length calculation, shortcut formula for measuring length of cheese package, time required for producing a package, count calculation from the length of a package, production calculation per spindle of ssm precision winding machine, problem associated in soft winding.
- From yarn dyeing section we learn the process procedure, list of chemical used in yarn dyeing lab, formula for using salt & soda, dyes & chemicals calculation formula for laboratory, dilution of solution.
- In yarn dyeing floor we learn dyes & chemicals measuring formula for yarn dyeing floor, names of raw materials used for yarn dyeing floor, flow chart of yarn dyeing
- From knitting floor we learn production calculation, stitch length, number of needles, quality assurance system in knitting/weaving section
- We also learn the process procedure of different color fastness test, dyeing process sequence of different types of fabric, different technical production parameters of knit dyeing floor.
- During training, we have learned practical operation of different process & the production parameters, shortcut formulas, costing of products, how to maintain workers, how to increase production, how to reduce cost, how to solve problem instantly, how to cope up with competitor.

CHAPTER-5

CONCLUSION

Chapter-5
Conclusion

The industrial training gives us the opportunity to work in industry. It was an experience of practical learning. This training gives us actual picture about man, machine, material, methods and market.

We have completed our industrial attachment successfully by the grace of Almighty ALLAH. Industrial attachment sends us to the expected destiny of practical life. The completion of the two months Industrial Attachment at Rahman Knit Garments Ltd, we have got the impression that the factory is a slightly modern export oriented knit composite in Narayangong. Though it was established only a few years ago, it has earned well reputation.

For its best performance factory is settled with utility to give all convenient supports to the productions for twenty-four hour. They follow all the latest system for their machines maintenance, so production can not hamper.

It has been found that there is some irregularity and irresponsibility is made by employees. Though important decision & issues are solved by technical person but it is a matter of great sorrow that most the employees bearing important position are non technical & backdated. There we think if they want to develop their growth then it is must for them to engage technical person. It has been also observed that there is no high qualified mechanical engineer.

Hope they will fulfill their lack age & will become a better composite knit industry in Bangladesh. It is a very good sign that the salary of labors is much better compared to others and till labor unrest is not happened.