Faculty of Engineering
Department Of Textile Engineering
REPORT ON
Industrial Attachment
At
Sister Denim Composite
Karardi, Shibpur
Narshindi, Bangladesh.
Course Title: Industrial Attachment (Wet Processing)
Course Code: Tex-442

Group: (C)

| Name | ID |
|---|---|
| Md. Rasel Rana | TEX1703012117 |
| Rubina Khatun | TEX1801013030 |
| Tanzina Sweety | TEX1801013029 |
| Md.Tajul Islam | TEX1801013066 |
| Mahadi Hasan Shawon | TEX1801013146 |

**Lecturer & Course Coordinator**

**Kamrul Hassan Bhuiyan**
Dean, Faculty of Textile Engineering, SU

This Internship Report Submitted in partial fulfillment of the requirement for the Degree of B.Sc. in Textile Engineering in the Faculty of Textile Engineering of Sonargaon University .

## Department of Textile Engineering

June, 2021

Department of Textile Engineering

# Sister Denim Composite Limited

From 1st March 2021 to 30st June

**Lecturer & Course Coordinator**

**Kamrul Hassan Bhuiyan**
Dean, Faculty of Textile Engineering, SU

……..
Kamrul Hassan Bhuiyan
Lecturer & Coordinator
Department of Textile Engineering Sonargaon University (SU).

# Letter of Approval

FALL 2021
The Head,
Department of Textile Engineering
Sonargaon University (SU), 146 Mohakhali, Dhaka 1212

Subject: Approval of Industrial Attachment Report of B.Sc. in Textile Engineering Program.

Dear Sir,

We are just writing to let you know that this Industrial Attachment in "Sister Denim Composite Ltd." has been prepared by the student bearing TEX1703012117, TEX1801013030, TEX1801013029, TEX1801013066 & bearing TEX1801013146 is completed for final evaluation. The whole report is prepared based on the proper investigation and information in Sister Denim Composite Ltd. The student was directly involved in their industrial attachment report activities.
Therefore, it will highly be appreciated if you kindly accept this industrial attachment report and consider it for final evaluation.
Yours Sincerely

……..
Md. Kamrul Hassan Bhuiyan
Lecturer & Coordinator
Department of Textile Engineering Sonargaon University (SU).

## Summary of the Industrial Report

I have completed my industrial attachment successfully by the grace of Allah. Industrial Attachment sends me to the expected density of practical life. The completion of the Four Months Industrial Attachment of Sister Denim Composite Limited. I have got the impression that factory is one of the most modern export-oriented Denim industries in Bangladesh.

Woven garments factories are playing a very vital role in our Bangladesh RMG sector. I worked in “Sister Denim Composite Limited”, Production division. “Sister Denim Composite Limited.” is a 100% export oriented woven denim factory. Company has well planned and setups with various international certifications fulfilling all demands of foreign buyers. During our training period, I learn from top to bottom of the working processes, from fabric in-house to goods shipment. I am so lucky and satisfied to do my industrial attachment in “Sister Denim Composite Limited.”. I believe this industrial attachment will be massively help full in my future carrier life.

# UNDERTAKING DECLARATION OF INDUSTRIAL TRAINING

Herewith I assure that I have done industrial internship in **Sister Denim Composite Limited** under the supervision of Lecturer & Coordinator **Kamrul Hassan Bhuiyan** Dean, Department of Textile Engineering, Sunargaon University (SU) from 01March 2021 to 30 June 2021.

I also declare that neither this internship report nor any part of this internship report has been submitted for award of any degree.

**Lecturer & Coordinator**

**Kamrul Hassan Bhuiyan**

Dean, Department of Textile Engineering

## Submitted By

| Name | ID |
|---|---|
| Md. Rasel Rana | TEX1703012117 |
| Rubina Khatun | TEX1801013030 |
| Tanzina Sweety | TEX1801013029 |
| Md.Tajul Islam | TEX1801013066 |
| Mahadi Hasan Shawon | TEX1801013146 |

# ACKNOWLEDGEMENT

All pleasure goes to the Almighty Lord to provide us energy and capacity to finish our four-month lengthy industrial attachment at **Sister Denim Composite Limited**. It used to be a first-rate opportunity for us to complete the industrial attachment with the assistance of folks employed in **Sister Denim Composite Limited**. We sense grateful to our educational supervisor **Kamrul Hassan Bhuiyan** Lecturer, Department of Textile Engineering, Faculty of Engineering, Sonargaon University as nicely as to our factory supervisor for their constantly guiding us about the improvement and preparation of this training report. They have enriched us with sharing essential theoretical and realistic thoughts and supervised us to complete this document on time. We would like to express our thanks to **Kamrul Hassan Bhuiyan** lecturer, Department of Textile Engineering, Faculty of Engineering, Sonargaon University for his variety assist to complete our training report. We also take the opportunity to specific our sincerest gratitude to the management, administration & personnel of **Sister Denim Composite Limited**. for their kind assistance. Heartfelt thanks goes to Md. Shahadat Hossain,Depertment Head of Washing, **Sister Denim Composite Limited**. for their permission & tremendous cooperation at some stage in the period of our training. We would also like to thank Engr. Md Asaduzzam Asad Depertment Head of R&D for their sincere support. The beneficent help is substantially appreciated. We would additionally like to thank Production Officers, Senior Production Officer and different officials of **Sister Denim Composite Limited**. for supporting me to whole industrial education successfully. Our gratitude also goes to all the personnel of **Sister Denim Composite Limited**. for their sincere co-operation, support and precious advices. Finally, we would like to categorical a feel of gratitude to our cherished parents and friends for their intellectual support, strength and assistance at some stage in writing the training report.

# TABLE OF CONTENT

# LIST OF TABLES

# LIST OF FIGURES

# Chapter: 01

# Introduction

# 1 Introduction

Figure 1.1: Sister Denim Composite Limited

Industrial attachment may compare as pre-job. So, for appropriate industrial attachment should select a perfect industry. Fortunately, we found a modern industry as like Sister Denim Composite Limited. The working discipline of this industry has impressed us. Four months of this industrialattachment is attached to our study curriculum to achieve adequate practical Knowledge and develop adopting power with industrial environment.

I have prepared this attachment in Sister Denim Composite Limited., which is 100% export-oriented denim fabric manufacturing industry. It has well planned, environment and over all section formaking denim fabrics.

By means of the practical knowledge it's possible to apply the theoretical knowledge in the practical field. For any technical education practical experience is almost equally important in association with the theoretical knowledge. The training minimizes the gap between theoretical and practical knowledge and makes us familiar with the industrial environment, I got an opportunity to complete15weeks (105 days) long industrial training and I did it in Sister Denim Composite Limited.

The industrial attachment is the process which builds understanding skill & attitude of the

performer, which improve knowledge in boosting productivity & services. College education provides us vast theoretical knowledge as well as more practical attachment, despite all these industrial attachments help me to be familiar with the technical support of modern machinery, Knowledge about various operation stages. It also provides us sufficient practical knowledge about IE (Productivity evaluation, Time study, target, work study, efficiency) & maintenance of machinery and their operation techniques etc.

Sister Denim Composite Ltd. is one of the largest eco- friendly denim textiles in Bangladesh. It was established in 2014 with a focus on producing a consistent quality and offering a diversified product range through continuous research and innovation. It is also the first company in the country that introduced the Rope Dyeing Technology. The project is built on 100 acres of land and is situated 60 km. North of Dhaka, Bangladesh.

## 1.1 Company Profile

Table 1.1: Company Profile of Sister Denim Composite Ltd.

| | |
|---|---|
| Name of the Factory | Sister Denim Composite Ltd. |
| Status | Private Limited Company |
| Year of Establishment | 2014 |
| Location | Karadi,Shibpur, Narsingdi, Dhaka, Bangladesh |
| Type of Factory | High quality fashion denim Manufacturer |
| Nature of company | 100% Export oriented Industry |
| Production Capacity | 10 million per month |
| Annual Production | 80 million per year |
| Product | High Quality Fashion Denim Fabric |
| Total Area of the Factory | 110 acre of land |
| Structure | Pre-Engineered Steel Structure Building |
| Certification | Oeko-Tex Certified GOTS Certified (Global Organic Textile Standards) OE100 or OE Blended (Organic Exchange) ISO-9001:2008 and ISO-14001:2008 Certification Systems. BSR Audit (Business for Social Responsibility) |
| Board of Directors | Mr.Abdul Kadir Mollah Bord of Chairman, Production Director Obaydul Haque |
| Corporate Office | Green City Edge(12-13$^{th}$ Floor),89 Kakrail C/A,Dhaka-1000.Tel:88-029333274,9369852,Fax88-029342526 |

## 1.2 Different Divisions of Sister Denim Composite Textiles Limited

Administration

Human Resource

Chairman Office

Finance

Marketing

Commercial

Company Secretariat

Production

Engineering

Research and Development

Project Management

Internal Audit

Quality Assurance

Supply Chain

Spinning

Information and Technology

## 1.3 Site Direction of Sister Denim Composite Ltd.

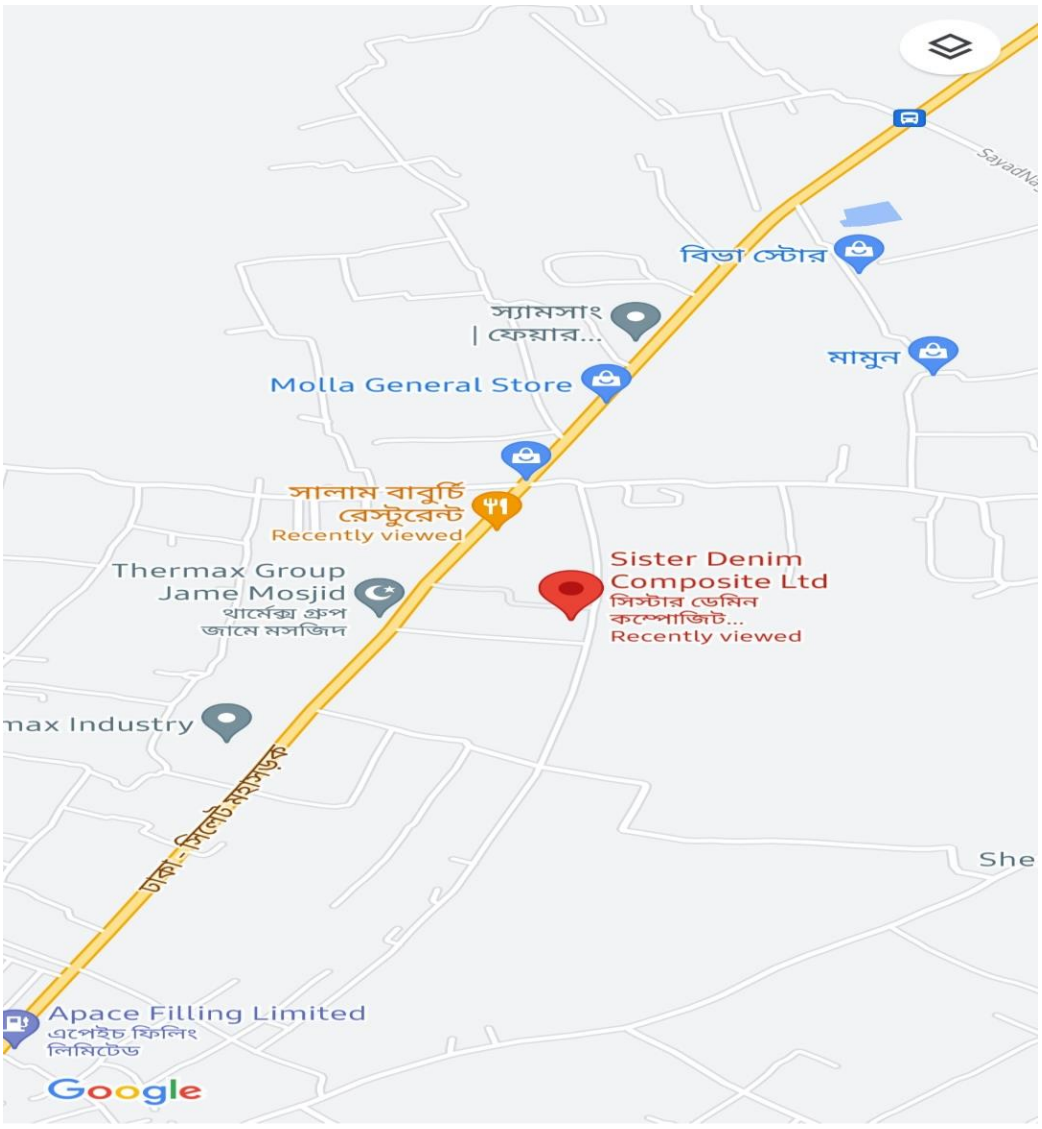



Figure 1.2: Site Direction of Sister Denim Composite Ltd

## 1.4 Clients:


Levi's


UNI
QLO


GAP


MANGO


Marubeni


H&M


PULL&BEAR


ESPRIT


C&A


Walmart


JCPenney


Carrefour

## 1.5 Certificates:






## 1.6 Manpower Organogram

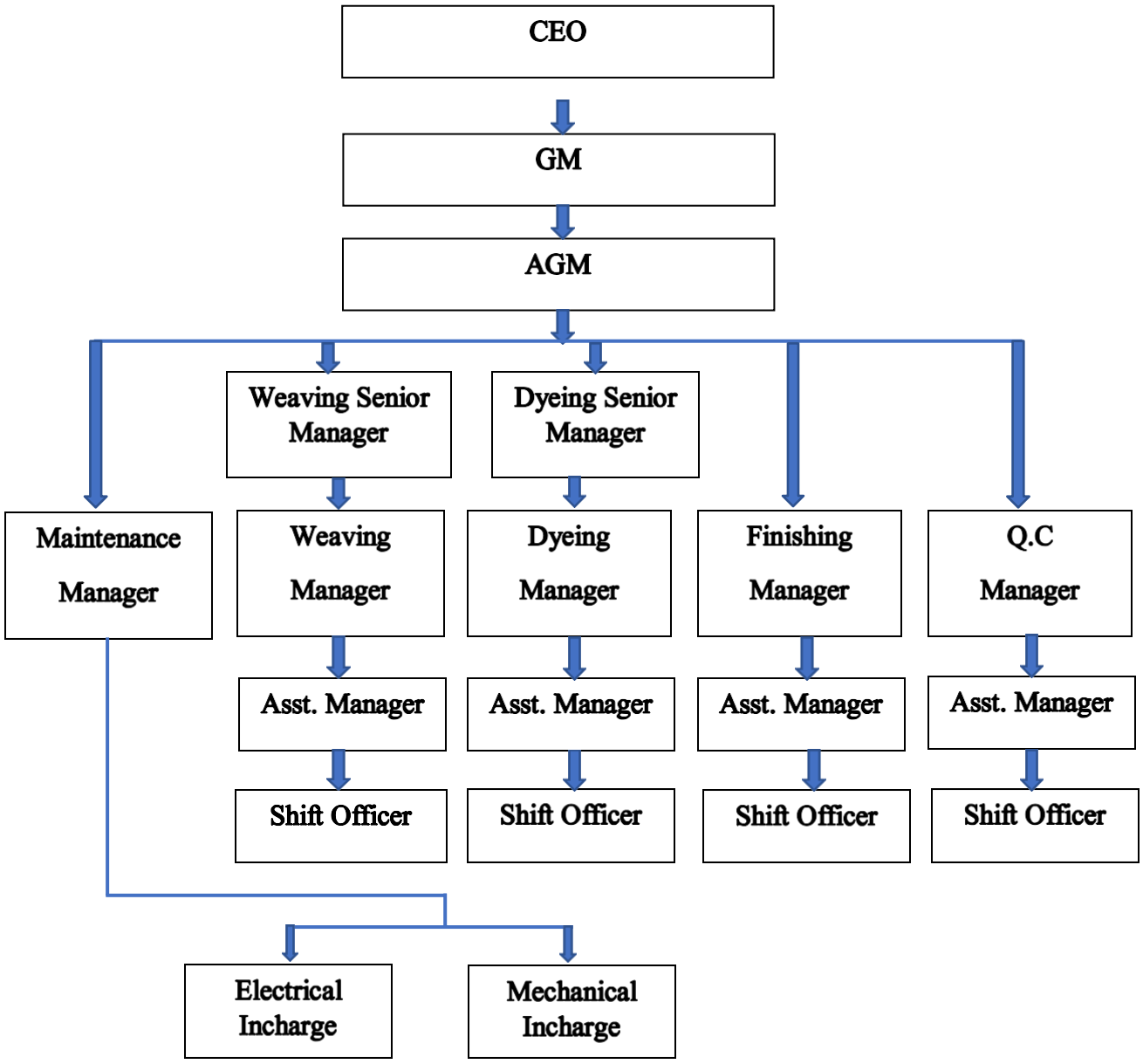



**Fig: Management Organogram**

## 1.7 Management System

The company has skilled administration, management and marketing team guided by proficient, dexterous & experienced leaders of offer right solution for the consumers with the right eminence & with the shortest lead-time for the export market in Bangladesh. The best use of continuous development of human resources by providing them International standard equal opportunity is the keys for achieving comprehensive competence in all level of the organizational hierarchy.

### 1.7.1 Shifting

There are three shifts in the industry. So, the shifts are changed at every 8 hours. Shift Change/ for worker of Security:

General shift 09:00 am– 05:00 pm

A Shift 06:00 am – 02:00 pm

B Shift 02:00 pm – 10:00 pm

C Shift 10:00 pm – 06:00 am

### 1.7.2 Duties & Responsibilities of Different Post

### Chief Executive Officer (CEO)

- To deal with the buyer and merchandiser.
- To set up price for the product.
- To plan apply and control all administrative functions.
- To follow up the instruction of managing director and chairman.

## General Manager

- To supervise the personal working under him
- To plan the sequence of production
- To arrange necessary raw materials for the production problems.
- To find out the possible reasons which are responsible for less production
- To follow up the instruction of CEO as well.

### Senior Production Officer

- Overall supervision of dyeing and finishing section.
- Batch preparation and pH check.

- Dyes and chemicals requisition issue and check
- Write loading/unloading time from machine.
- Program making, sample checking color measurement.
- Control the supervisor, operator, asst. operator and helper of dyeing machine.

## Production officer

- To collect the necessary information and infrastructure from the previous shift for the smooth running of the section.
- To match production sample with target shade.
- To match production sample lot sample matching next production.
- To observed dyed fabric during finishing running and also after finishing process.
- To identify disputed fabrics and report to PM/Gm for necessary action.
- To discuss with PM about overall production if necessary.
- To sign the store requisition and delivery challenge in the absence of PM
- To execute the overall floor work.
- To maintain loading/unloading paper.

## Shift in charge

- To follow the worker's movement.
- Should discuss with the production Officer about what is happening.
- To maintain the production sequence.
- To check the sample at certain time interval.

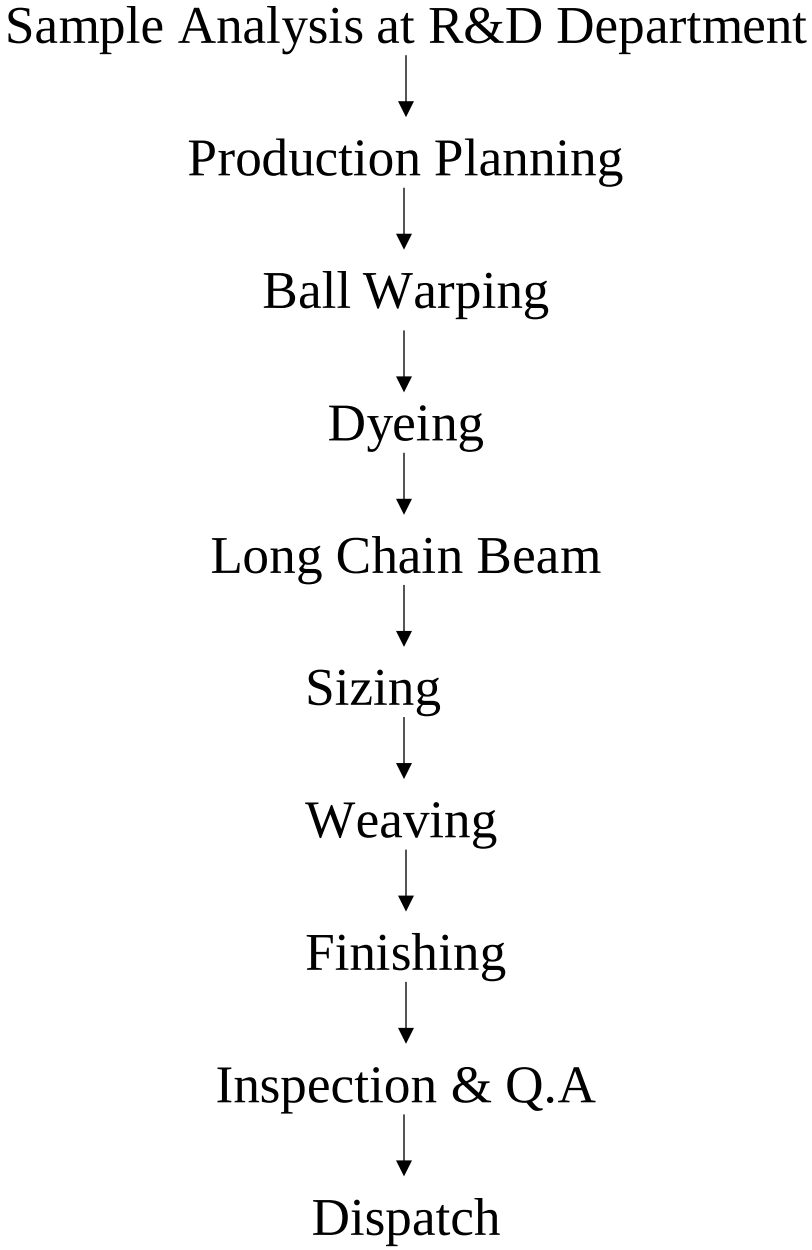
## 1.8 Internship Working Process Sequence

In our whole internship our supervisor divided our whole working period in different segment with specific allocated days. Those are given below.

