Faculty of Engineering

Department of Textile Engineering

Report On Industrial Attachment

At

Shasha Denims Ltd

DEPZ, Savar, Dhaka.

Course Title: Industrial Attachment

Course Code: TE 418

Section : A

Submitted By

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Supervised By

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This Attachment Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Textile Engineering.

Advance in Fabric Manufacturing Technology
Duration: from September 06 to November 06.

Declaration

We hereby declare that the work which is being presented in this report entitled, **"Report On Industrial Attachment At Shasha Denims Ltd"** is original work of us, has not been presented for a degree of any other university and all the resources of collected information for this report have been duly acknowledged.

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This is to certify that the above declaration made by the candidate is correct to the best of my knowledge.

Factory Supervisor	Academic Supervisor
Md. Shahjahan Manager Preparation & Planning Department Shasha Denims Ltd.	Prof. Dr. Md. Mahbubul Haque, Professor & Head Department of Textile Engineering Daffodil International University

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At last but not the least, we would like to acknowledge my parents for their approval, support & love to complete the report.

Finally we would like to acknowledge that we remain responsible for the inadequacies and errors, which doubtlessly remain

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Chapter-1

1.1 Executive Summary:

The term textile means originally a woven fabric, but textile & the plural textiles are now also applied to fibre, filament & yarn. Natural & manufactured fibre & most products for which these are raw materials are called textiles.

This definition embraces, for example fibre based products in the following categories: threads, cords, ropes & braids, woven, knitted & non-woven fabrics, lace, nets & embroidery, hosiery knitwear & made up apparels, household textiles, soft furnishing & upholstery, carpets & other floor coverings, technical, industrial & engineering textiles include geo textiles & medical textiles.

Textile education is based on industrial ground. Theoretical background is not sufficient enough, for why industrial training is an essential part of study to make a technologist technically sound in this field. Industrial training provides us to gather practical knowledge.

Shasha Denims Ltd is one of the woven industry which produced 100 % export oriented denim based fabrics. The goal of Shasha Denims Ltd is to become the preferred partner for sourcing high quality denim fabrics from Bangladesh with highly advanced technology & an emphasis on developing local human resources. Shasha Denims Ltd has the potential to make an important contribution to the nation's growing woven fabric export sector.

The rationale behind the existing structure & future expansion of Shasha Denims Ltd is to capture value added at each stage of the textile manufacturing process. Despite Bangladesh's lack of indigenous cotton production capability Shasha Denims Ltd has leveraged Bangladesh's labor cost advantage & export competitiveness to the maximum level.

1.2 Introduction:

Industrial attachment is the first step to professional life of student, especially of technical Side. It's an indispensable part of study a practically running processing technology of an industrial unit for a student. In our university , we have seen few processing techniques of textile but all processing machines are not in continuous running condition and latest textile technology are not available. So it would only provide demonstration of mechanical features & processing technology of the material in accomplishment of the theory , Thereof but not of the situational variables to achieve practical knowledge. So two months industrial attachment program in a denim weaving mill **(shasha Denims Ltd)** was arranged for us.

Textile education can't be completed without industrial training. Because this industrial attachment program minimizes the gap between theoretical and practical knowledge and make me accustomed to industrial environment. We got an opportunity to complete two month long industrial training in **Shasha Denims limited** , which is a 100% export, oriented Denim Industry.

1.3About Shasha Denims ltd :

The factory is the leading denim fabric producer in Bangladesh since 2000. The factory is professionally managed and technically sound organization located at Dhaka Export Processing Zone (DEPZ). The plant is fully integrated with State of the Art technology and machinery from Switzerland, Germany, Belgium, USA and india to give factory valued customer the real classical Indigo Denim made with the best and most modern computerized slasher dyeing technology. With ever increasing acceptance of quality fabric and increase in demand the production capacities were expanded at regular intervals. Factory production capacity is 1.8 million yards per month.

The machinery and the facilities are equally complemented with highly motivated and trained, skilled workforce who works round the clock to deliver the world class denim fabrics. In the era of specialization it concentrates only in denim Fabrics. The concentration and continues improvement made the factory an expert in the Denim arena. This segmented concentration gives them opportunity to serve their customers better. Most of their customers are world renowned and in number of cases they are the only nominated supplier for them from Bangladesh.

The factories make fabrics and deliver the largest quantity from Bangladesh. They have the widest range of denim fabrics. No one in the country produces as much.