Table 1.2: Internship Working Process Sequence

| Departments | Allocated Time |
|---|---|
| Orientation | 01 |
| Fire Safety Training | 01 |
| Spinning | 03 |
| Ball Warping | 03 |
| Dyeing | 10 |
| Long Chain Beam | 01 |
| Sizing | 05 |
| Weaving | 10 |
| Finishing | 05 |
| Inspection & QA | 06 |
| Research & Development | 07 |
| Utilities | 03 |
| Others | 01 |

## 1.9 Production Division Sequential Flowchart



# Chapter: 02

# Raw Materials

# 2 Raw Materials at ETL

## 2.1 Denim yarn:

This section has detailed description about the yarn that is usually used by Envoy Textiles Ltd. for manufacturing high quality denim fabrics. The spinning method of denim yarn is also described shortly.

## 2.2 Common yarn for denim:

Warp yarns for bottom weight jeans typically range in size from Ne 4.0 to Ne 12.5/1.Finer yarns are used for lighter weight chambray shirting fabrics and lighter weight jeans, vests, dresses, and skirts. These yarns may range in count from Ne 12.5 to Ne 30.0.

## 2.3 Yarn spinning system

Before the late 1970s, all denim yarns were ring spun. Today, denim fabrics have different combinations of ring and open-end yarns. The term "ring/ring, open end /open end (OE/OE), and ring/OE," it is referring to which yarn is in the warp and which yarn is in the filling, respectively. For example, ring/OE indicates a ring-spun warp yarn and an open-end filling yarn. Weaving a combination of ring-spun and open-end yarns can help to reduce fabric costs while still maintaining some favorable ring-spun fabric characteristics.

## 2.4 Elastic Denim Yarns

Core-spun yarns are produced conventionally on ring-spinning machines by introducing a spandex filament at the back of the front drafting roll of the machine. The drafted cotton fibers twist around the spandex core to produce an elastic ring-spun type yarn. There are also open-end and air-jet spinning machines that have been adapted to produce core-spun yarns. The core filament yarn (normally spandex) is inserted through the rotor shaft on OE frame or the spindle of the air-jet frame, and the cotton fiber wraps around the spandex filament during the process of spinning. The yarn is somewhat similar to the ring core-spun yarns in terms of yarn and fabric characteristics. Open-end and air-jet core-spun yarns have

fewer knots and splices as compared to ring core-spun yarns

## 2.5 Type of yarn used

1. Rotor yarn
2. Ring yarn
3. Slub yarn
4. Polyester yarn
5. Lycra yarn

## 2.6 Yarn count

**For warp**: 6, 7, 9, 10. 12, 20, 26 (Normal + Slub)

**For weft:** 6, 7, 9, 10. 12, 20, 26 (Normal + Slub)

**Polyester:** 150D, 300D, 450D, 600D

**Lucre:** 10L40D, 16L70D, 150L40D, 150L70D , 300L70

## 2.7 The name of yarn supplier and origin

Table 2.1: The name of yarn supplier and origin

| Count | Supplier | Origin |
|---|---|---|
| $_{7}^{OE}$ | Badsha &AAyarn &Nahar | Bangladesh |
| $_{9}^{OE}$ | Badsha &AAyarn | |
| $_{10}^{OE}$ | Badsha | |
| $_{12}^{OE}$ | Badsha &AAyarn&Gulshan | |
| $_{16}^{OE}$ | Badsha &Gulshan | |
| 16 Ring | AT&T | Bangladesh |
| $_{8}^{RSL}$ | AT&T | |
| $_{9}^{RSL}$ | AT&T | Bangladesh |
| $_{10}^{RSL}$ | AT&T | |
| $_{12}^{RSL}$ | AT&T &Square | |
| $_{10}^{PSL}$ | Arif | Bangladesh |
| $_{12}^{PSL}$ | AT &T | |
| $_{9}^{OSL}$ | Badsha &AAyarn | Bangladesh |
| $_{9}^{SL}$ | Badsha &AAyarn | Bangladesh |
| 150D | Hangzhou | China |
| | Zhejiang | China |
| | Kader | Bangladesh |
| 300D | Zhejiang | China |
| 450D | Zhejiang | China |
| 600D | Hangzhou | China |
| | Hangzhou | China |
| 10L40D | AT&T | Bangladesh |
| 16L40D | AT&T | |
| 16L70D | AT&T &NRG | |
| 150L40Dwhite | Welspun | Spain |
| 150L40DBlack | Shaoxing Boram | China |
| 150L70D White | Hangzhou | China |
| 300L70D | Welspun | Spain |

# Chapter: 03

# Ball Warping

# 3 Ball Warping

## 3.1 Warping:

Warping is the process of transferring multiple yarns from individual yarn packages onto a single package or beam assembly.

## 3.2 Ball Warping:

In ball warping 250 to 400 yarn ends are pulled from the creel. The yarns then pass through a comb-like device (sometimes called a hack or reed), which keeps each warp yarn separate and parallel to its neighboring ends. The yarns then go through a funnel-shaped device called a trumpet or condenser, which collapses and condenses the sheet of yarn into rope form. This device is located at the base of the warper head and traverses back and forth, guiding the newly formed rope of yarn onto a log.


Figure 3.1: Ball warping machine

## 3.3 Classification of Warping

There are two types of warping:

1. Section warping or pattern warping
2. High speed warping or direct warping.

Besides these special type of warping for Denim Yarn Dyeing:

3. Ball warping.

- Cross warping
- Chain warping

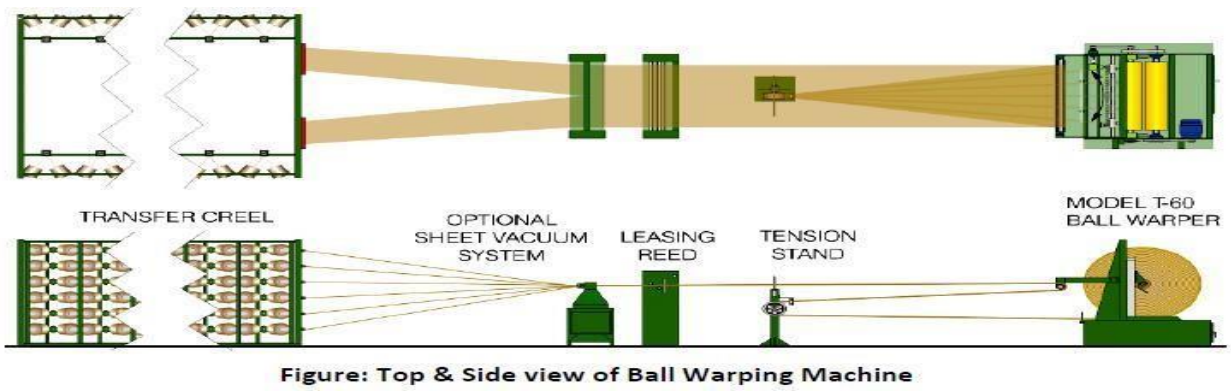
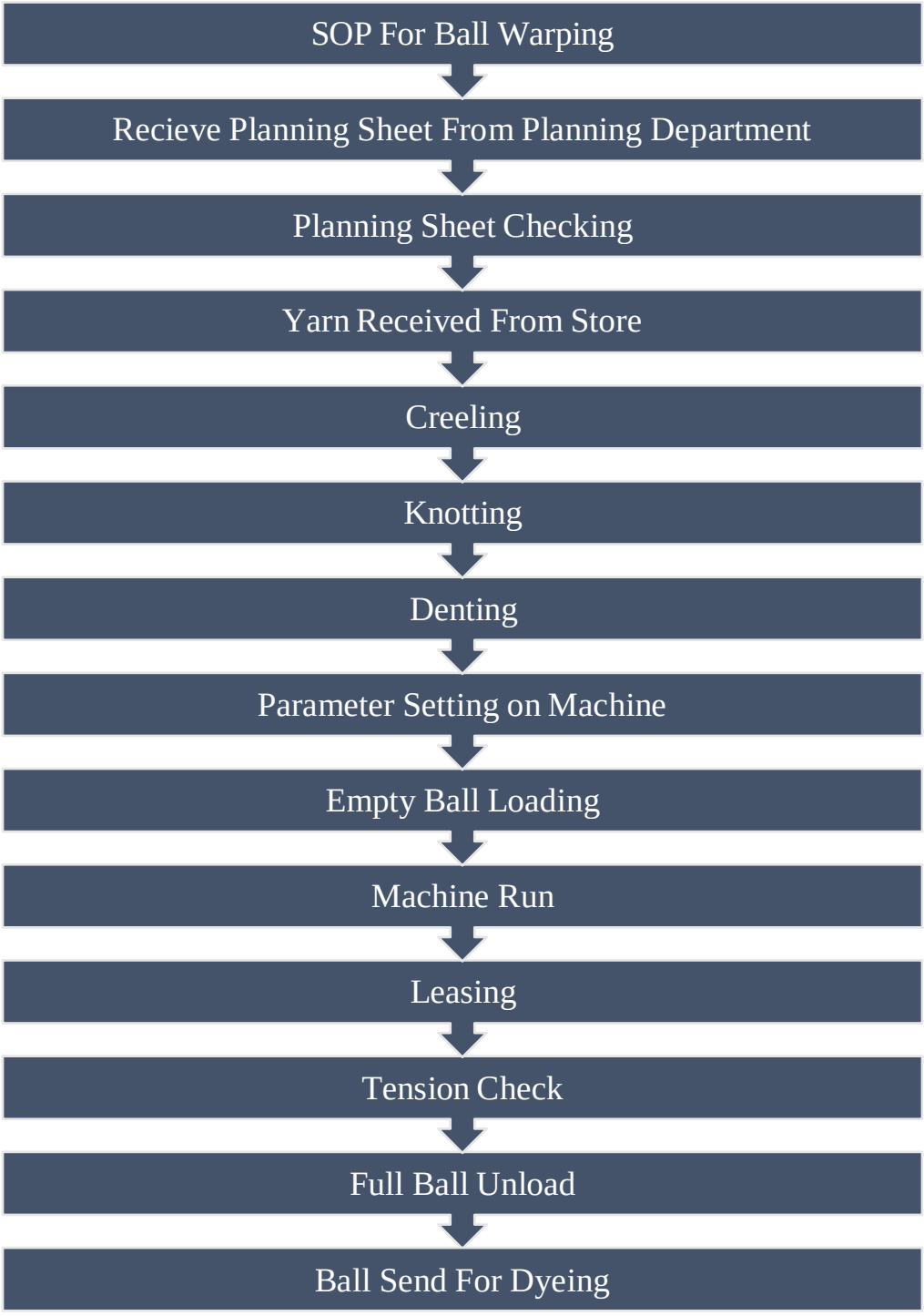



Figure 3.2: Top & Side view of Ball warping machine

## **3.4** Flow Chart of Ball Warping



## 3.5 Machine Parts

1. Creel
2. Cone Holder
3. Guide
4. Tension Device
5. Pole
6. Auto Stop Motion
7. Signal Light
8. Yarn Separator (Reed)
9. Spindle
10. Head Stroke
11. Blower
12. Trumpet

## 3.6 Machine Specification and Parameters

Table 3.1: Ball warping machines specifications and parameters

| Sl. No. | Brand Name | Origin | Machine Type | Creel Capacity | Stop Motion | Speed (Rpm) | Count |
|---|---|---|---|---|---|---|---|
| 1. | Griffin | USA | Manual | 456 | Drop Wire | 450 | 7 – 16 |
| 2. | Griffin | USA | Automatic | 456 | Electrical Sensor | 450 | 7 – 16 |
| 3. | Morrison | USA | Automatic | 528 | Electrical Sensor | 550 | 7 – 16 |
| 4. | Karl Mayer | China | Automatic | 456 | Electrical Sensor | 500 | 7 – 30 |

**Total Number of Units:** 03

**Total Number of Machines:** 12

**Lease:** after every 500 m

**Lease yarn:** Ring Yarn

**Production/day (8 hours):**

**A.** 5,500 m – 14 to 16 balls

**B.** 11,000 m – 8 to 9 balls

**C.** 16,000 m – 6 to 7 balls

**Calculation:**

**No of Balls: 12**

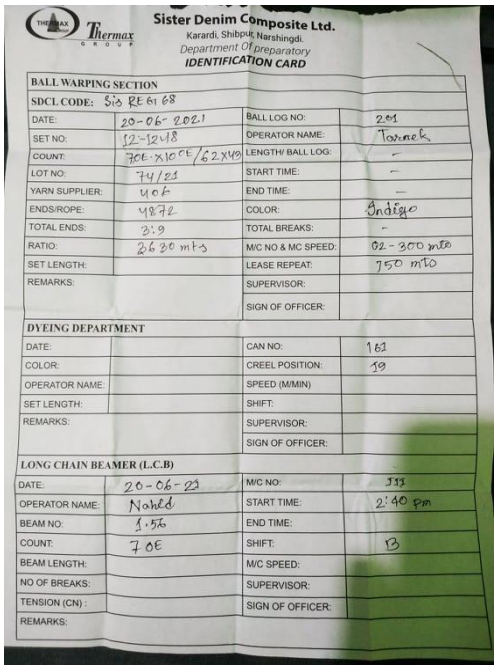
**Yarn Length/ Ball: 11, 000 m**

**Therefore,**

**Production =** $\frac{11000}{12}$

**= 916.67 = 917 balls/shift**

## 3.7 Preparatory Beam Card



Sister Denim Composite Ltd.
Karardi, Shibpur, Narshingdi.
Department Of preparatory
IDENTIFICATION CARD

| BALL WARPING SECTION | | | |
|---|---|---|---|
| SDCL CODE: | Sis RE 61 68 | | |
| DATE: | 20-06-2021 | BALL LOG NO: | 201 |
| SET NO: | 12-1248 | OPERATOR NAME: | Tasmeh |
| COUNT: | 30E·X10CE/62X40 | LENGTH/ BALL LOG: | – |
| LOT NO: | 74/21 | START TIME: | – |
| YARN SUPPLIER: | Yoh | END TIME: | – |
| ENDS/ROPE: | 4872 | COLOR: | Indigo |
| TOTAL ENDS: | 3:9 | TOTAL BREAKS: | – |
| RATIO: | 26 30 mts | M/C NO & MC SPEED: | 02 - 300 mts |
| SET LENGTH: | | LEASE REPEAT: | 750 mts |
| REMARKS: | | SUPERVISOR: | |
| | | SIGN OF OFFICER: | |

| DYEING DEPARTMENT | | | |
|---|---|---|---|
| DATE: | | CAN NO: | 161 |
| COLOR: | | CREEL POSITION: | 19 |
| OPERATOR NAME: | | SPEED (M/MIN) | |
| SET LENGTH: | | SHIFT: | |
| REMARKS: | | SUPERVISOR: | |
| | | SIGN OF OFFICER: | |

| LONG CHAIN BEAMER (L.C.B) | | | |
|---|---|---|---|
| DATE: | 20-06-23 | M/C NO: | JJJ |
| OPERATOR NAME: | Nahid | START TIME: | 2:40 pm |
| BEAM NO: | 1.56 | END TIME: | |
| COUNT: | 70E | SHIFT: | B |
| BEAM LENGTH: | | M/C SPEED: | |
| NO OF BREAKS: | | SUPERVISOR: | |
| TENSION (CN) : | | SIGN OF OFFICER: | |
| REMARKS: | | | |

Figure 3.3: Preparatory Beam Card

## 3.8 Planning Report of Ball Warping

Table 3.2: Planning report of ball warping

| *Sl no* | *P0* | *style* | *Count & description* | *Ratio* | *Total ends* | *No of rope per set* | *Set Length* | *No of set* | *Quantity* |
|---|---|---|---|---|---|---|---|---|---|
| **1** | 658 | 3434E | 7oe+9oeslub<br>Badsha-29+badsha es-93 | 5:5 | 3760 | 10 | 14600 | 6 | 87600 |
| **2** | 66/ 107 | M-96 | 7oe+9oe+12oe<br>Bad-29+bad-29+bad-14 | 4:4:4 | 4440 | 12 | 10600 | 5 | 5300 |
| **3** | 197 | 3715 | 16ringslub+16 Ring<br>AT&T-ES-26+AT&T(991) | 10:5 | 5700 | 15 | 64000 | 2 | 128 |
| **4** | 137/ 173 | LY-99 | 9oesl+9ring+9oe<br>Bad-ES-92+Arif ES-11+BAD-29 | 4:4:4 | 4440 | 12 | 11720 | 2.5 | 30875 |

## 3.9 Re coning Machine

Wastage yarn and small cone package are re coned to for larger cones for factory use and sale.

Machine Name : Savio Polar

Origin : Italy

Capacity 160

Magazine 40

Magazine Pocket : 4 * 40 = 160

For,

Cone Weight : 2.5 kg

Yarn Length/Cone : 70, 000 m

Count : 17 Ne

For,

Cone Weight : 3.5 – 4.0 kg

Yarn Length/Cone : 47, 000 m

Count : 9 Ne

Figure 3.4: Re-coning machine

## 3.10 Direct Warping Machine

| | |
|---|---|
| Machine Name | : Karl Mayer |
| Origin | : China |
| Process | : Direct Warping |
| Rpm | : 1200 max |
| Creel Capacity | 660 |

Figure 3.5: Direct warping machine

## 3.11 Knit Winding Machine

| | |
|---|---|
| Machine Name | : Karl Mayer |
| Origin | : China |
| Quantity | : 7 machines |
| Production per Month | : 70 ton |
| Winding Roll | : Requirement |
| Cone Weight | : 2.0 kg |
| Bobbin Weight | : 0.5 gm |
| Creel Capacity | : 400 (1 - 6) & 440 (7) |
| Below 30 count Package Length | : 50,000 m |

Figure 3.6: Knit Winding machine

## Calculation of Production for Knit Winding

$$Production = \frac{\frac{Length\ (m)}{Count} * Ends}{1693\ (Constant)}$$

# Chapter: 04

# Rope Dyeing

# 4 Rope Dyeing

## 4.1 Dyeing

Dyeing in textiles is a process in which color is transferred to a finished textile or textile material (like fibers and yarns) to add permanent and long-lasting color. It can be done by hand or by machine. Dyes can come as powders, crystals, pastes or liquid dispersions, and they dissolve completely in an aqueous solution like water. When the textile and the dye come into contact, the textile is completely saturated by the dye and colored.

## 4.2 Types of Dyes

1. Natural Dyes
2. Synthetic Dyes
3. Acid Dyes
4. Basic Dyes
5. Vat Dyes
6. Sulphur Dyes…… etc.

## 4.3 Denim Dyeing

In Denim fabric dyed (indigo) yarn is used in warp direction and generally undyed yarn is used in weft direction. So for the warp yarn dyeing process is done. Dyeing process in manufacturing is the most crucial in the production sequence Till 1970's denim dyeing was indigo based. Then Sulphur dyes specially the Sulphur black were introduced. At present Sulphur dyes are used for pure black shade of denim or the different shade effect before or after indigo dyeing. Today the dyeing of denim in not limited to black and blue rather it is now vastly diversified in different shade which is produced using reactive and other classes of dyes through their popularity and production compatibility of denim.

## 4.4 Rope Dyeing

Believed to be the best possible dyeing method for yarn, the threads of denim yarn are initially twisted into a rope, then undergo a repetitive sequence of dipping and oxidization. The more frequent the dipping and oxidizing, the stronger the shade.

Rope dyeing consists of twisting the yarns into a rope that is then quickly dipped into dye baths. It is considered the best method for dyeing denim as the short dyeing time does not allow the dye to fully penetrate the fibers, thus creating ring-dyed yarn that fades better and faster than fully dyed yarn.

### 4.4.1 Types of shade in rope dyeing

1. Indigo (Vat Dye)
2. Black (Sulphur Dye)
3. Bottoming (Black + Indigo)
4. Topping (Indigo + Black)

Figure 4.1: Different shaded rope dyed yarn

### 4.4.2 Two types of dyes are used for rope dyeing

1. Indigo dye:

   Indigo dye is an organic compound with a distinctive blue color.

2. Sulfur dye:

   Sulfur dyes are the most commonly used dyes manufactured for cotton in terms of volume. They are cheap, generally have good wash-fastness and are easy to apply.


Figure 4.2: Dyed yarn in trolley

### 4.4.3 Rope Dyeing Flow chart

## 4.5 Basic Dyeing Recipe Components

- Dyes
- Hydrose / Reducing Agent
- Caustic Soda
- Wetting Agent
- Dispersing Agent
- Sequestering Agent
- Temperature
- Water liquor
- PH (9 – 10 / 10 – 12)

## 4.6 Leuco Form of Dyes

A dye which can switch between two chemical forms; one of which is colorless .....The colorless form is sometimes referred to as the leuco form.