1.4 Company profile :

Name of the factory	SHASHA DENIMS LIMITED.
Status	Private Company.
Head office	10th Floor, Mascot Plaza, Sec- 7, Uttara Model Town, Dhaka, Bangladesh
Factory Address	184 - 193, DEPZ Extension, Savar, Dhaka, Bangladesh
Contact	Tel: +88 02 7701302 – 5, +88 02 7701188, Fax: +88 02 7701307, +88 02 7701309 Web: **www.shashadenim.com**
Year of establishment	1998 (on production: 2000)
Product	Denim Fabric
Monthly production	1.8 million yards
Nature of company	100% export oriented company.
Factory area	0.3 million square feet
GSP Fascility	Yes, Europe Only

1.5 Sponsor of the project:

Anisul Islam Mahmud, MP
Chairman of Shasha Denims Ltd
Hon'ble Minister, Ministry of Water Resources

Mr. Anisul Islam Mahmud is Hon'ble Chairman of Shasha Denims Ltd.
Mr. Anisul Islam Mahmud was born in 1947 in an illustrious family of Chittagong. His father was Serajul Islam Mahmud and Mother was Sajeda Begum Chowdhury. His paternal grandfather was Khan Shaheb Abdul Halim Chowdhury and his maternal grandfather was Dr. Md. Sanaulla, Bar-at-Law, PhD. At present residing at House No.7, Road No. 117, Gulshan Model Town, Dhaka - 1212, Bangladesh.Mr. Mahmud obtained his B.A. (Honours) in Economics from Dhaka University in 1969 and M.Sc. in Economics from Quaide Azam University in Karachi. Mr. Mahmud received a Commonwealth Scholarship to study at the Essex University, UK, and received an MA in Economics from there in 1972. He was called to the Bar from Lincolns Inn, London, UK in 1975. Mr. Mahmud was a Lecturer of Economics at the Hertfordshire University (UK) from 1973 to 1977. He was a Senior Research Associate in the Economics Department at the East Anglia University in the UK from 1972 to 1973. He served as a Lecturer of Economics at Dhaka University from 1969 to 1970. Mr. Mahmud has been elected as a Member of Parliament from 282 Chittagong-05 constituencies in the 10th National Parliamentary Election in 2014. He took oath as a Cabinet Minister on the 12th January 2014 and has been awarded the portfolio of the Ministry of Water Resources, Government of the People's Republic of Bangladesh. He was also elected to the Bangladesh National Parliament (Bangladesh Jatiya Sangsad) in 1979, 1986, 1988 and 2008. As a Member of the Parliament of 9th National Parliamentary Election, he served as the Chairman of the Parliamentary Standing Committee for Expatriates Welfare & Overseas Employment.

Moreover, Mr. Mahmud served as a Cabinet Minister from 1984 to 1990. Mr. Mahmud served as the Minister of Foreign Affairs between 1988 and 1990. Prior to that he served as the Minister of Education in 1988 and held the additional charge of the Ministry of Irrigation, Water Development and Flood Control. He was the Minister of Irrigation, Water Development and Flood Control from 1985 to 1988. During this period he also briefly held the charge of the Ministry of Information. He served as the Minister of Labour and Manpower in 1985. Mr. Mahmud was the President of the Bangladesh Cricket Control Board from 1989 to 1990. He was also the President of Bangladesh Flying Club Ltd. from 1987 to 1990.

1.6 Vision & mission of the project:

The mission and vision of **Shasha Denims Ltd**. is to manufacture and deliver high quality Denim fabric to its customers. The core objective is to attain and enhance customer satisfaction by providing on time delivery of desired quality Denim fabrics and also to increase efficiency of workforce.

To attain these objectives, the management of Shasha Denims Ltd has decided to adopt the followings-

1. To increase awareness regarding customers requirements throughout the organization.
2. By providing training to develop efficiency of the employee.
3. To collect customer's feedback regularly to know about their conception about their company and to take timely appropriate action.

1.7 Name of some Buyers of Shasha Denims Ltd:

Name	Country	Logo
Marks & Spencer	United Kingdom	
George	United Kingdom	
Zara	United Kingdom	
H&M	Sweden	
Next	United Kingdom	
Polo	South africa	
Tesco	United Kingdom	
Mexx	Netherlands	
Wall-mart	USA	
JC Penny	USA	
Tommy	USA	
Gap	USA	
Lee Hang Fat		
Adams		
Woolworth	Australia	
Gulden P fenning		
Li & Fung and so on		

1.8 Factory Location:

Figure: Location of Shasha Denims Ltd.(Satellite view).

Figure : Front view of Shasha Denims Ltd.