## 4.7 Mercerization Recipe

- Caustic Soda (as required)
- Sequestering (as required)
- Wetting Agent (as required)
- Water (1000 gpl)
- Temperature (25 - 30)

Time Taken to Dye 1 rope

$$=( rope\ length/rpm\ ) * \frac{1}{60}$$

## 4.8 Function of Chemicals

### Sodium hydroxide or caustic (NaOH)

In mercerization or slight scouring sodium hydroxide remove natural impurities oil, grease, and other dust. During spinning and ball warping or any cases above impurities attach with the yarn.

### Wetting agent

The function of wetting agent is a surface-active agent. It reduces surface tension of solution as a result solution can easily entered.

### Dispersing agent

The function of dispersing agents is to spread the dye molecule evenly in the solution. As a result, dyeing performance get better in the material.

### Reducing agent

It is reducing agents which are used for soluble of Sulphur dye.

### Black redox

It is a reducing agent, which is used to broken or reduces the Sulphur molecule. Its directly make from glucose.

### Sequestering agent

The main function of sequestering agents is to remove hardness of water.

### Fixing agent (indisol)

It is a fixing agent. When needed dye absorption or dye uptake is more, then fixing agent is used. Naturally it is used for dark shade.

### Softener

Softener are the important for textile material which render the surface of the fiber smoother, lubricant, high spreading and penetrating power.

### Belfasin GT

It is a cationic softener when the material is entered into aqueous solution of cationic softener. The hydrophilic cat-ion of the softener is attracted and held on the negative site of the

fiber there by producing an only film on the fiber surface. This film producing a soft, handle and well lubricated surface on the fiber.

## 4.9 Machine Specifications

Table 4.1: Machine Specification of Different Rope Dyeing Machine

### 4.9.1 Machine No.: 01

| Sl. No. | Parameters | Specifications |
|---|---|---|
| **1.** | Brand Name | Morrison + Smartec (1) |
| **2.** | Origin | USA + China |
| **3.** | Creel Capacity | 64 |
| **4.** | Rope Capacity | 32 |
| **5.** | Speed | 22 to 28 rpm |
| **6.** | Cylinder | 36 |
| **7.** | Mercerize Tank | 01 |
| **8.** | Wash Tank | 05 (Pre Wash) |
| | | 06 (Post Wash) |
| **9.** | Dyeing Tank | 10 |
| **10.** | Softener Tank | 01 |
| **11.** | Process | Continuous Dyeing |
| **12.** | Medium | Alkaline |
| **13.** | Length of Rope inside machine | 600 m |
| **14.** | Dipping Time | 26 – 30 sec (depends on rpm) |
| **15.** | Oxidation Time | 1 – 2 min (depends on rpm) |

Figure 4.3: Morrison & Smartec machine (Denim 1)

### 4.9.2 Machine No.: 02

| Sl. No. | Parameters | Specifications |
|---|---|---|
| **1.** | Brand Name | Smartec (2) |
| **2.** | Origin | China |
| **3.** | Creel Capacity | 40 |
| **4.** | Rope Capacity | 40 |
| **5.** | Speed | 30 rpm |
| **6.** | Cylinder | 36 |
| **7.** | Mercerize Tank | 01 |
| **8.** | Softener Tank | 01 |
| **9.** | Wash Tank | 04 (Pre Wash) |
| | | 04 (Post Wash) |
| **10.** | Dyeing Tank | 10 |
| **11.** | Softener Tank | 01 |
| **12.** | Process | Continuous Dyeing |
| **13.** | Medium | Alkaline |
| **14.** | Length of Rope inside machine | 1000 m |
| **15.** | Dipping Time | 26 – 30 sec (depends on rpm) |
| **16.** | Oxidation Time | 1 – 2 min (depends on rpm) |


Figure 4.4: Smartec Machine 2

### 4.9.3 Machine No.: 03

| Sl. No. | Parameters | Specifications |
|---|---|---|
| **1.** | Brand Name | Smartec (1) |
| **2.** | Origin | China |
| **3.** | Creel Capacity | 32 |
| **4.** | Rope Capacity | 16 |
| **5.** | Speed | 30 rpm |
| **6.** | Cylinder | 36 |
| **7.** | Mercerize Tank | 01 |
| **8.** | Softener Tank | 01 |
| **9.** | Wash Tank | 02 (Pre-Wash) |
| | | 03 (Post Wash) |
| **10.** | Dyeing Tank | 10 |
| **11.** | Softener Tank | 01 |
| **12.** | Process | Continuous Dyeing |
| **13.** | Medium | Alkaline |
| **14.** | Length of Rope inside machine | 1000 m |
| **15.** | Dipping Time | 26 – 30 sec (depends on rpm) |
| **16.** | Oxidation Time | 1 – 2 min (depends on rpm) |

Figure 4.5: Smartec Machin

## 4.10 Flow Chart of Indigo (Vat) & Black (Sulphur) Dyeing

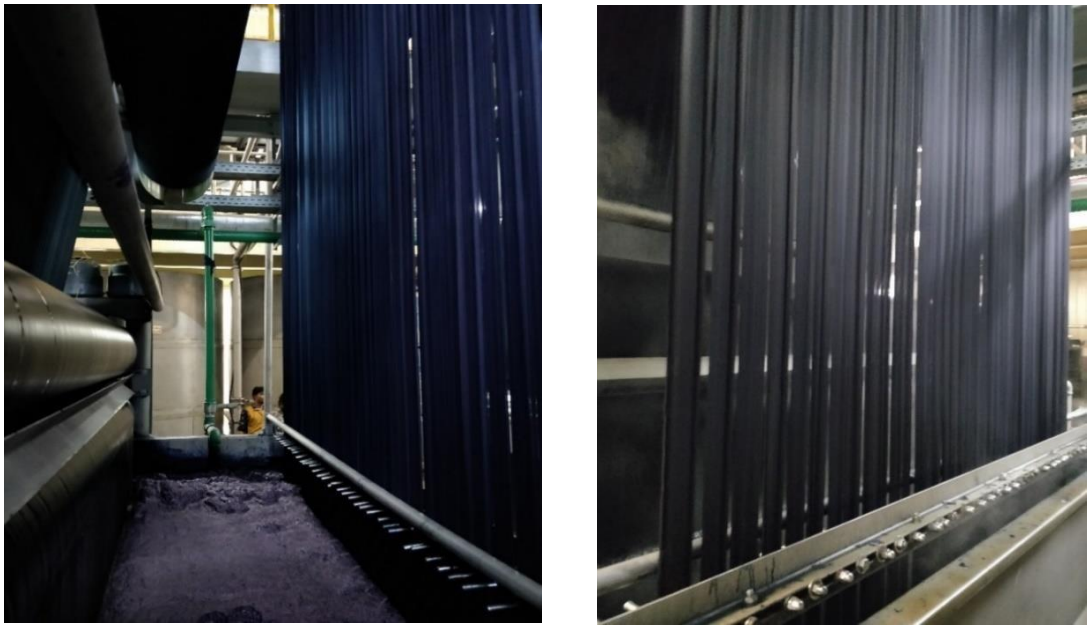



Figure 4.6: Rope at the dye bath

## 4.11 Flow Chart of Topping Color

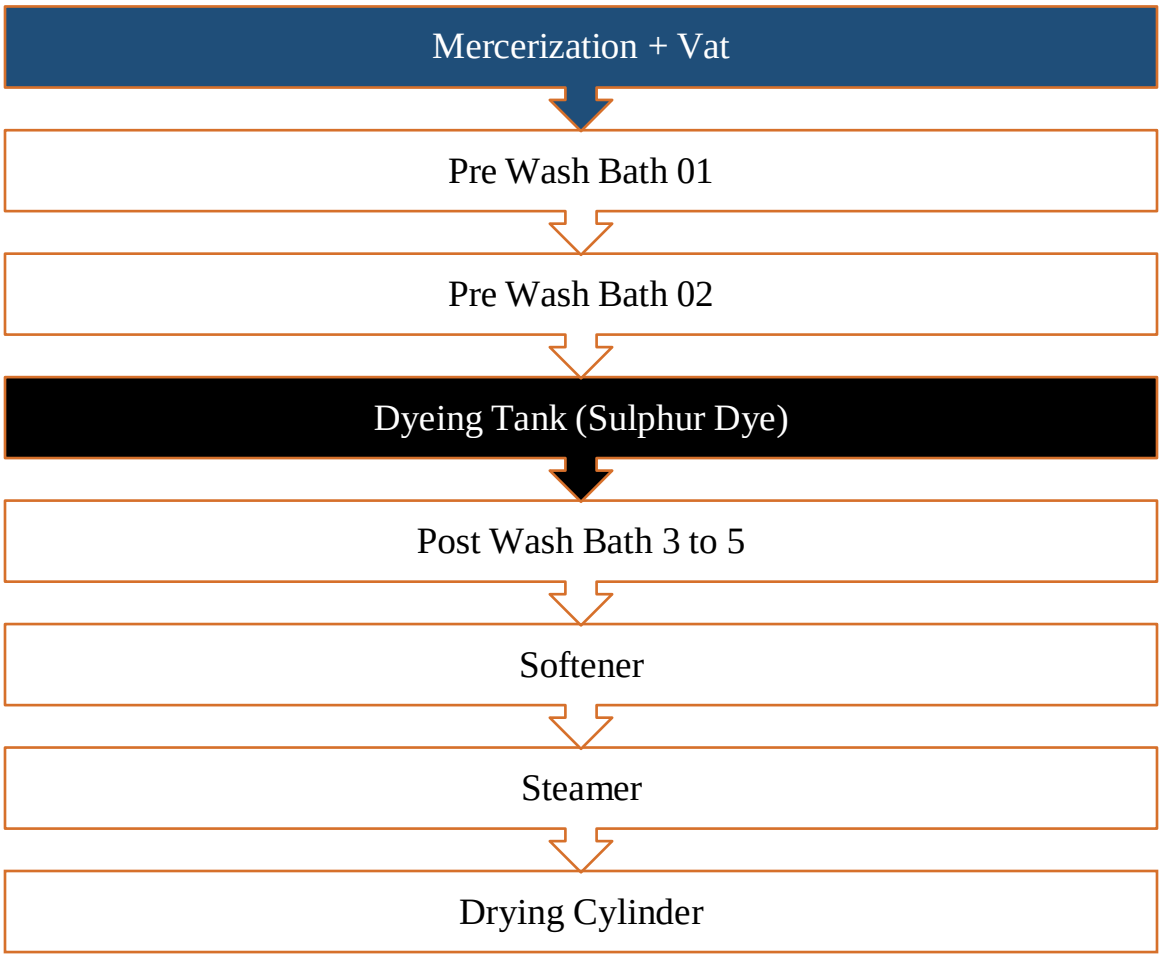
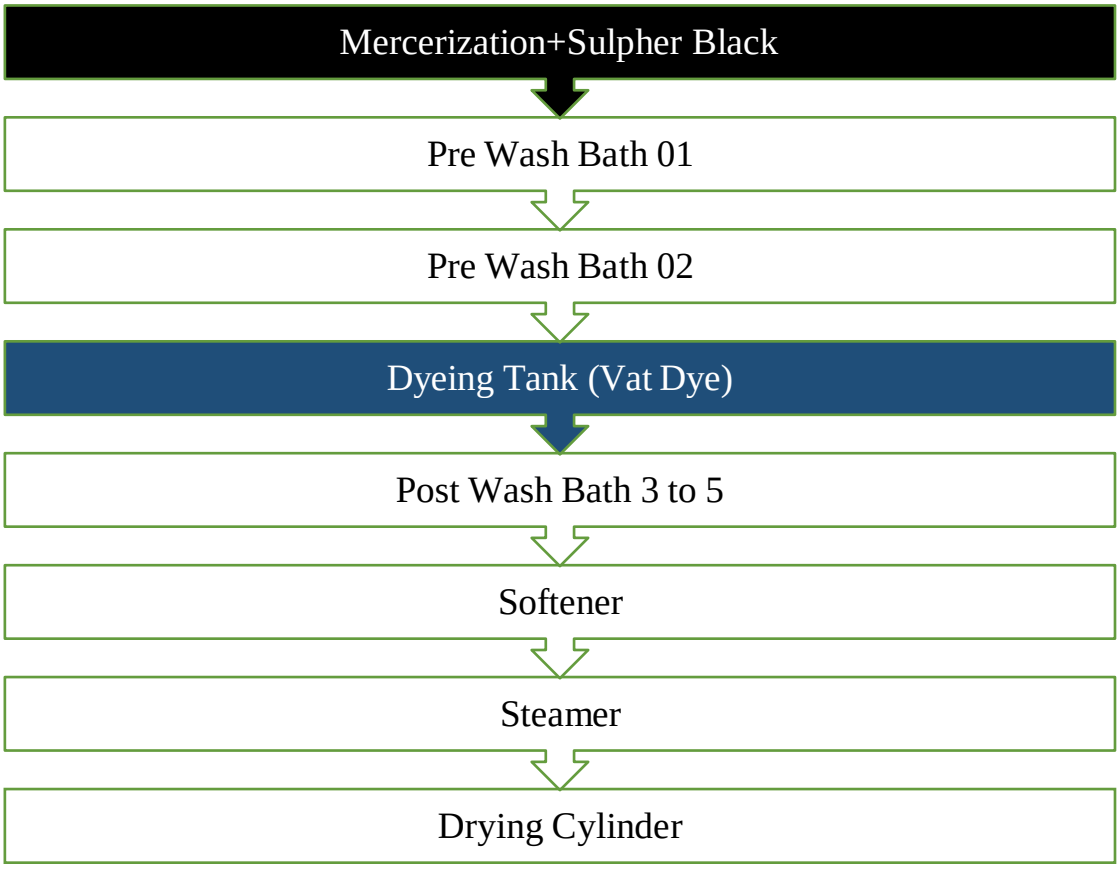



Figure 4.7: Topping color dyed yarn

## 4.12 Flow Chart of Bottoming Color



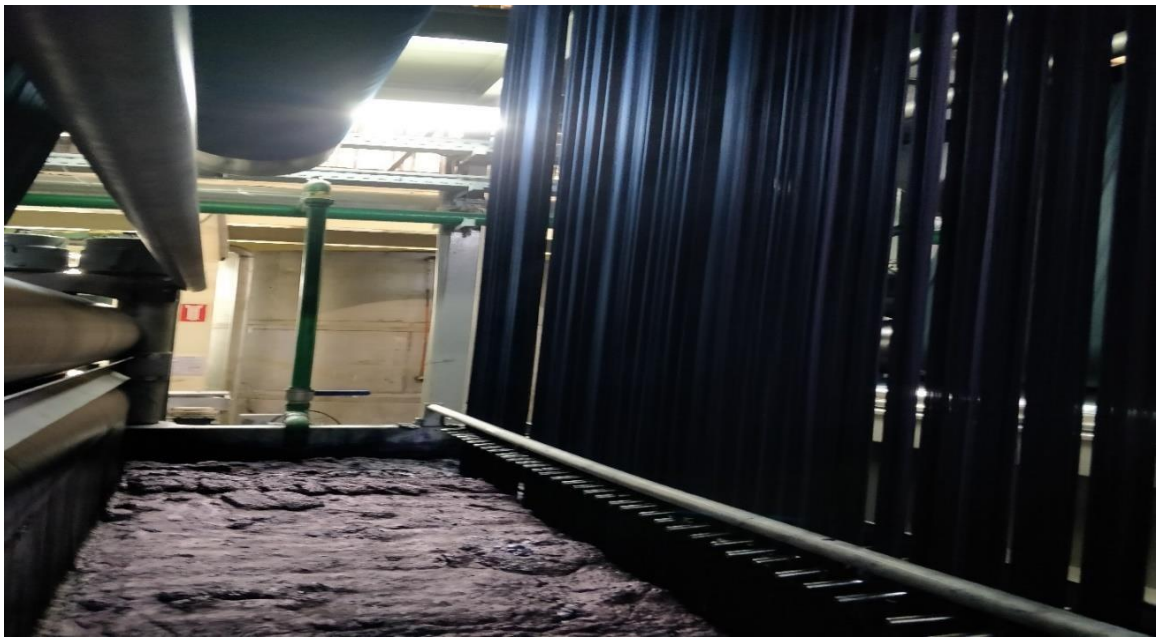



Figure 4.8: Bottoming color dyed yarn

## 4.13 Dyeing Lab Instrument

### 4.13.1 Spectrophotometer:

We measure the concentration of black or indigo in the box solution. But here only black gpl measured. It is very essential because shade dark or light depend on GPL (gram per liter) which is measured by this instrument. Here used concentration factor is 720 and wave length 695 nm respect to black.

**Brand Name** : HACH

**Model** : LICO 500

**Origin** : Germany

**Use** : Check GPL

Figure 4.9: Spectrophotometer

### Process:

A definite amount of bath solution taken in a biker which contain 1L water and stirring and first the instrument check digit 0 but standard water and definite solution(5ml) set up in the spectrophotometer and show the result on the monitor by GPL.

### 4.13.2 Metrohm:

This is most important instrument in dyeing. which measure the PH of the black and indigo and also measure GPL (gram per liter) of indigo and hydro in bath solution.

**Brand Name:** Metrohm

**Model:** 877 Titrino Plus

**Origin: Switzerland**

**Use:** Test GPL of Indigo & Hydro & measure Redox Potential for Reducing agent.

Figure 4.10: Metrohm

**Brand Name:** Metrohm

**Model:** 794 Basic Titrino

**Origin:** Switzerland

**Use:** Used to check PH

### 4.13.3 Baume meter:

By using this meter, we can measure the concentration of caustic in the mercerizing box.

**Process:**

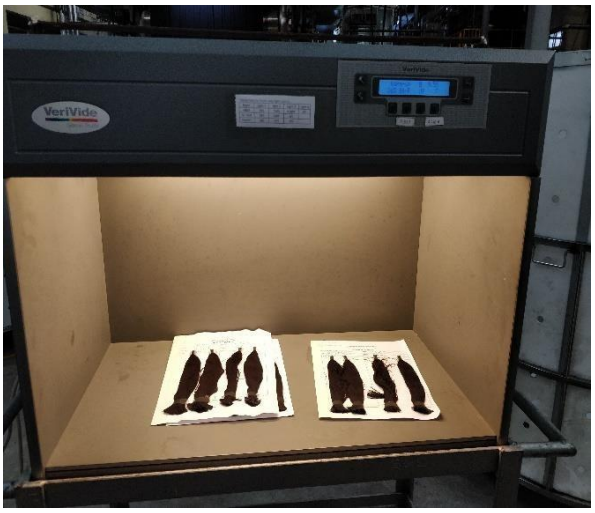
At first taken mercerizing solution in a biker of volume of 500 ml (or any volume) . And then Baume meter enter the solution. After observation the top of the meter, the number of meter which floating on the solution that number indicate the concentration of caustic in solution.

### 4.13.4 Light box:

This is another most important instrument in every dyeing lab. Here there are four type of light such as $D_{65}$ (artificial day light), $TL_{84}$ (Narrow and phosphor florescent lamp), UV (ultraviolet black light) which is used to detect the presence of OBA (optical brightening agent, it is used for knit composite factory)

But we always used $D_{65}$ because specified for most application where there is a maintain color consistence and quality conforming.

**Day Light (D65)**



**A – Light (OBA)**

**UV Light (H&M, Levis)**

**TL 83 (Warm Up Brown)**

Figure 4.11: Light box cabinet

### 4.13.5 Color Testing Procedure

Dimethyl Formamide Test (DMF)

1. Take 100 ml DMF
2. Put the swatch in the beaker with DMF solution
3. Heat the Solution to Boiling Point
4. Heat for 10 to 12 minutes
5. Check the shade
    a) Full white – Indigo
    b) No Change – Black
    c) Brown – Topping
    d) Light Brown – Bottoming

Nitric Acid Test

1. Cut a sample with GSM cutter
2. Put a drop of nitric acid on it
3. Check the change of color

## 4.14 Parameters Considered for Dyeing Process

1. Squeeze roller pressure
2. Dancer roller pressure
3. Temperature of every box
4. Dry zone: steam pressure
5. Rope moisture
6. Indigo or Black
    a) Temperature
    b) Bath ph
    c) Stock ph
    d) Stock vat(gpl)
    e) Shade percentage
    f) Dosing
    g) Hydro
    h) Dye circulation rate
7. Softener

# Chapter: 05

# Long Chain Beamer

# 5 Long Chain Beamer

After the rope dyeing of warp yarn in denim production, the next operation is the Long Chain Beamer (LCB). When the rope has been dyed and dried in the rope dyeing, it is taken in large cans in coiler section. In rope dyeing range, if the machine has a capacity 24 ropes, then there will be 24 separate coilers which delivers 24 ropes in separate cans. These cans are transferred to the Long Chain Beaming area. The basic purpose of long chain beamer is to open the rope into a sheet form of yarn and wind onto a sizing beam which in turn transferred to the sizing machine.

In Long Chain Beamer, the yarn alignment in the dyed rope is change from a rope form to a sheet form. In the Long Chain Beamer, the rope pulls from the can by moving them upward to a guiding device. The guiding device is mounted above the can, probably in the ceiling. The upward movement of the rope allows the ropes to entangle before nearing the beamer head and allow the rope to shake loose form from the rest of the rope in the can.