1.9 Factory layout plan:

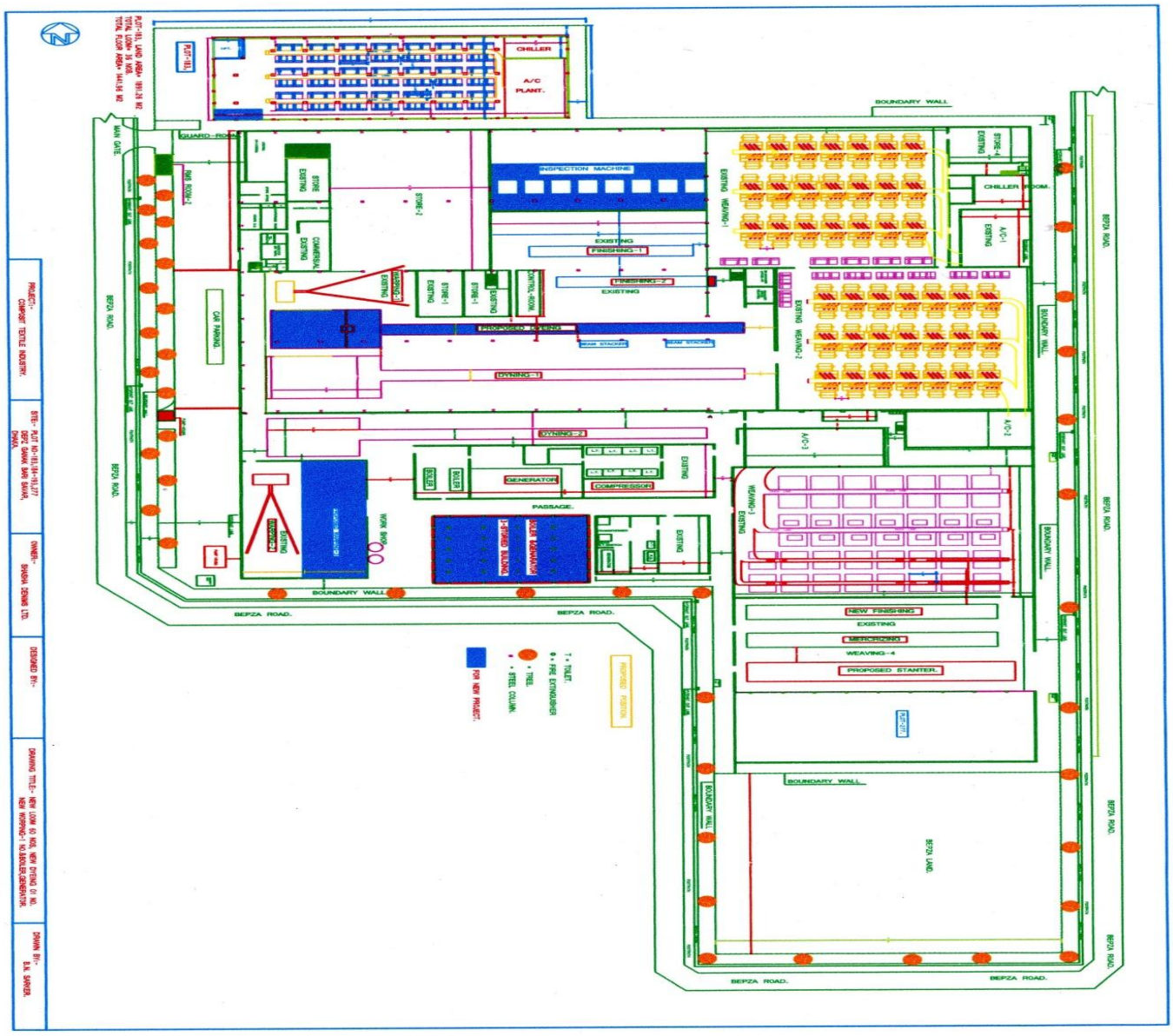
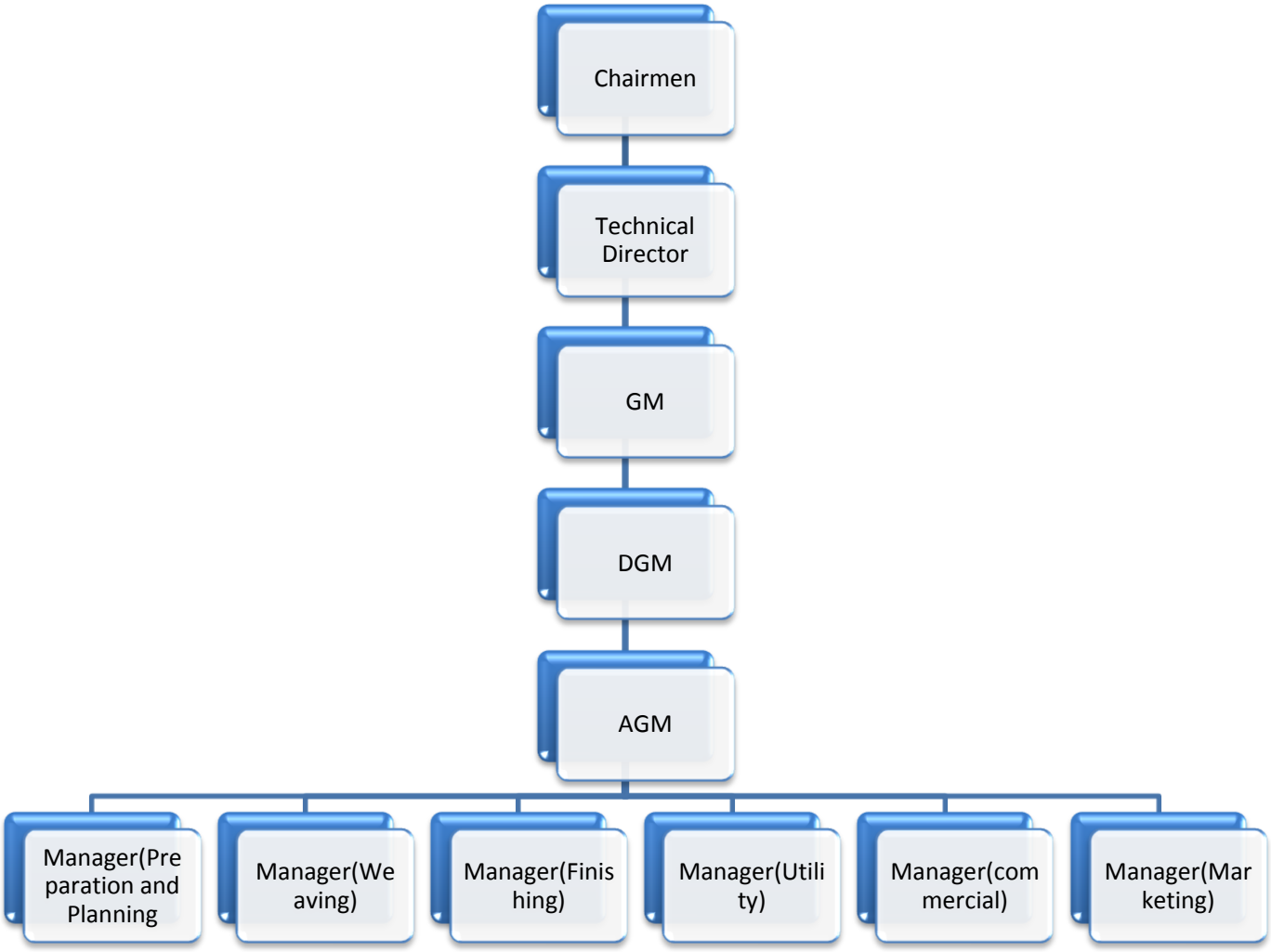