## 5.1 Purpose of LCB Department

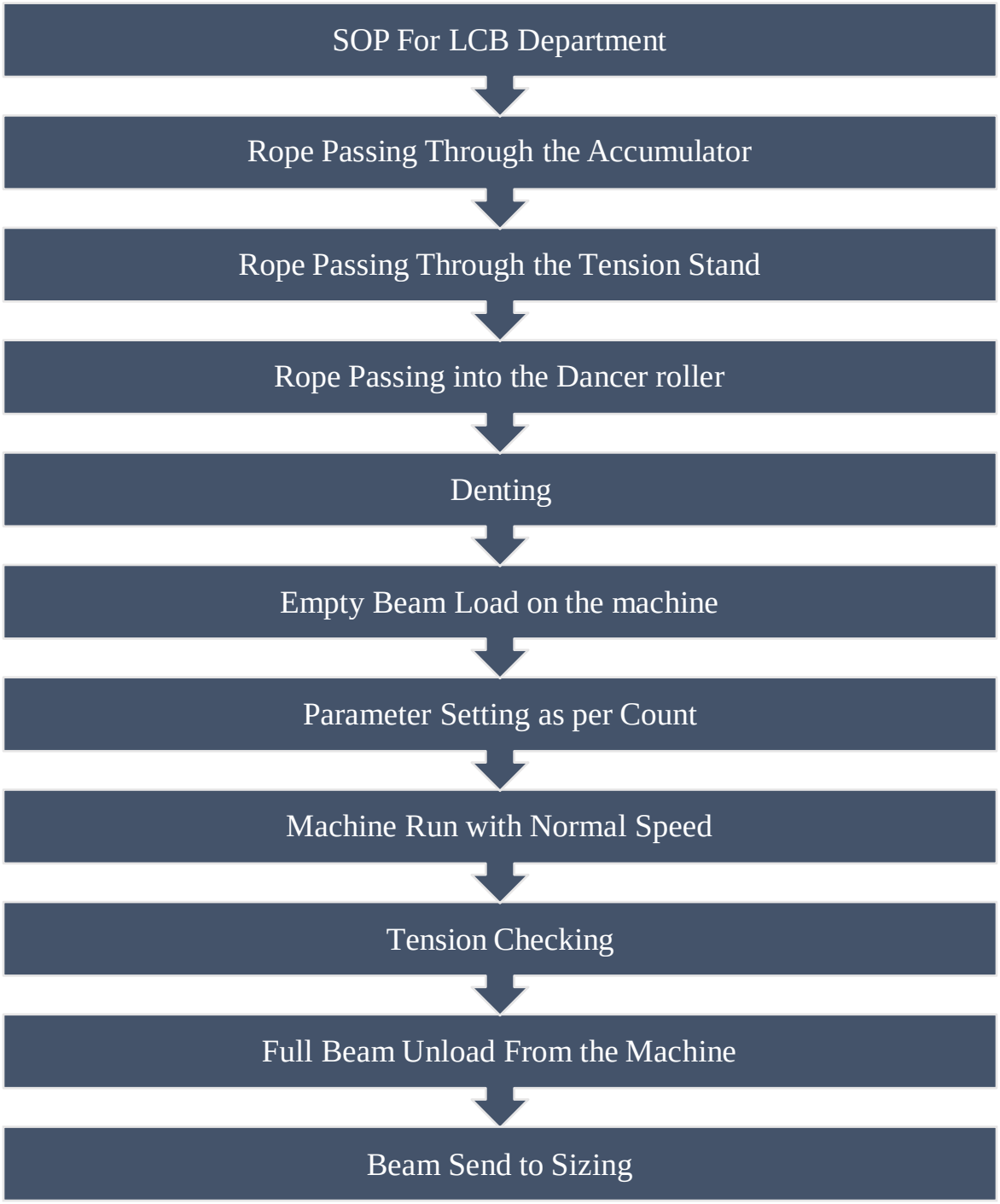
- The alignment of dyed rope converted to a uniform sheet form.
- This is the opposite action of ball warping.
- Prepare the yarn for sizing.

## 5.2 Procedure of Long Chain Beaming

- Receive program from dyeing section
- Put on the power switch
- Make the count wise parameter on the m/c, tension, speed, lease, ends
- Then clean the machine carefully
- Set up the loaded Rope Can under accumulator
- Complete the yarn passage from rope can to head stock via accumulator, tension stand & dancer roller
- Do the reed denting
- Set up reed with machine
- Load empty beam on the machine
- Put the safety guard on place
- Firstly run the machine at slow speed and then slowly increase the m/c speed

- After finishing 12 beams, 1 program will be complete & the production data should be filled up in the relevant production sheet.

## 5.3 Flow Chart for LCB



## 5.4 Schematic Diagram of LCB machine

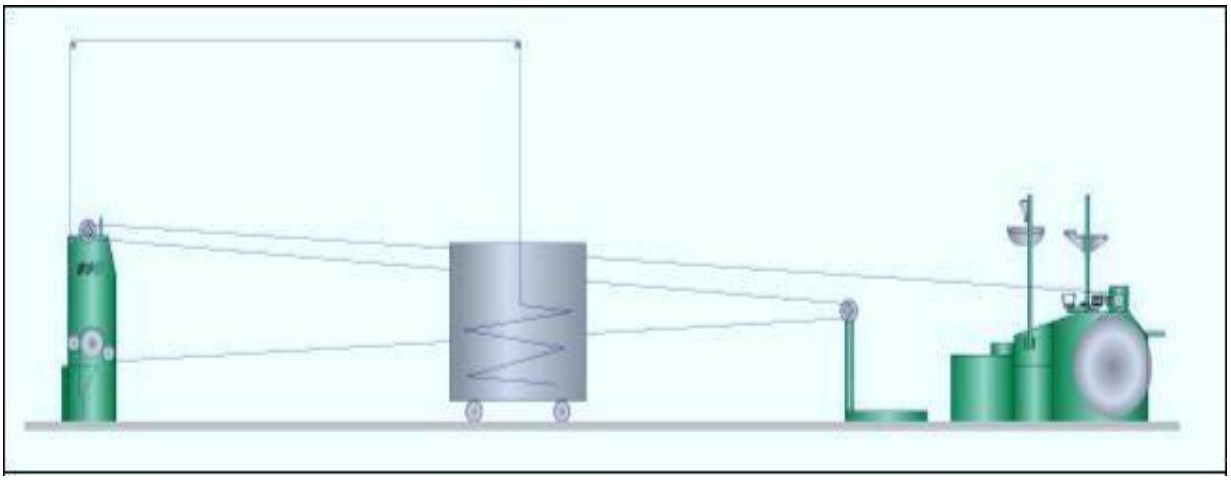


Figure 5.1: Schematic diagram of LCB machine

## 5.5 Machine Specifications

Table 5.1: Machine Specification of different LCB Machine

| No. of m/c | Brand Name | Origin | Speed | Stop Motion |
|---|---|---|---|---|
| 18 | Karl Mayer | China | 160 – 300 rpm | Electrical |
| 02 | Morrison | USA | 170 – 250 rpm | No Sensor |
| 08 | Griffin | USA | 170 – 250 rpm | Electrical |

## 5.6 Image of Machine

Figure 5.2: Morrison & Griffin machine (LCB)

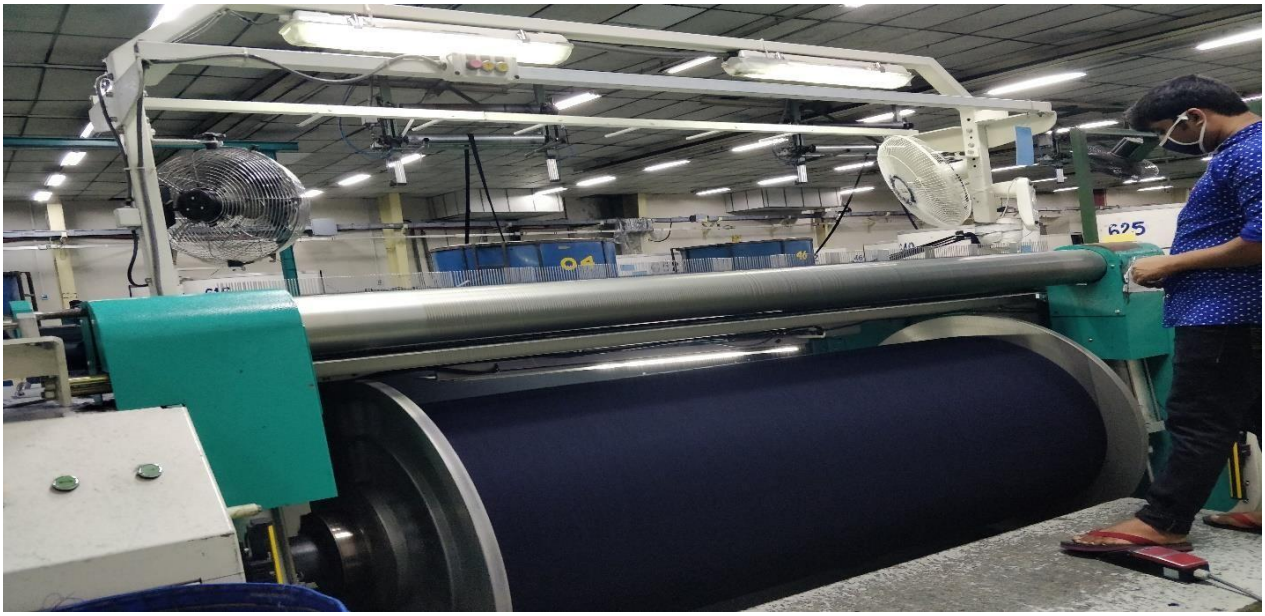


Figure 5.3: Karl Mayer machine (LCB)

## 5.7 Name and Function of machine parts

**Accumulator**

It is used the reverse and forward movement of the rope as per required when the yarn breakage.

**Sensor**

It is used when the rope breaks or winding with each other or ending rope inside the can then it stops the machine automatically.

**Tension stand**

It is used to maintain the tension level of the yarn.

**Dancer roller**

If the tension remains in the yarn after using tension stand then dancer roller will maintain that yarn tension.

**Stomach**

This device as like a chain which rotate contract of the yarn as a result the yarn remain in tension and easily enter into the reed dent.

**Reed**

The separation of yarn one by one by using reed.

**Head stock**

The empty beam feed in the head stock. When complete the required length on the beam, then full beam is replaced by the empty beam.

## 5.8 Count wise tension and speed of machine

Table 5.2: Count-wise tension and speed of Machine

**Section-1**

| m/c no | 6 count | | 7 count | | 9,10 count | | 12 count | | 16 count | | 20 count | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| 1 -8 | 80/ 85 | 180/ 200 | 75/ 80 | 200/ 250 | 68/ 73 | 200/ 250 | 60/ 65 | 200/ 250 | 50/ 55 | 160/ 200 | 45/ 50 | 150/ 170 |
| 9-10 | 33/ 38 | 160/ 180 | 30/ 35 | 200/ 250 | 23/ 28 | 200/ 250 | 20/ 25 | 200/ 250 | 17/ 22 | 160/ 200 | 15/ 20 | 150/ 170 |

**Section-2**

| m /c no | 6 count | | 7 count | | 9,10 count | | 12 count | | 16 count | | 20 count | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| 1-12 | 90/ 100 | 200/ 250 | 90/ 100 | 200/ 250 | 85/ 90 | 200/ 250 | 80/ 85 | 200/ 250 | 70/ 75 | 180/ 200 | 65/ 70 | 160/ 180 |

## 5.9 Faults of LCB

- Bunch formation (for problem of chemical)
- Broken end (causes of lapper)
- Sticky problem (for softener problem)
- More or less moist rope ( for problem of steam setting )
- Ball formation
- Count mixing
- Rope crossing or losing open

## 5.10 Calculation Report of LCB (Example Only)

Breaks/Million meter =

(Total breaks *1000000) / (Total ends per rope*program length*No of beam)

= (368*1000000) / (400*10500*16)
= 6

Since acceptable range of LCB section is 6.

So, this yarn quality is very good.

## 5.11 Input and Output of LCB

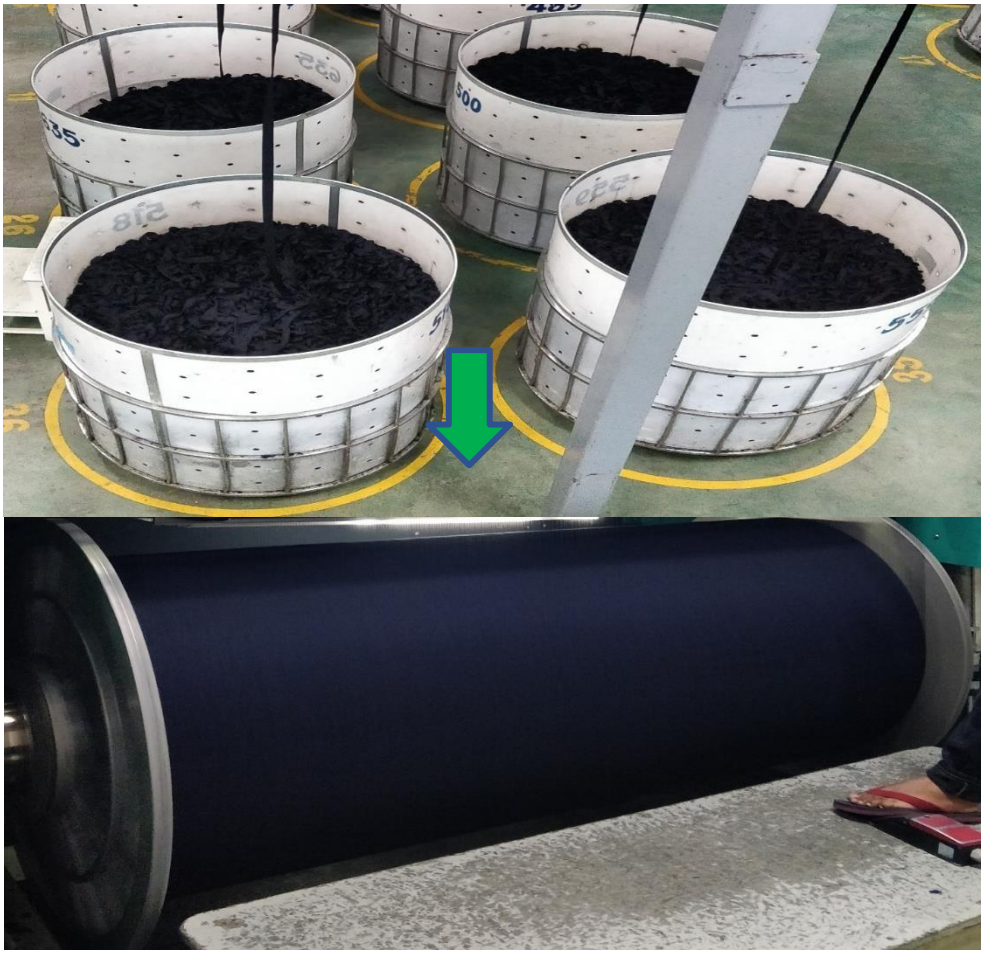


Figure 5.4: Input and Output of LCB

# Chapter: 06

# Sizing

# 6 Sizing

The process of applying a protective adhesive coating upon the yarns surface id called sizing. This is the most important operation to attain maximum weaving efficiency especially for blended yarns. Due to sizing increase elasticity of yarn, strength of yarn, weight of the yarn, smoothness, frictional resistance.

## 6.1 Objects of Sizing

- To improve the weave ability of warp yarn.
- To maintain good fabric quality by reducing hairiness, weakness and by increasing smoothness, strength of yarn.
- To increase the tensile or breaking strength for cellulose yarn.
- To maintain good quality of fabric.
- To increase the elasticity
- To remove the projecting fibers.
- To remove yarn irregularity by increasing yarn dia.

## 6.2 Changes in Yarn Due to Sizing

- Breaking strength : Increase
- Abrasion resistance : Increase
- Stiffness : Increase
- Elasticity : Increase
- Frictional resistance : Increase
- Yarn diameter : Increase
- Extension : Decrease
- Electrostatic charge : Decrease

## 6.3 Machine Specifications

Table 6.1: Machine Specification of Different Sizing Machine

| Machine No. | Brand Name | Origin | Speed | Capacity | Size Box | Drying Zone |
|---|---|---|---|---|---|---|
| **1.** | Griffin (1) | USA | 55 -65 rpm | 12 | 02 | 04 |

### 6.3.1 Parameters

**Drying Zone**

**Zone 1 (5 Cylinder)** **:** 110◦C - 120◦C

**Zone 2 (5 Cylinder)** **:** 110◦C - 120◦C

**Zone 3 (5 Cylinder)** **:** 110◦C - 120◦C

**Zone 4 (5 Cylinder)** **:** 105◦C - 110◦C

Figure 6.1: Griffin Sizing machine 1

### 6.3.2 Heat Setting

**Size Box 1** : 88◦C - 90◦C

**Size Box 2** : 88◦C - 90◦C

### 6.3.3 Tension

**Creel** : 21 – 35 g/e

**Lease** : 43 – 75 g/e

**Beam** : 48 – 85 g/e

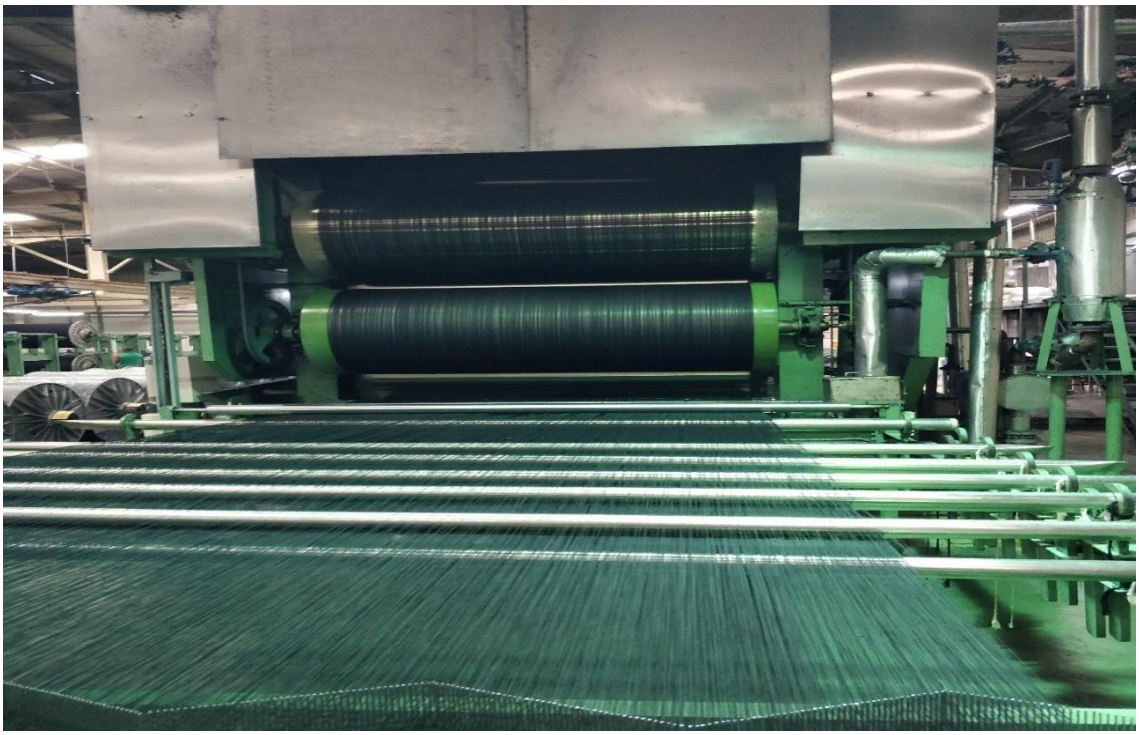


Figure 6.2: Sized yarn passing through guide

## 6.4 Machine Specifications

| Machine No. | Brand Name | Origin | Speed | Capacity | Size Box | Drying Zone |
|---|---|---|---|---|---|---|
| **2.** | UKIL (3) | Korea | 35 -70 mpm | 16 | 02 | 04 |

### 6.4.1 Parameters

**Drying Zone**

**Zone 1 (5 Cylinder)** **:** 110◦C - 135◦C

**Zone 2 (5 Cylinder)** **:** 110◦C - 135◦C

**Zone 3 (5 Cylinder)** **:** 110◦C - 120◦C

**Zone 4 (5 Cylinder)** **:** 105◦C - 130◦C

**Zone 5 (5 Cylinder)** **:** 100◦C - 120◦C

Figure 6.3: UKIL Sizing machine 2

### 6.4.2 Heat Setting

**Size Box 1** : 80◦C - 90◦C

**Size Box 2** : 80◦C - 90◦C

### 6.4.3 Tension

**Creel** : 27 – 32 g/e

**Lease** : 40 – 60 g/e

**Beam** : 50 – 70 g/e

Figure 6.4: Yarn passing through size bath

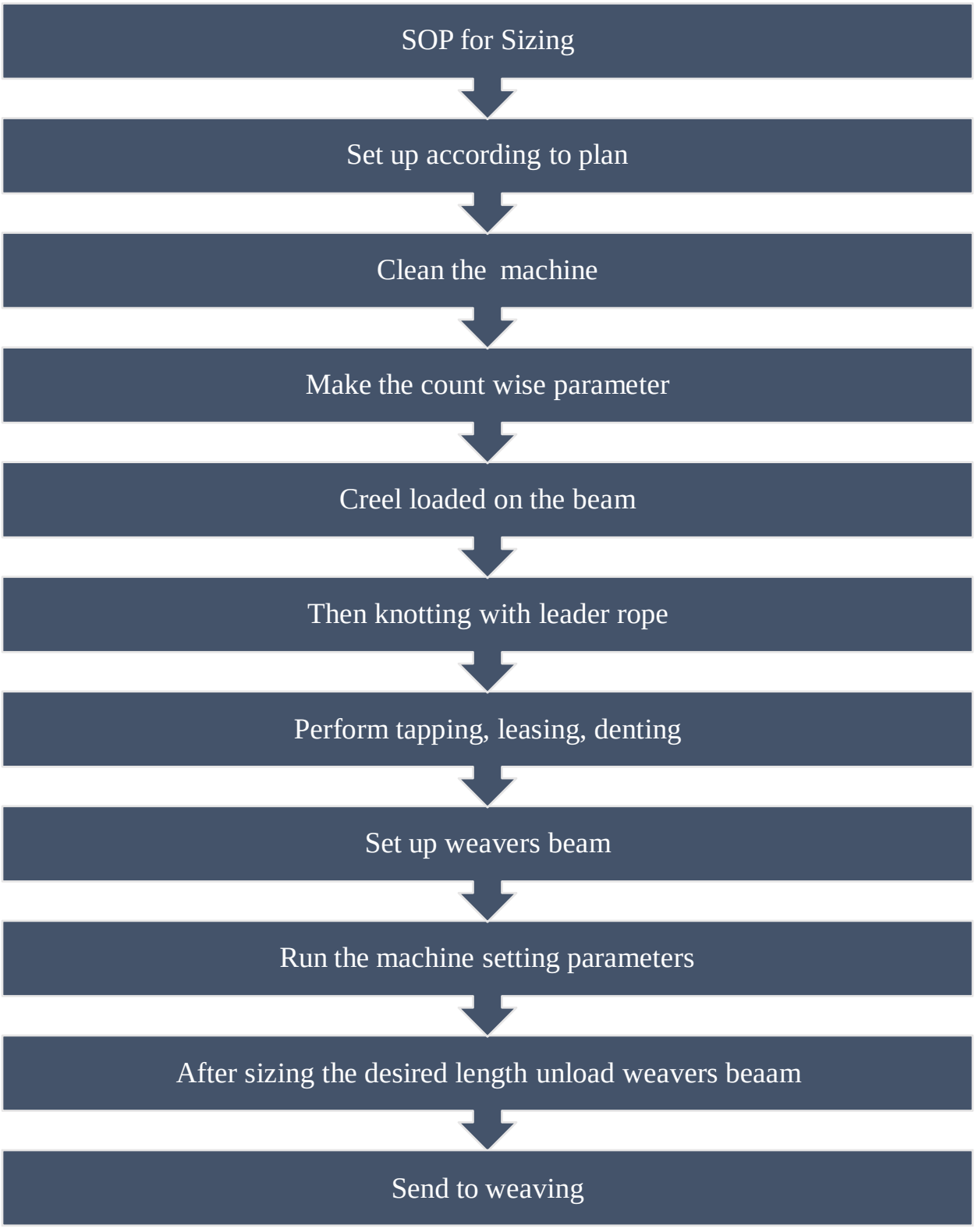
## 6.5 Beam Stocker

Table 6.2: Specification of Beam Stocker Machine

| Machine No. | Brand Name | Origin | Storage | Capacity | Power | Dimensions |
|---|---|---|---|---|---|---|
| **3.** | WJK 90 (3) | China | 32 | 13.5 ton | 7.5 kw | 13427mm*3000mm *5680mm |

Figure 6.5: Beam Stocker

## 6.6 Flow Chart of Sizing



## 6.7 Chemicals Used in Sizing Section

1. Starch
    a. Size tex-5
    b. Kollo tex-5
    c. Kollo tex-750
    d. Quick solan SPR
2. Binder
    a. Tem size
3. Softener
    b. Wax


Figure 6.6: Size Kitchen

## 6.8 Size Cooking Process

1. Add cold water to cooking.
2. All of the water should be added before adding materials.
3. Start the agitator and circulating pump.
4. Add the proper amount of starch and other chemical.
5. Add the proper amount of wax.
6. Inject live steam to raise temperature to 80-90$^0$c and stir at this temperature for 20-30 minutes.
7. If starch is present, temperature should be 85 – 99$^0$ c stir for 30 – 45 minutes.
8. Add any liquid binders as appropriate. Stir for 2-3 minutes
9. Check final solids and viscosity and add to adjust as needed.

## 6.9 Functions of Chemicals

### 6.9.1 Adhesive: Size tex-5, Kollo tex-5, Kollo tex-750, Quick solan SPR.

- To improve strength
- To increase smoothness
- To increase elasticity and stiffness
- Reduce extension percentage
- Impart adhesion

### 6.9.2 Lubricant or softener: Wax

- To smoothen the yarn
- To reduce stiffness
- Reduce flexibility and friction

### 6.9.3 Hygroscopic agent: Calcium chloride, magnesium chloride, glycerin etc.

- To moisture the yarn
- To prevent excessive drying of yarn

## 6.10 Sizing Faults

1. Loose yarn
2. Tight yarn
3. Beam stain
4. Slack yarn
5. Ball formation
6. Miss yarn
7. Cross yarn
8. Bunch
9. Loose site of beam

## 6.11 Count wise refraction value, Viscosity and Pick up Percentage

Table 6.3: Count-wise refraction value, viscosity and pick-up percentage of yarn

| Count | Refraction Value | Viscosity | Pick Up (%) |
|---|---|---|---|
| 6 | 0 % | 21 – 26 | 8 % - 11 % |
| 7 | 1 % | | |
| 9 | 1 % | | |
| 10 | 1 % | | |
| 12 | 1 % | | |
| 16 | 2 % | 27 – 31 | |
| 20 | 2 % | | |

## 6.12 Effect of Temperature and Tension in Sizing

- Lower Count Yarn Higher Temperature and Tension
- Higher Count Yarn Lower Temperature and Tension

# Chapter: 07

# Weaving

# 7 Weaving

Weaving is a process of interlacement of two sets of threads namely the warp and weft threads in lengthwise and crosswise respectively to form a fabric. The Weaving loom introduces machine settings like warp and weft tension, speed, fabric design, ends per inch, pick per inch and many other loom settings to achieve the denim fabric property like width, twill design and weight of fabric in Oz/yds.

Figure 7.1: Weaving

## 7.1 Basic Weaving Mechanism

### 7.1.1 Shedding:

The process of separating the warp yarn into two layers by raising the heald to form an open area between two sets of warps and known as shed

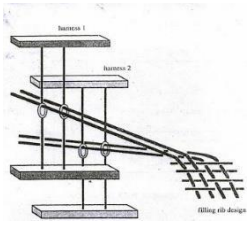


Figure 7.2: Shedding

### 7.1.2 Picking mechanism

The picking mechanism passes weft thread from one selvedge of the fabric to the other through the shed by means of a shuttle, a projectile, a rapier, a needle, an air-jet or a water-jet. The inserted weft thread is known as “pick

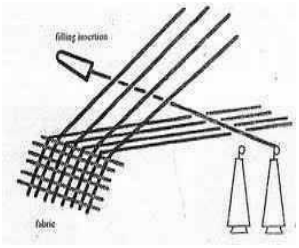


Figure 7.3: Picking

### 7.1.3 Beat-up mechanism

The beat-up mechanism beats or pushes the newly inserted length of weft thread (pick) into the already woven fabric at a point known as “fell of the cloth”. These three mechanisms namely shedding, picking and then beat-up are done in sequence

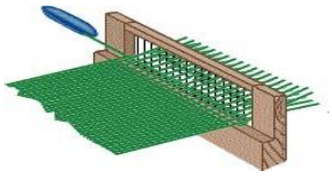
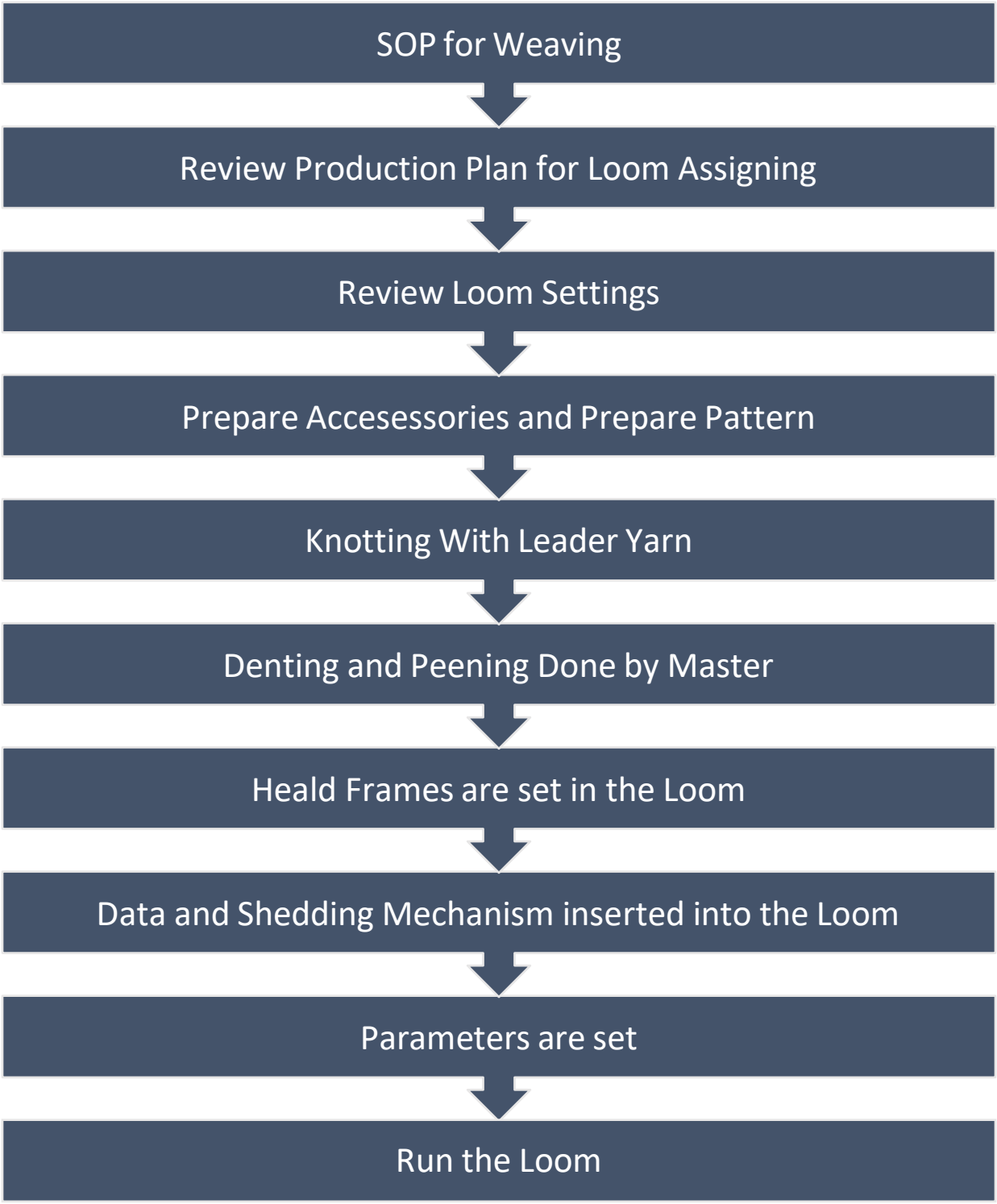


Figure 7.4: Beat-up

## 7.2 Weaving Flowchart



## 7.3 Machine Specifications

Table 7.1: Machine Specification of Different Weaving Machine

### 7.3.1 Machine No.: 01

| Sl. No | Parameters | Specifications |
|---|---|---|
| **1.** | Machine Name | Airjet Loom |
| **2.** | Brand | TsudKoma |
| **3.** | Origin | Japan |
| **4.** | Model No. | ZAX 9100 |
| **5.** | Manufacturer | TsudKoma Co. |
| **6.** | Machine Speed | 700 rpm (max 900 rpm) |
| **7.** | Reed Width | 190 cm |
| **8.** | Weft Insertion | 2 ways |
| **9.** | Type | Full Automatic |
| **10.** | Selvedge Type | Full Cross Leno |
| **11.** | No. of Machine | 112 |
| **12.** | Pressure | 6 bar (max 13 bar) |

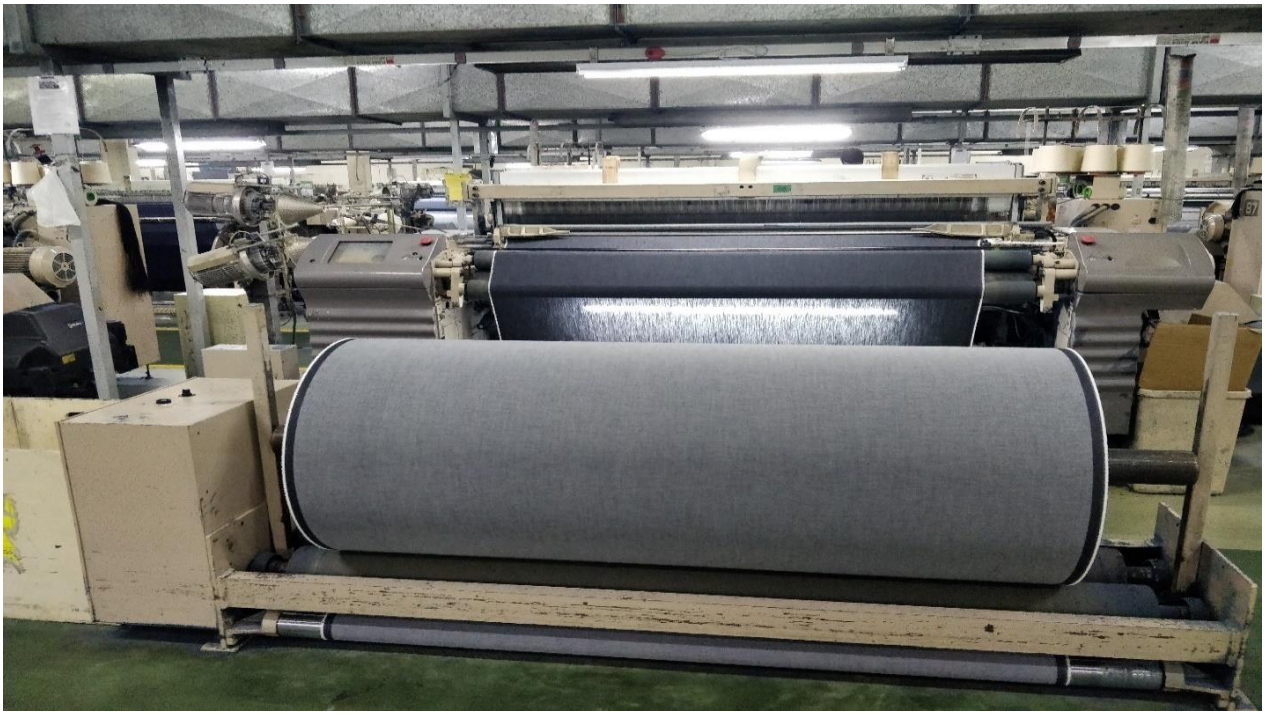


Figure 7.5: Tsudakama Air jet loom

### 7.3.2 Machine No.: 02

| Sl. No | Parameters | Specifications |
|---|---|---|
| **1.** | Machine Name | Rapier Loom |
| **2.** | Brand | Picanol Optimax |
| **3.** | Origin | Belgium |
| **4.** | Model No. | Picanol Optimax 4r |
| **5.** | Manufacturer | Belgium |
| **6.** | Machine Speed | 550 – 600 rpm (700 max) |
| **7.** | Reed Width | 190 cm |
| **8.** | Weft Insertion | 6 way |
| **9.** | Type | Automatic |
| **10.** | Selvedge Type | Half Cross Leno |
| **11.** | No. of Machine | 19 |


Figure 7.6: Picanol Optimax Rapier loom

### 7.3.3 Machine No.: 03

| Sl. No | Parameters | Specifications |
|---|---|---|
| **1.** | Machine Name | Airjet Loom |
| **2.** | Brand | Picanol Omniplus |
| **3.** | Origin | Belgium |
| **4.** | Model No. | Picanol Omniplus 800 |
| **5.** | Manufacturer | Belgium |
| **6.** | Machine Speed | 800 rpm (1000 max) |
| **7.** | Reed Width | 190 cm |
| **8.** | Weft Insertion | 2 way |
| **9.** | Type | Automatic |
| **10.** | Selvedge Type | Full Cross Leno |
| **11.** | No. of Machine | 01 |
| **12.** | Pressure | 6 bar (max 9 bar) |

Figure 7.7: Picanol Omniplus Air jet loom

### 7.3.4 Machine No.: 04

| Sl. No | Parameters | Specifications |
|---|---|---|
| **1.** | Machine Name | Airjet Loom |
| **2.** | Brand | Picanol Omniplus Summum |
| **3.** | Origin | Belgium |
| **4.** | Model No. | Picanol Omniplus Summum |
| **5.** | Manufacturer | Belgium |
| **6.** | Machine Speed | 700 - 800 rpm (1000 max) |
| **7.** | Reed Width | 190 cm (78 m/c)<br>220 cm (64 m/c) |
| **8.** | Weft Insertion | 4 way |
| **9.** | Type | Automatic |
| **10.** | Selvedge Type | Full Cross Leno |
| **11.** | No. of Machine | 142 |
| **12.** | Pressure | 9 bar (max 13 bar) |


Figure 7.8; Picanol Omniplus Summon Air jet loom

### 7.3.5 Machine No.: 05

| Sl. No | Parameters | Specifications |
|---|---|---|
| **1.** | Machine Name | Rapier Loom |
| **2.** | Brand | Picanol GT Max |
| **3.** | Origin | Belgium |
| **4.** | Model No. | Picanol GT |
| **5.** | Manufacturer | Belgium |
| **6.** | Machine Speed | 650 rpm (800 max) |
| **7.** | Reed Width | 190 cm (78 m/c) |
| **8.** | Weft Insertion | 2 way |
| **9.** | Type | Automatic |
| **10.** | Selvedge Type | Half Cross Leno |
| **11.** | No. of Machine | 40 |
| **12.** | Pressure | 6 bar (max 13 bar) |


Figure 7.9: Picanol GT-Max Rapier loom

### 7.3.6 Machine No.: 06

| Sl. No | Parameters | Specifications |
|---|---|---|
| **1.** | Machine Name | Airjet Loom |
| **2.** | Brand | Toyota |
| **3.** | Origin | Japan |
| **4.** | Model No. | T-500 |
| **5.** | Manufacturer | Toyota |
| **6.** | Machine Speed | Max 500 rpm |
| **7.** | Reed Width | 190cm |
| **8.** | Weft Insertion | 2 Shuttle |
| **9.** | Type | Automatic |
| **10.** | No. of Machine | 40 |

Figure 7.10: Toyota Air jet loom

### 7.3.7 Machine No.: 07

Table 7.2: Specification of Warp Tying Machine

| Sl. No | Parameters | Specifications |
|---|---|---|
| **1.** | Machine Name | Warp Tying Machine |
| **2.** | Brand | Todo |
| **3.** | Origin | Japan |
| **4.** | Model No. | - |
| **5.** | Manufacturer | TODO, Japan. |
| **6.** | No. of Machine | 02 |


Figure 7.11: Warp Tying machine

### 7.3.8 Machine No.: 08

Table 7.3: Specification of Bobbin Winder Machine

| Sl. No | Parameters | Specifications |
|---|---|---|
| **1.** | Machine Name | Bobbin Winder |
| **2.** | Brand | Harutz |
| **3.** | Origin | Japan |
| **4.** | Manufacturer | Izumi International |
| **5.** | No. of Machine | 02 |

Figure 7.12: Bobbin Winder

## 7.4 Secondary Mechanisms

These mechanisms are next in importance to the primary mechanisms. If weaving is to be continuous, these mechanisms are essential. So they are called the secondary‟ mechanisms. They are: a. Take-up motion b. Let-off motion

### 7.4.1 Take-up motion

The take-up motion withdraws the cloth from the weaving area at a constant rate so as to give the required pick-spacing (in picks/inch or picks/cm) and then winds it on to a cloth roller.

Figure 7.13: Take-up mechanism

### 7.4.2 Let-off motion.

The let-off motion delivers the warp to the weaving area at the required rate and at constant tension by unwinding it from the weaver‟s beam. The secondary motions are carried out simultaneously.

Figure 7.14: Let-off motion

## 7.5 Auxiliary Mechanisms

To get high productivity and good quality of fabric, additional mechanisms, called auxiliary mechanisms, are added to a plain power loom. The auxiliary mechanisms are useful but not absolutely essential. This is why they are called the „auxiliary" mechanisms. These are listed below. a. Warp protector mechanism b. Weft stop motion c. Temples d. Brake e. Warp stop motion (Predominantly found in automatic looms)

### Warp protector mechanism

The warp protector mechanism will stop the loom if the shuttle gets trapped between the top and bottom layers of the shed. It thus prevents excessive damage to the warp threads, reed wires and shuttle.

### Weft stop motion

The object of the weft stop motion is to stop the loom when a weft thread breaks or gets exhausted. This motion helps to avoid cracks in a fabric.

### Temples

The function of the temples is to grip the cloth and hold it at the same width as the warp in the reed, before it is taken up.

### Brake

The brake stops the loom immediately whenever required. The weaver uses it to stop the loom to repair broken ends and picks.

### Warp stop motion

The object of the warp stop motion is to stop the loom immediately when a warp thread breaks during the weaving process.

## 7.6 Weaving Design

There are four type of design make in weaving

1. Twill design (2/1 & 3/1 Right hand twill and Left-hand twill)
2. Broken twill (3/1)
3. Satin design (4/1)
4. Herring bone twill

Table 7.4: Different Weaving Design use in ETL

| Sl no | Weave | | Definitions |
|---|---|---|---|
| 1 | Plain Weave | 1 x 1 weave | - Consist of one thread over and one thread under. This type is found in shirting goods. |
| 2 | Twill Weave | 3/1- RHT / LHT<br>2/1- RHT / LHT<br>3/1 Broken Twill<br>3/1 Hearing Bone | - Has each warp thread passing over two or more filling threads, with the interlacing advancing one thread on successive warps. This type, with its "diagonal line" is found in denim. |
| | | | |
| 3 | Satin Weave | 4/1 RH/LH weave | - Has few interlacing widely but regularly spaced, resulting in a lustrous right side and dull back. This weave usually found in dress goods |

## 7.7 Properties of Fabric checked by Executive

- EPI
- PPI
- Design
- Color
- Width
- Weight
- Warp & Weft yarn appearance

### 7.7.1 Unit: 01

Table 7.5: Count-wise tension, speed and efficiency of the Machine at Denim Unit-1

| Count | Tension (N) | Speed | Efficiency |
|---|---|---|---|
| 7 | 2600 – 3200 | 650 – 680 | **Average 89.50 %** |
| 9 | 3200 | 650 | |
| 10 | 3000 | 600 | |
| 12 | 2400 – 2600 | 500 – 700 | |
| 16 | 2800 – 2900 | 650 – 700 | |
| 20 | 2400 | 500 | |

### 7.7.2 Unit: 02

Table 7.6: Count-wise tension, speed and efficiency of the Machine at Denim Unit-2

| Count | Tension (KN) | Speed | Efficiency |
|---|---|---|---|
| 7 | 3.00 – 3.50 | 650 – 800 | **Average 89.20 %** |
| 9 | 3.00 – 3.50 | 650 – 800 | |
| 10 | 3.00 | 650 – 750 | |
| 12 | 3.20 | 500 – 700 | |
| 16 | 2.80 – 3.00 | 700 | |
| 20 | 2.4 | 600 - 700 | |

### 7.7.3 Breaks Per Centi Million Picks (Cmpx Calculation):

To determine the CMPX, we can evaluate the production efficiency of loom.

So, we can say that,

$$CMPX \propto \text{Total breaks}$$

$$CMPX \propto 1/\text{Production}$$

Let

Total Picks = 335000

Total Breaks = 22

Warp Breaks = 9

Weft Breaks = 12

Other Breaks = 1

PPI = 55

- Cmpx Warp = $Warp\ Break * 100000\ picks / Picks/8hrs$
- Cmpx Filling Yarn = $Weft\ Break * 100000\ picks / Picks/8hrs$
- Cmpx Total = $Total\ Break * 100000\ picks / Picks/8hrs$
- For Definite Length
- Cmpx Total = $Total\ Break * 100000\ picks / Length * PPI * 39.37$

## 7.8 Production Calculation

We know,

Production / shift = ( RPM / PPI ) *Efficiency

= (750 /49 /39.37) * 60 * 8 * 92%
= 171.69 m

Weft Yarn Requisition Calculation

For cotton count

Weft /day = (Rpm*60*24*PPI*39.37*1.80*1.0936) / (PPI*39.37*840*count* 2.204)

= (RPM / Count) *1.51 Kg / day

For denier count,

Weft /day = (Rpm *60*24*PPI *39.37*1.80* Count) / (PPI *39.37*9000*1000)

=Rpm * Count * 0.000289 Kg / day

## 7.9 Weaving Faults, Causes and Remedies

Table 7.7: Weaving faults, cause and remedies

| Sl. No. | Faults | Descriptions | Causes | Remedies |
|---|---|---|---|---|
| **1.** | Double Pick | 2 Picks Interlaced in 1 Shed | • Double End During Winding<br>• Cutting Problem<br>• Wrong Air Pressure | Review Faults |
| **2.** | Double Ends | Double Strands | • Miss Drawn Ends | Counter check draw in |
| **3.** | Miss Pick | Pick not properly inserted | • Wrong Pick<br>• Low Air Supply | Check pic finding and air supply |
| **4.** | Starting Mark | Mark on fabric width | • Loom not properly set up | This cannot be avoided but can be controlled |
| **5.** | Snarling | Selvedge Curling | • Excess air pressure<br>• Low filling tension | Check main nozzle pressure and PFT finger value |
| **6.** | Miss Ends | Straight line visible in warp direction | • Bad Sizing<br>• Low strength<br>• Loose or tight yarn | Re knotting and proper sizing required |
| **7.** | Reed Mark | Oil spot or dent spot | • Damaged reed | Change Reed |
| **8.** | Filling Stop | Pressure fluctuation | • FD1 failed to reach FD2 | Re Setup the machine |
| **9.** | Temple | Abrasion on fabric | • Improper temple rolls setting | Set temple rolls accordingly |

## 7.10 Some Fabric Constructions

**1.** $\frac{18OE * 16+40D}{71 * 48}$

**2.** $\frac{11RSL+11OE * 30+70DPC}{60 * 60}$

**3.** $\frac{9RSL +9SL * 9OE + 40D}{63 * 45}$

**4.** $\frac{18OE * 16+40D}{71*48}$

**5.** $\frac{16RSl + 16OE * 16OE}{76 *54}$

**6.** $\frac{18OE * 16+40D}{71*48}$

**7.** $\frac{12SL + 12OE * 16OE}{76*48}$

**8.** $\frac{16OE * 16SL + 70DPC}{71*55}$

and many more constructions are developed in Sister Denim Composite Ltd.

# Chapter: 08

# Finishing

# 8 Finishing

Finishing of grey denim fabric normally carried out after weaving. It takes an important role in fabric properties, appearance, softness and residual fabric shrinkage. The finishing of denim fabric is carried out for several purposes. Finishing of denim fabric can be varied according to the specific requirement of customer.

## 8.1 Objects of Finishing

- To improve the appearance of the fabric, that is make it more attractive or lustrous by operations like calendaring.
- To improve the feel of the fabric by softening, stiffening etc.
- To increase weight of the cloth
- To improve wearing qualities of the cloth by making it shrink resistant, crease resistant, or free from pills and soiling.
- To make garments hold their shape and enable them to be worn without ironing.
- To impart special properties to the fabric for specific end uses
- To set the texture of certain fabrics and make others dimensionally stable.
- To produce stronger and more durable fabrics.

## 8.2 Basic Denim Finish Process

In basic denim finishing, fabric arrives from weaving directly, without de-sizing, and is brushed to remove contamination, singed with flame to make the fabric smoother by reducing hairiness, padded with a simple recipe, passed over a pair of skew rolls to reduce fabric torque which causes skew movement and then dried.

## 8.3 Machine Specifications and Flowchart

### 8.3.1 Machine No.: 01

| | |
|---|---|
| Machine Name | : Flat Finish |
| Brand Name | : Jiangsu Red Flag |
| Origin | : China |
| Machine Type | : Singeing |
| Speed | : 40 – 45 rpm |

Figure 8.1: Flat Finish Singeing machine

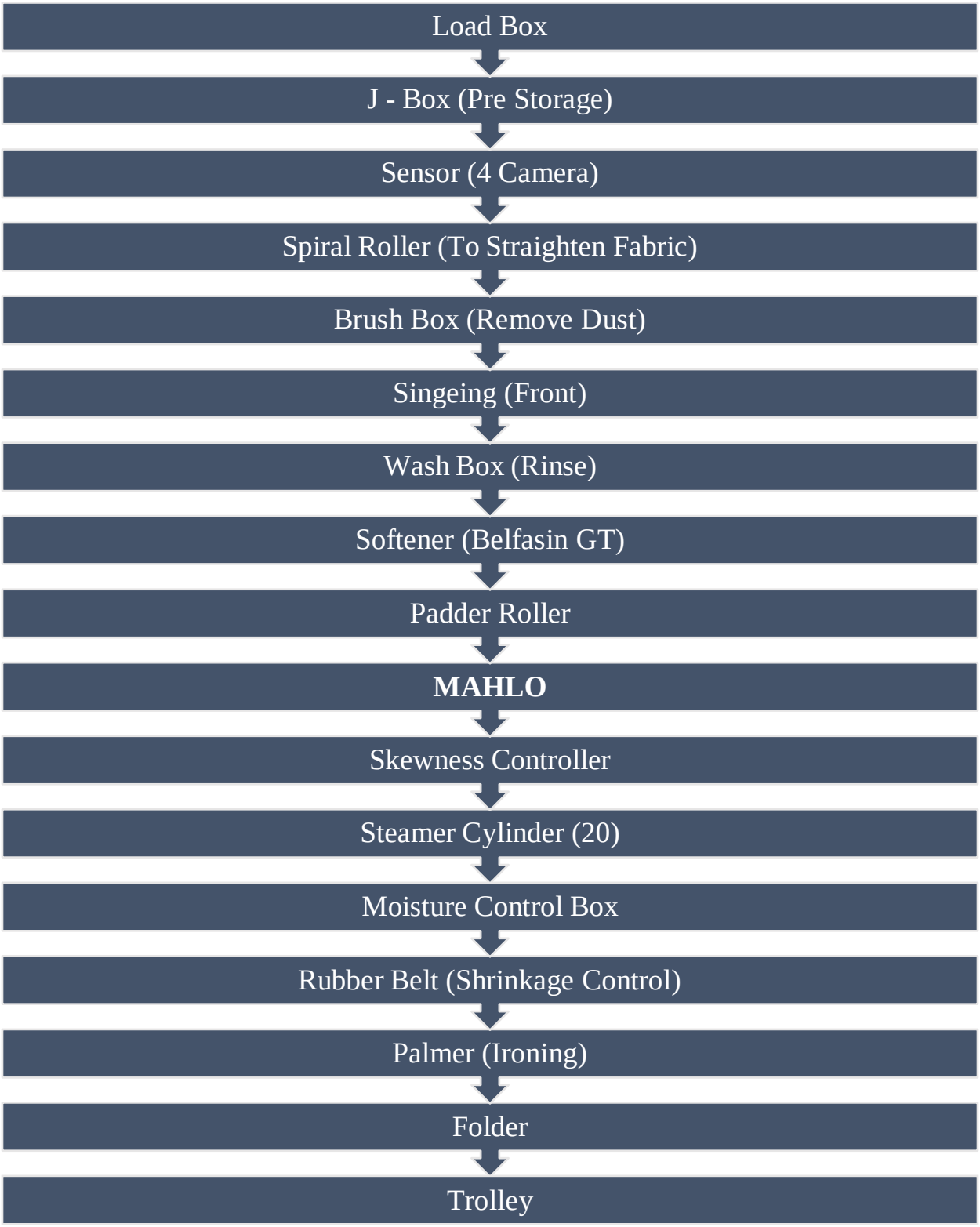
8.3.1.1 Flowchart

### 8.3.2 Machine No.: 02

| | |
|---|---|
| Machine Name | : Wet Finish |
| Brand Name | : Morrison – 1 |
| Origin | : USA |
| Machine Type | : Wet Finish |
| Speed | : 42 – 48 rpm |

Figure 8.2: Morrison Wet Finish machine

8.3.2.1 Flowchart



### 8.3.3 Machine No.: 03

| | |
|---|---|
| Machine Name | : Flat Finish |
| Brand Name | : Kyoto |
| Origin | : Japan |
| Machine Type | : Desize, Mercerize |
| Speed | : 35 – 50 rpm |

#### 8.3.3.1 Properties:

1. Width Control
2. Shade Control
3. Neps
4. Front Singeing
5. Caustic Soda
6. Softener
7. Order Desize
8. Chemical Desize
9. Mercerize
10. Flat Finish
11. Skewness
12. Shrinkage Control

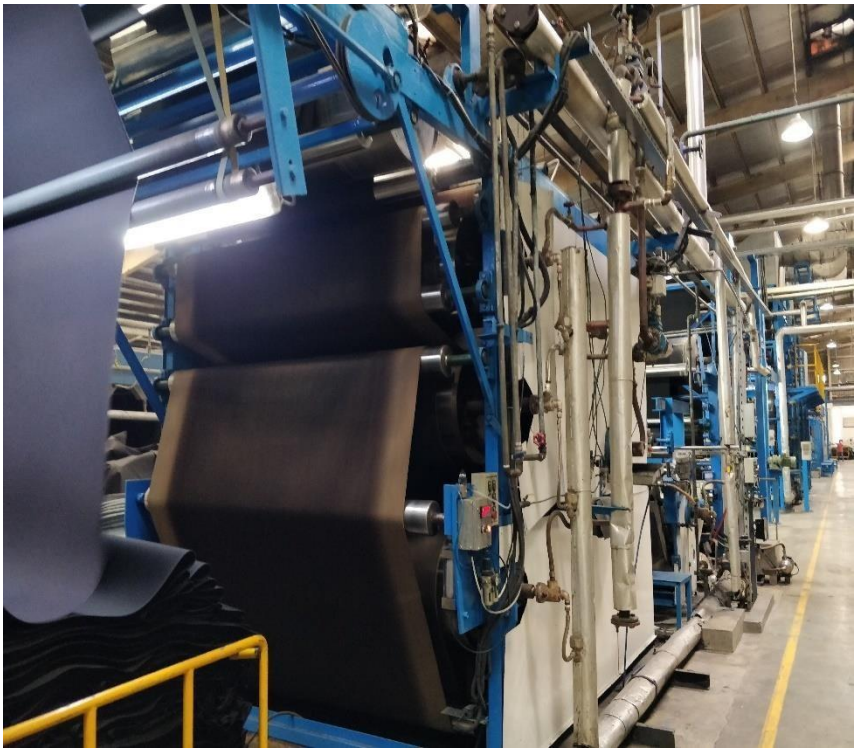
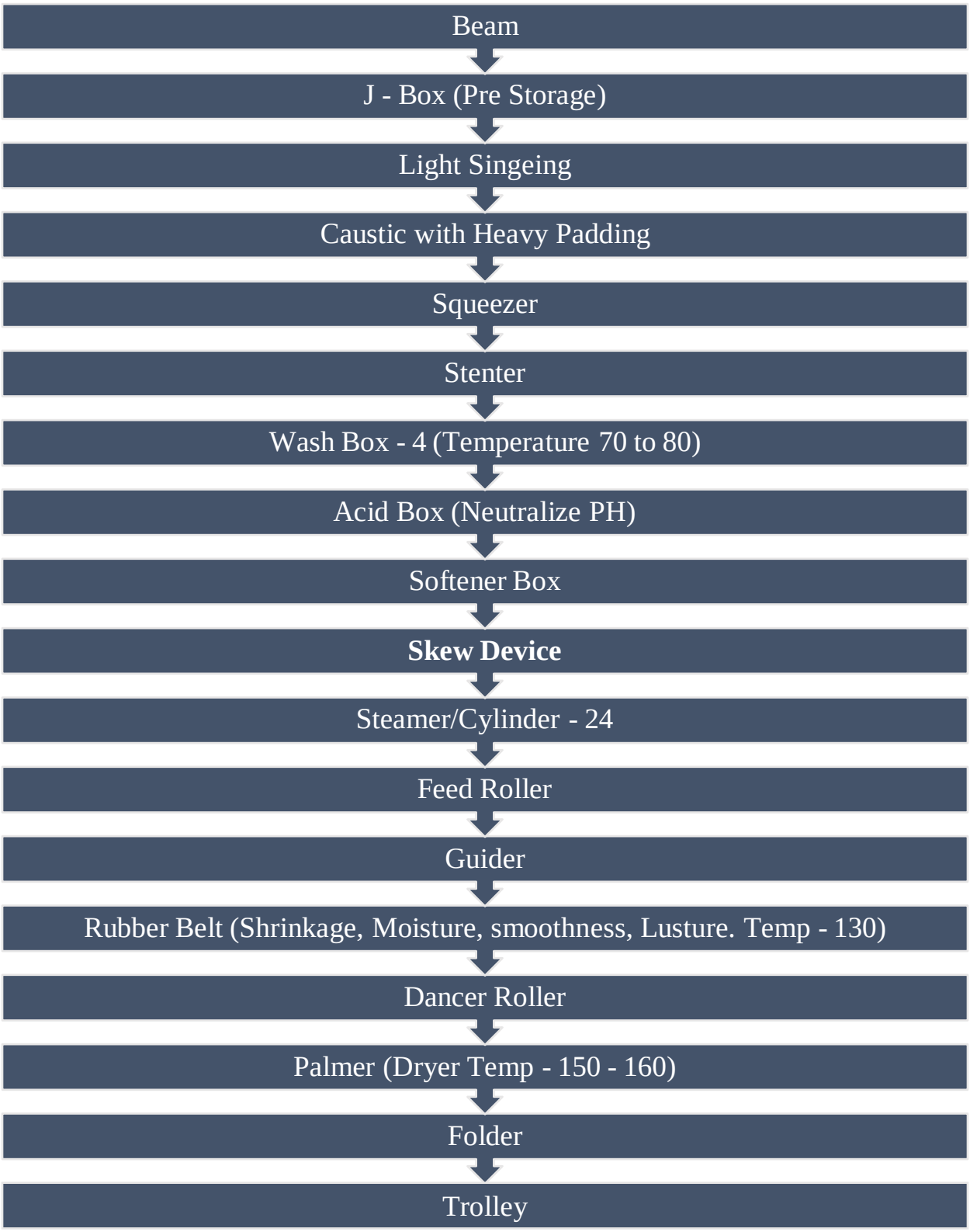


Figure 8.3: Kyoto Flat Finish machine

8.3.3.2 Flowchart

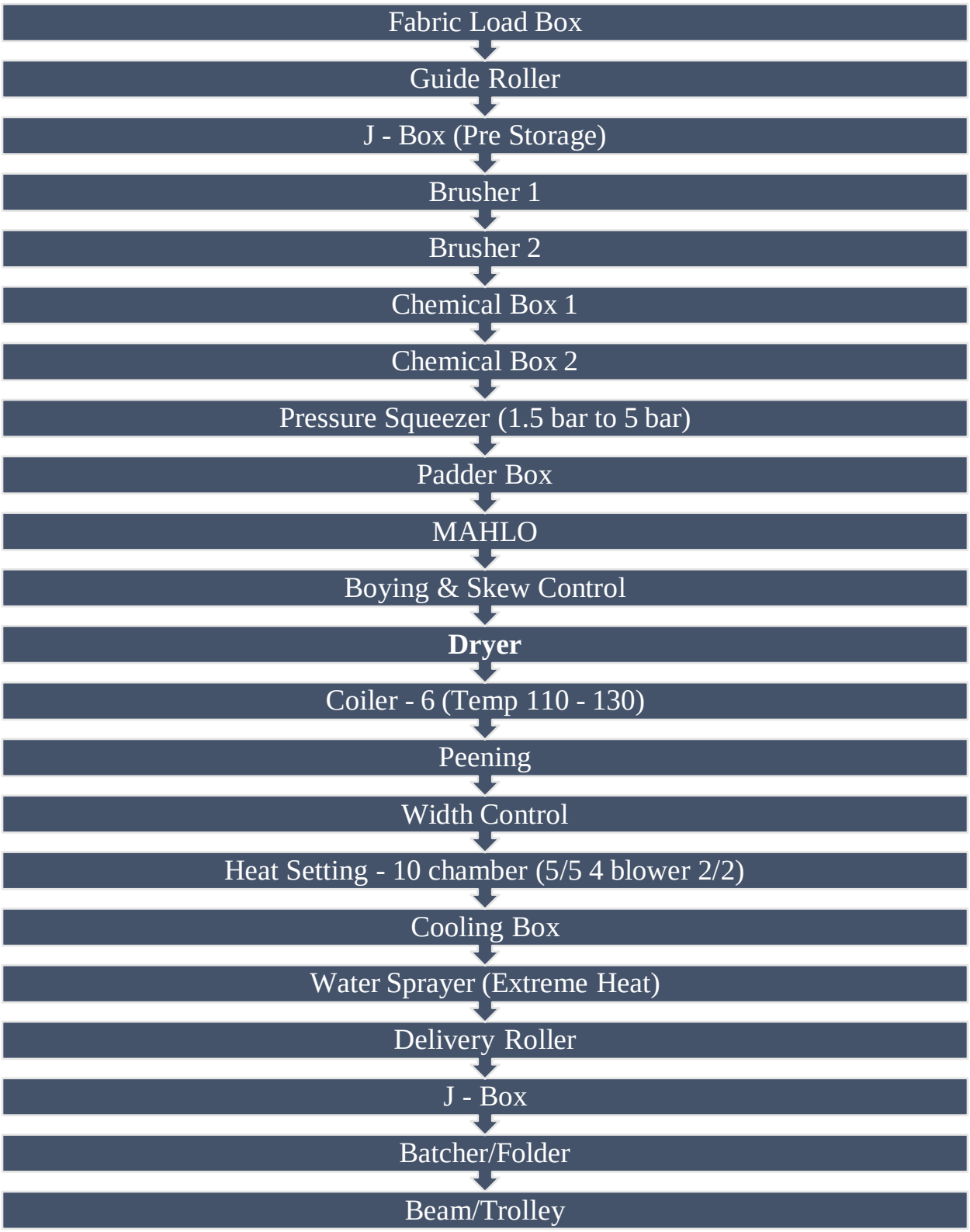


### 8.3.4 Machine No.: 04

| | |
|---|---|
| Machine Name | : Groove Stentor |
| Brand Name | : Has |
| Origin | : Turkey |
| Machine Type | : Wet and Dry Finish |
| Speed | : 40 – 50 rpm |

Figure 8.4: Groove Stentor machine

### 8.3.4.1 Flowchart



### 8.3.5 Machine No.: 05

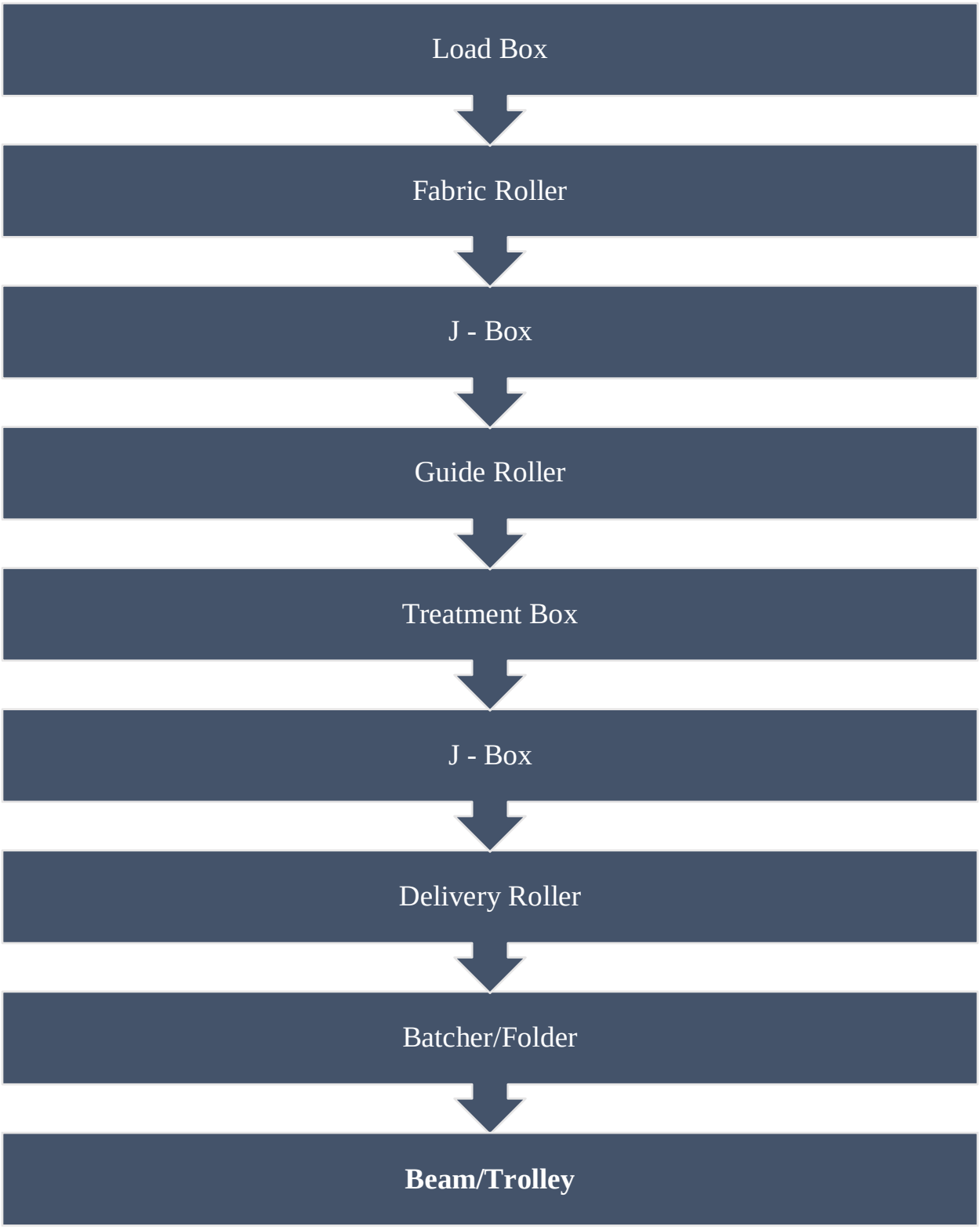
| | |
|---|---|
| Machine Name | : Minor Treatment |
| Brand Name | : Penteck |
| Origin | : Italy |
| Machine Type | : Wet and Dry Finish |
| Speed | : 300 – 450 rpm |

#### 8.3.5.1 Properties

1. Water Treatment
2. Stretch Control
3. Elasticity
4. Softening

Figure 8.5: Penteck minor treatment machine

### 8.3.5.2 Flowchart

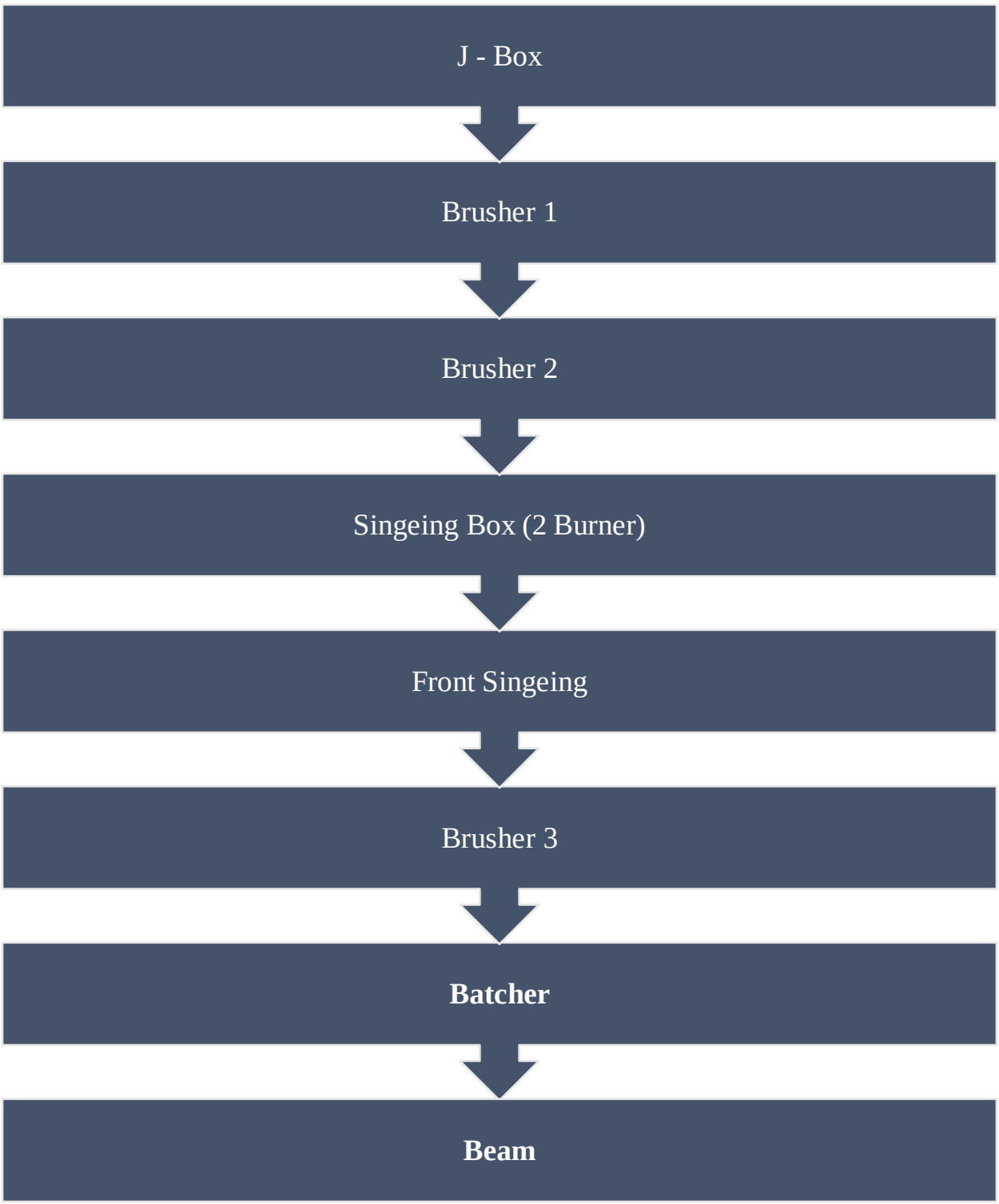


### 8.3.6 Machine No.: 06

| | |
|---|---|
| Machine Name | : Singeing |
| Brand Name | : Osthoff |
| Origin | : Germany |
| Machine Type | : Dry Finish |
| Speed | : 150 – 200 rpm |


Figure 8.6: Osthoff Singeing machine

### 8.3.6.1 Flowchart



### 8.3.7 Machine No.: 07

Machine Name : Multi-Functional

Brand Name : Monforts

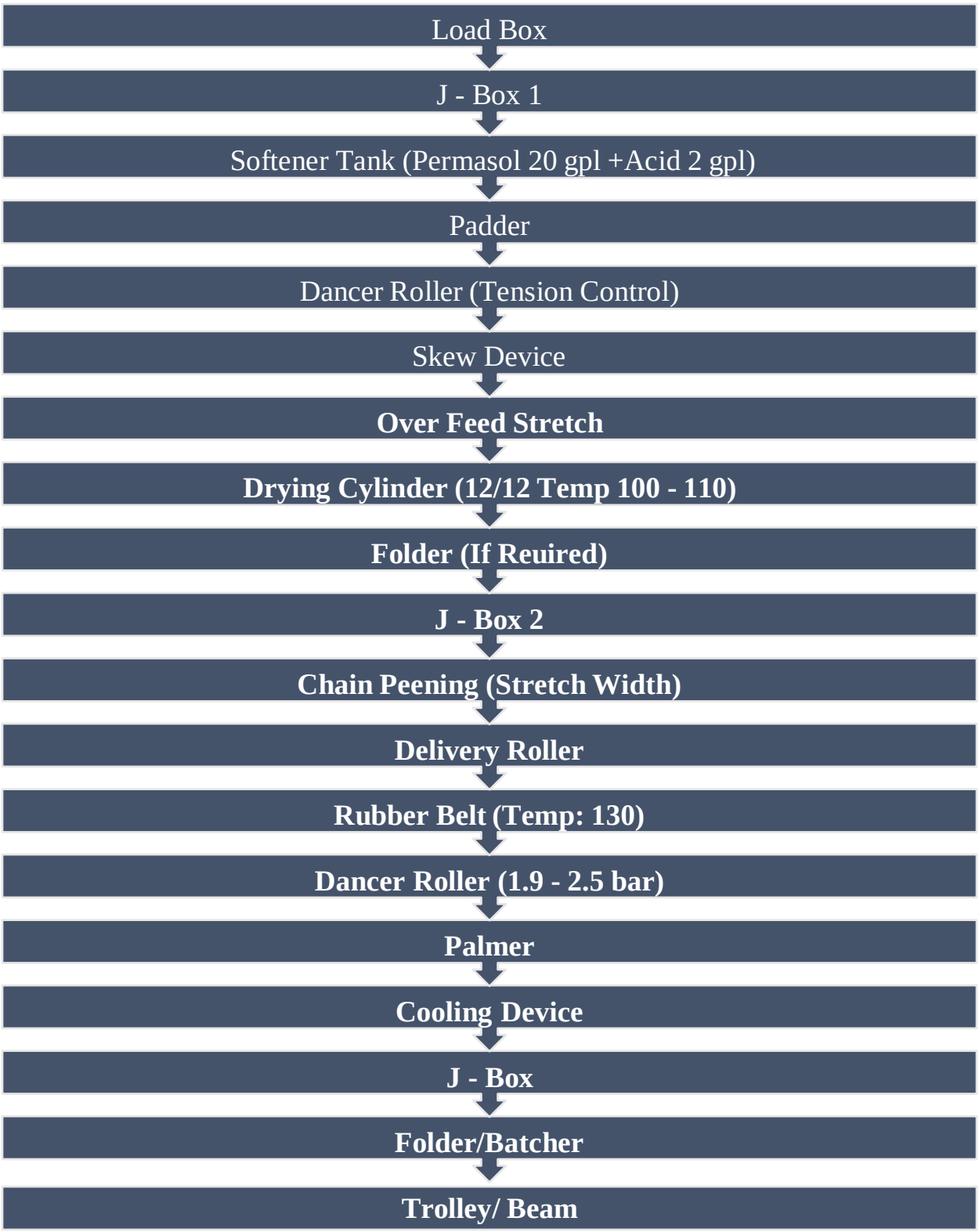
Origin : China

Machine Type : Various finish

Speed : 50 – 90 rpm

Figure 8.7: Monforts multi-functional machine

### 8.3.7.1 Flowchart



### 8.3.8 Machine No.: 08

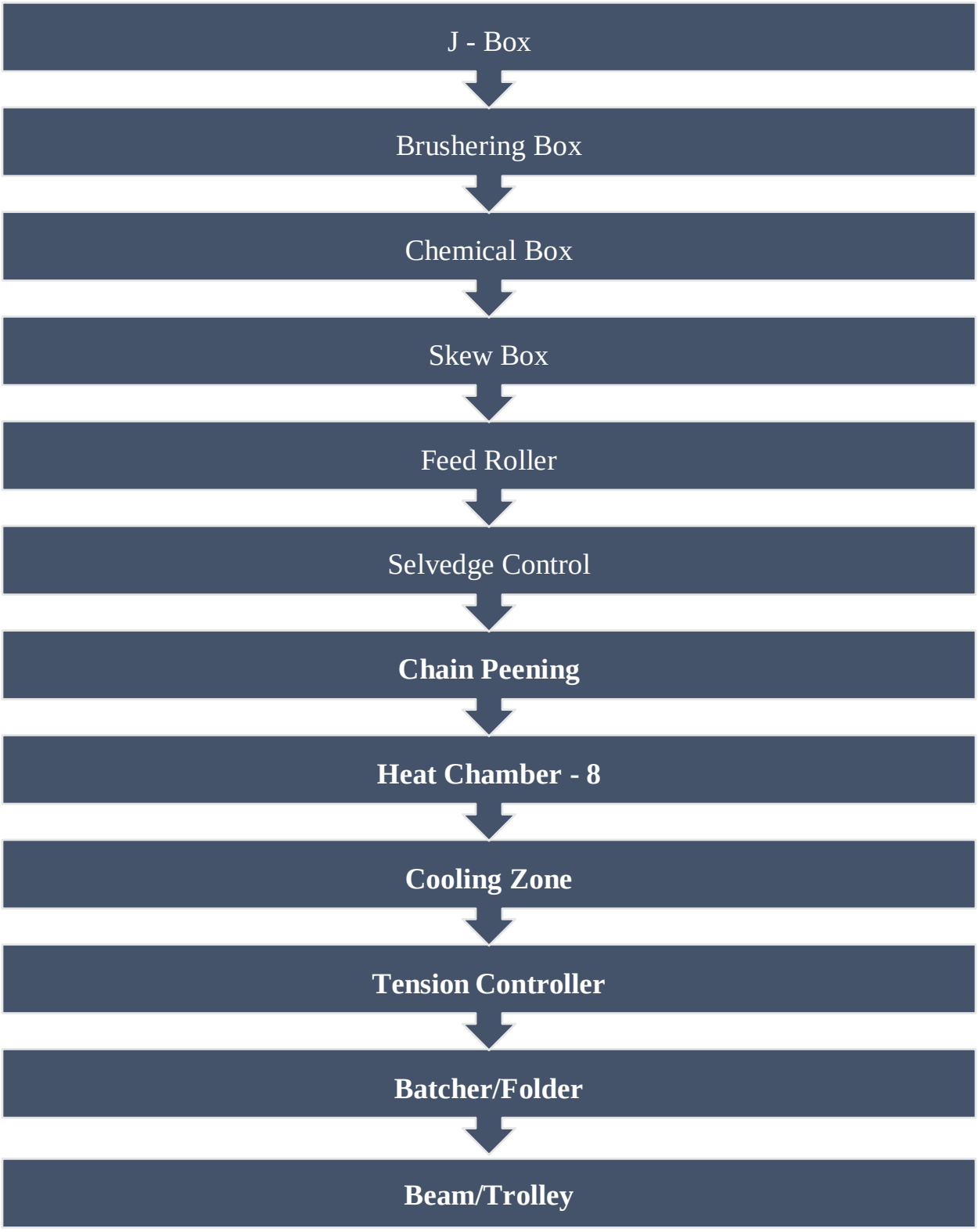
| | |
|---|---|
| Machine Name | : Minor Treatment |
| Brand Name | : Sheentech |
| Origin | : Taiwan |
| Machine Type | : Dry Finish |
| Speed | : 100 rpm (max) |

#### 8.3.8.1 Properties

1. Width Control
2. Shrinkage Control
3. Skewing
4. Heat Setting
5. Fabric Tension Control
6. Fabric Tension Control (warp and weft)

Figure 8.8 Sheenteck Minor Treatment machine

### 8.3.8.2 Flowchart



## 8.4 Finishing Faults

Table 8.1: Some Finishing Faults

| Sl. No. | Faults/Problems |
|---|---|
| **1.** | Dancer Failure |
| **2.** | Breakage of Fabric Joining |
| **3.** | Fabric Loose |
| **4.** | Crease Mark |
| **5.** | Water Mark |
| **6.** | Width Variation |
| **7.** | Oil Mark |
| **8.** | Stop Mark |
| **9.** | Waviness |
| **10.** | Excess Buoying |
| **11.** | Excess Skew |

## 8.5 Some Important Terms for finishing

### 8.5.1 Singeing

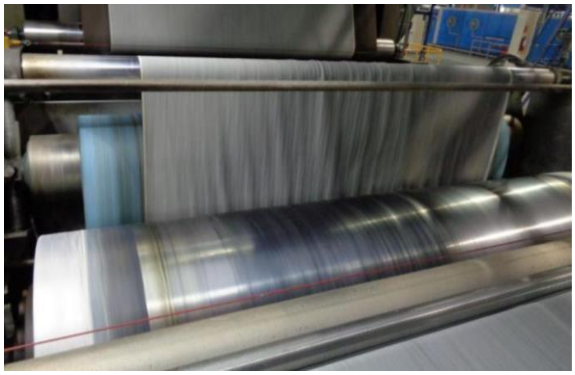
Singeing is an important as it burn the port rooting and hairy fibers form the fabric surface

**Singeing Parameter**

- Fabric speed (m/min)
- Flame intensity (mbar)
- Fabric moisture content (%)
- Singeing positions
- Burner fabric distance (mm)

### 8.5.2 Sanforisation

Sanforisation is a treatment applied to fabric to reduce cloth shrinkage after washing. During the sanforising process, the fibers of the cotton fabric are stretched both in length and in width



so that cloth that is washed and dried will not shrink much.

### 8.5.3 Calendaring

Calendaring is a finishing process used on cloth where fabric is folded in half and passed under rollers at high temperatures and pressures. Calendaring is used on fabrics such as moisture to produce its water effect and also on chambray and some types of satin. In preparation for calendaring, the fabric is folded lengthwise with the front side, or face, inside, and stitched together along the edge, however this is not done as often as it is more difficult. The fabric is then run through rollers that polish the surface and make the fabric smoother and more lustrous. High temperatures and pressure are used as well. Fabrics that go through the calendaring process feel thin, glossy and papery.

### 8.5.4 Mercerization:

It is the process by which natural twist/convolutions are open by the help of concentrated alkali under tension conditions. It is a treatment which makes the cellulose start to swell at a certain alkali concentration.

### 8.5.5 Fabric Skewness:

A process in the fabric creation that helps to prevent leg twist that can occur during the shrinking process. To mitigate this effect, skewing is done in the opposite direction of the twill direction by a degree.

Skewness created to prevent leg twist, skewing was patented in 1976 by Karin Hakanson. Depending on the twill direction, the fabric is skewed in the corresponding direction to remove tension from the threads. Thus, right hand twill is skewed counterclockwise and left-hand twill is skewed clockwise. A fabric's weight, twill weave, yarn size, and yarn twist all factors into the amount of skewing a material needs. For jeans, the denim is usually skewed between 4% and 10%.

## 8.6 There are 4 variables that are critical for shrinkage, fabric defects andelongation:

1. Temperature
2. Moisture
3. Quantity of Pressure
4. Time of Pressure

### 8.6.1 Critical Temperature

There are 3 critical temperatures:

1. The temperature of the steam-heated cylinder which heats the rubber-belt.
2. Temperature of the Palmer Unit for drying the denim.
3. Temperature of the fabric as it enters the rubber-belt.

### 8.6.2 Sanforizing Moisture Control

1. A general rule is that for each oz/square yard, 1% moisture should be applied. For example, for a 10-ounce fabric, 10% moisture.
2. Most denim finishing is now on the "integrated range. Moisture is controlled by the drying cylinders on the finishing machine, then fabric passes directly to the Sanforizer.
3. Final moisture of 4-5% is necessary in order to stabilize the fabric compression.
4. If the moisture is higher, the fabric will elongate which increases final shrinkage.

### 8.6.3 Pressure (% of Compression)

1. Sanforizing is a form of "mechanical shrinkage".
2. If a fabric has 12% shrinkage with 20 weft yarns/cm and 3% at 22/cm, then 10% compression by the rubber belt will result in the weft being pushed together which increases the weft yarns from 20-22/cm and reduces the shrinkage by 10 points.

## 8.7 Finished Fabric Storage

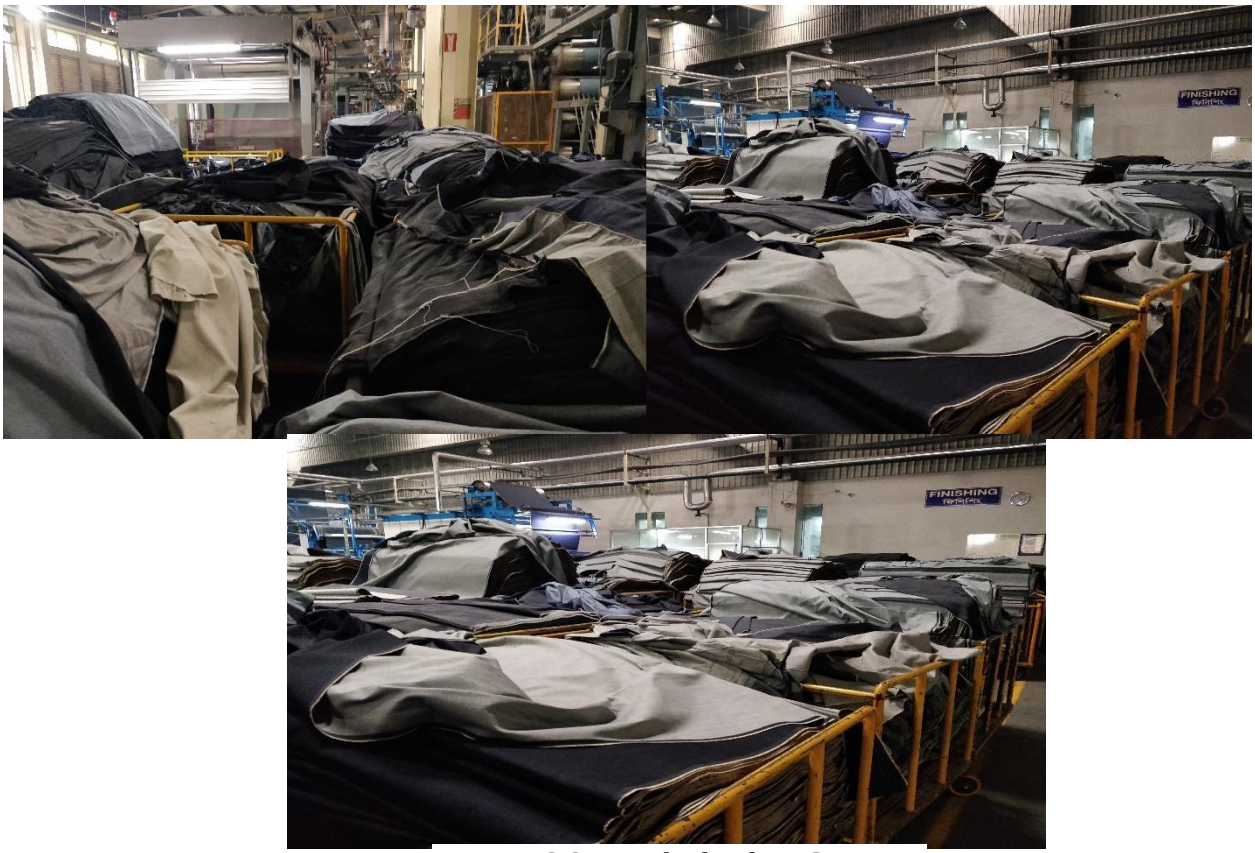



Figure 8.9: Finished Fabric Storage

# Chapter: 09

# Inspection

# 9 Inspection

Inspection can be defined as the visual examination of raw materials (such as fabric, buttons, zippers, sewing threads, trims etc.), partially finished components of the garments and completely finished garments in relation to some standards, specifications or requirement as well as measuring the garments to check if they meet the required measurements.

## 9.1 Machine Specifications

Table 9.1: Machine Specifications of Inspection Machine

| Name of m/c | Brand | Origin | Speed | No. of m/c |
|---|---|---|---|---|
| Inspection | Yayao Shun Long | China | 20 – 25 rpm | Total Quantity 22 |
| Inspection | Tarkey | Turkey | 25 – 30 rpm | |

Figure 9.1: Fabric Inspection machine

Table 9.2: Packing Machine Specifications

| Name of m/c | Brand | Origin | Speed | No. of m/c |
|---|---|---|---|---|
| Packaging | Penguin | India | 25 – 30 rpm | 03 |


Figure 9.2: Packing machine

## 9.2 Inspection Faults

Table 9.3: Some Faults in Inspection occurred in different section

| **Yarn Defects** | | **Finishing Defects** | |
|---|---|---|---|
| **Code** | **Defects** | **Code** | **Defects** |
| 101 | Coarser Warp | 501 | Crease Mark |
| 102 | Coarser Weft | 502 | Upsized |
| 103 | Finer Warp | 503 | Width Variation |
| 104 | Finer Weft | 504 | Machine Stop |
| 105 | Oily Warp | 505 | Stain |
| 106 | Oily Weft | 506 | Hole |
| 107 | Slub | 507 | Sleeve Mark |
| 108 | Contamination | 508 | E.H Mark |
| 109 | Thick / Thin | 509 | Wave |
| **Dyeing Defects** | | **Weaving Defects** | |
| 201 | Shade Variation | 401 | Broken Pick |
| 202 | Stain | 402 | Double Pick |
| 203 | Steep Mark | 403 | Miss Pick |
| 204 | SSV | 404 | Lashing Pick |
| 205 | Dyeing Patta | 405 | Starting Mark |
| **Sizing Defects** | | 406 | Reed Mark |
| 301 | Loose | 407 | Knot |
| 302 | Tight | 408 | Snarl |
| 303 | Beam Stain | 409 | Smash |
| 304 | Size Spot | 410 | Bad Selvedge |
| 305 | Bad Selvedge | 411 | Floating End |
| 306 | Less Width | 412 | Double End |
| 307 | Slack End | 413 | Wrong Drawing |
| 308 | B.F. | 414 | Less Width |
| | | 415 | Wave |
| | | 416 | Miss Yarn Width |

## 9.3 Fabric Inspection System

Inspection of fabric is performed by fabric inspection machine. There are number of system available to inspect the fabric.

There are as follows:

1. 4- point system
2. 10-point system
3. 78-point system

Only 4 - point system is approved by American apparel Manufacturer Association (AAMA) and American Association of Quality control (AAQC) for Denim Fabric Inspection. This is why this system is widely used for fabric inspection.

### 9.3.1 4 – Point System

Table 9.4: 4- Point System

| Sl. No. | Fault Length | Points |
|---|---|---|
| **1.** | 0 – 3 inches | 1 |
| **2.** | 3 – 6 inches | 2 |
| **3.** | 6 – 9 inches | 3 |
| **4.** | 9 – 12 inches | 4 |

**Calculation:**

Points/100 square yards =

$$\boldsymbol{total\ points\ for\ the\ roll * 3600} \Big/ \boldsymbol{inspected\ yards * fabric\ width\ (inch)}$$

## 9.4 Category of Fabrics after Inspection

Table 9.5: Category of the Fabric after Inspection

| Category | Max. points/100 square yards | Title |
|---|---|---|
| **1** | 15 | Super Elite |
| **2** | 20 | Elite Plus |
| **3** | 24 | Elite |
| **4** | 30 | Sound Surplus |
| **5** | >30 | Shady (Style Wise) |
| **6** | >30 | Mixed |
| **7** | Cut Pieces | Cut Pieces |
| **8** | Off Pieces | CAT – 8 |

## 9.5 Visual Fabric Faults

Figure: Loose yarn

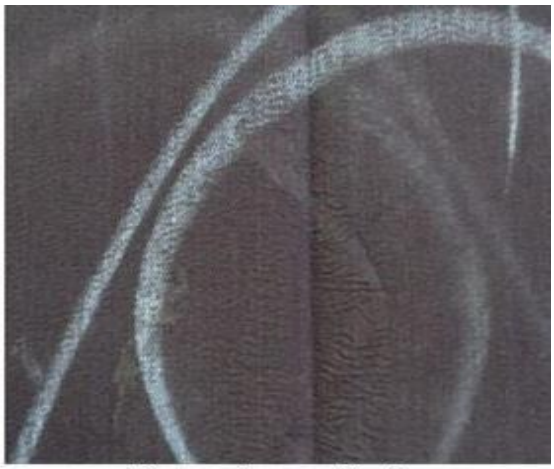


Figure: Crease Mark

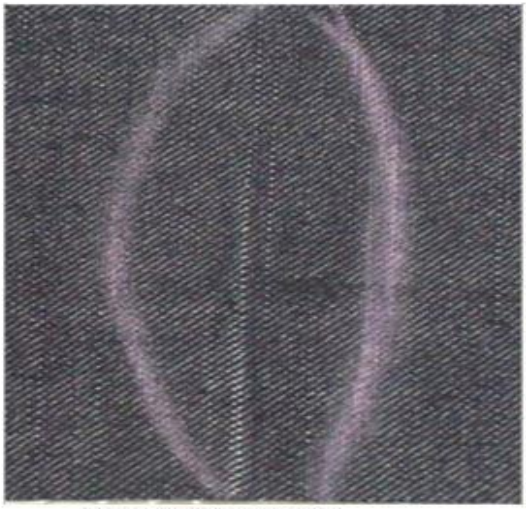


Figure: Tight yarn


Figure: Missed yarn

Figure: Bent Pick

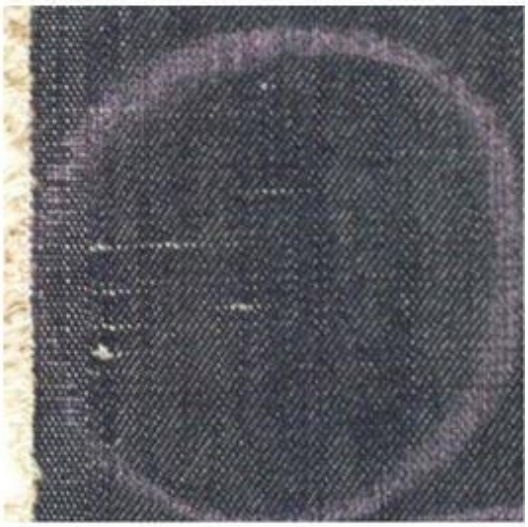


Figure: Snarling

**Figure: Knot with loose yarn**

**Figure: Double yarn**

**Figure: Loose yarn**

**Figure: Crease Mark**

**Figure: Knot**

**Figure: Faulty Slub**

Figure: Starting mark

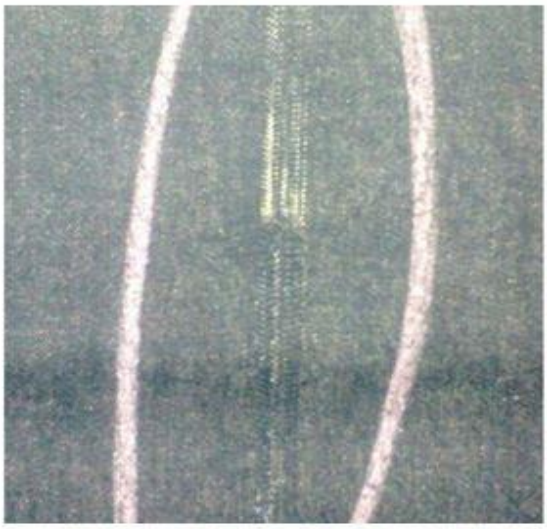


Figure: Loose and tight

Figure: Beam stain

Figure: Coarser yarn

Figure 9.3: Different Visual Fabric Faults

# Chapter: 10

# Research & Development

# 10 Research and Development

According to the buyer provides sample, R & D department research about Shade, EPI, PPI, warp yarn count, weft yarn count, fabric type, width, total ends, yarn type, weave, GSM, reed count etc.

## 10.1 Fabric Analysis

- EPI (ends per inch)
- PPI (pick per inch)
- Warp count
- Weft count
- GSM
- Weave
- Ratio
- Color
- Slab length
- Pause length
- Yarn type

**Moreover, R&D operates planning of production of machine accordingly giving proper time schedule and delivery time or lead time. The most efficient and time-oriented department of Sister Denim Composite Ltd.**

## 10.2 Washing

Industrial washing is one of the most important applied finishing methods on fabric or apparel. Different washing methods can be applied in case of denim fabric finishing. To achieve special outlook as well as to change the fashion, responsible, washing methods are stone wash, enzyme wash and bleach wash.

### 10.2.1 Types of Washing

1. **Dry Wash**
2. **Wet Wash**

### 10.2.2 Types of Dry Washes

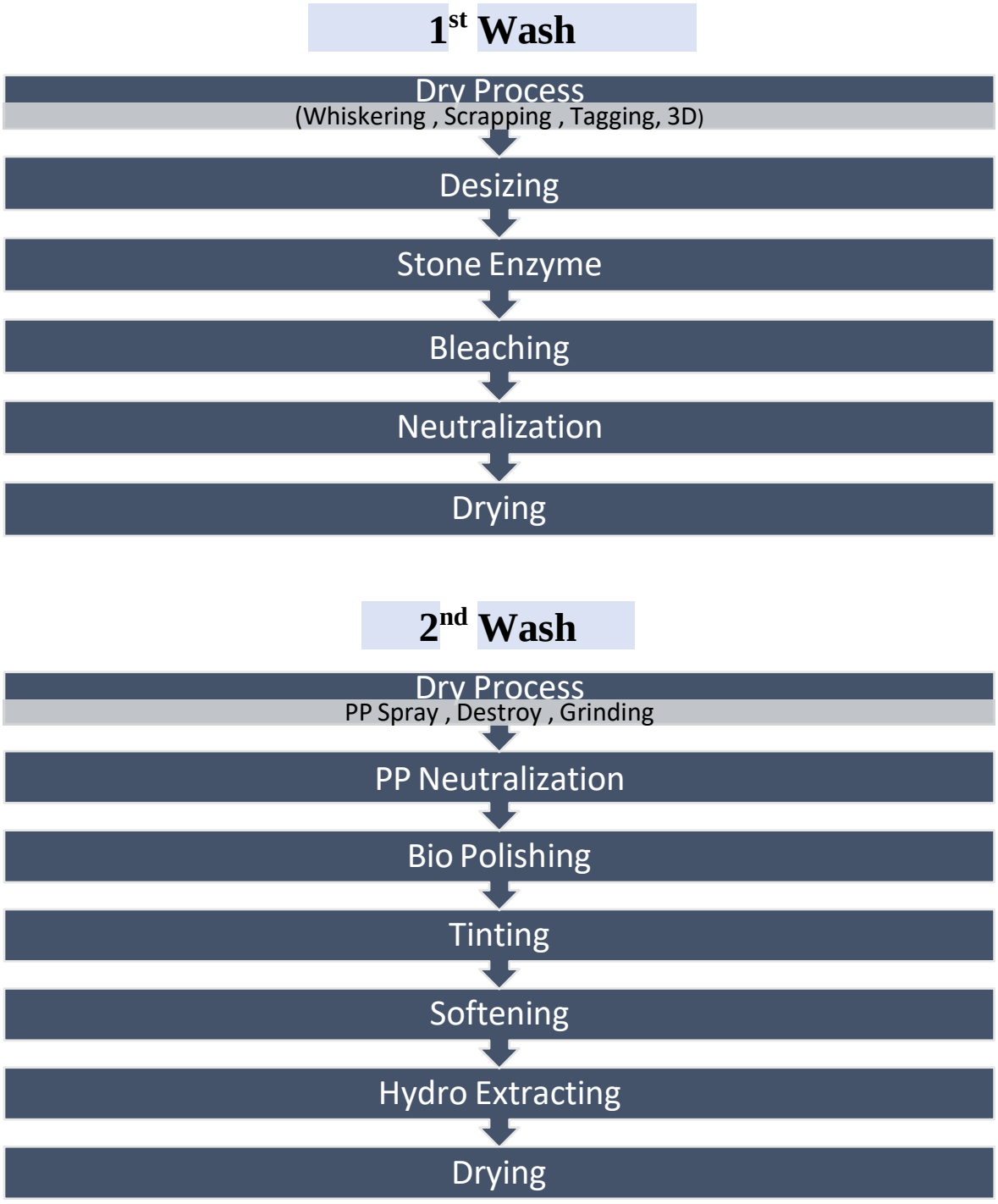
1. Whiskering
2. Hand Sanding
3. Tagging
4. Destroy
5. Grinding
6. 3D

### 10.2.3 Types of Wet Washes

1. Rinse wash (desize wash)
2. Enzyme wash
   a. Heavy enzyme wash
   b. Medium enzyme wash
   c. Enzyme Stone wash
   d. Heavy enzyme stone wash
   e. Medium enzyme stone wash
   f. Enzyme stone bleach wash
3. Bleach wash
   a. Heavy enzyme bleach wash
   b. Medium enzyme bleach wash
   c. Heavy (light) enzyme stone bleach wash
   d. Medium enzyme stone bleach wash

Figure 10.1: Sample Wash machine 1

### 10.2.4 Flow Chart for Sample Wash



### 10.2.5 Rinse Wash:

Denim fabric has been subjected to enzymatic desizing process for removal of size materials which were added in the sizing process to reduce ends breakage rate during weaving the fabric. Here desizing is carried out by using the following suitable recipe while maintaining proper time and temperature.


Figure 10.2: Sample Wash machine 2

For 5 kg Sample

| | |
|---|---|
| Temperature | : 60◦C |
| Desize Chemical | : 100 gm |
| Time | : 8 – 10 mins |

Enzyme Wash for 5 kg Sample

| | |
|---|---|
| **Water** | **:** 100L |
| **Temperature** | : 45 – $50^0$ c |
| **Enzyme** | : 200 g |
| **Ant back stain** | : 100 g |
| **$p^H$** | : 5 |
| **Time** | : 15 – 20 minutes |

Figure 10.3: Sample Wash machine 3

Bleach Wash for 5 kg Sample

| | |
|---|---|
| **Water** | 150 L |
| **Temperature** | 55-$60^0$ C |
| **Bleaching agent** | 1-1.5 kg |
| **Time** | 15 – 20 minutes |

Neutralization for 5 kg Sample

| | |
|---|---|
| **Water** | 80 L |
| **Temperature** | $60^0$ C |
| **Neutralize agent** | 500 g |
| **Time** | 5 – 7 minutes |

**At last for every shade two times wash done with cold water**

**Enzyme Stone and Heavy Stone**

| | |
|---|---|
| **Water** | 80 L |
| **Temperature** | 45-50OC |
| **Enzyme** | 100 gm |
| **Stone** | 2-2.5 kg (For heavy stone wash stone 4-6 kg |
| **Time** | 35-40 min |

**At last for every shade two times wash done with cold water**

**Enzyme Stone Bleach**

| | |
|---|---|
| Water | 90 L |
| Temperature | 55-60O C |
| Bleaching chemical | 500 cc |
| Time | 6-8 minute |

**At last for every shade two times wash done with cold water**

**Softener**

| | |
|---|---|
| Temperature | $40^0$ C |
| Softener: agent | 1-2 mg/ 2 kg |
| Time | 3– 5 minutes |

**At last for every shade two times wash done with cold water**

# 11 Conclusion

Theoretical knowledge is inadequate without the knowledge of its execution. Industrial physical activity at Sister Denim Composite Ltd has given me the opportunity to fulfill my desire of technical knowledge. Besides I get a prospect to compare my theoretical knowledge with concrete knowledge. During my industrial training period I tried my level best to utilize my time properly.I tried to compare my theoretical knowledge with its practical implementation.

Sister Denim Composite Ltd is a prominent rope denim industry in Bangladesh for its quality product and strong management. Sister Denim Composite Ltd standard operating procedure and quality assurance are strictly followed. Besides Sister Denim Composite Ltd has the reputation for on time delivery. Due to quality and on time delivery worldreputed buyer such as LEVIS, H&M, WALMART, GAP Inc., VF ASIA, JC PENNY and so on place order in Sister Denim Composite Ltd. Sister Denim Composite Ltd Textiles Limited provides amenities to worker as per Bangladesh labor law. So here labor unrest is not found which an important factor for huge production.

I have found myself fortunate to have my industrial training in Sister Denim Composite Ltd. So I tried to properly utilize the opportunity. During my industrial training period I observed the production and quality control procedure in Warping to R&D, Utilities. During my internship period I was supervised by Depertment Head of Washing Md. Shahaddat Hossain and R&D Division Md. Asaduzzaman Asda Sir. Moreover, my deep thanks all the Department Heads, seniors and as well as the operators of the machine for helping me throughout my Internship.

My Special thanks to Department of Research and Development for helping me to understand Denim Analysis and properties.

I deeply obligated to Sister Denim Composite Ltd. for approachable collaboration, and teamwork.