Figure: Layout plan of Shasha Denims Ltd.

1.10 Organograms :

Shasha Denims Ltd the Managing Director/ Chairman who controls the entire factory. And the others respective department chief controls their department in this factory.

In this below the organograms of administration and the others department is showing:



The respected manager`s are controlled their own department under proper guiding and competence.

Chapter-2

2.1 Textile:

The term textile means originally a woven fabric, but textile & the plural textiles are now also applied to fibre, filament & yarn. Natural & manufactured fibre & most products for which these are raw materials are called textiles.

2.2 Denim:

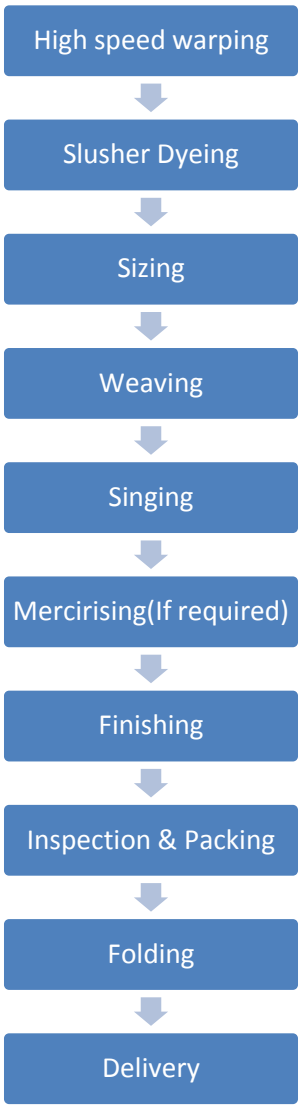
Denim is the oldest, most widely used, most fashionable and most versatile woven(warp faced twill)fabric of the world. At present denim is mainly used for producing garments particularly trousers for the young people. The gross production of denim fabric is approximately 3,000 million meters per year.

Denims are produced from 4 oz. to 16 oz./ sq. yds in weight. Technically Denim is defined as a 3/1 warp faced twill but also produced from weaves like: Left hand twill, right hand twill, broken twill, cross hatches, cords, dobby's, structures, etc .

Denims are made from yarn dyed warp and undyed weft. Traditionally, denim was dyed with various shades of indigo, yarn-dyed, different costs, and over-dyed with various types finishes at fabric as well as garments state. Denims are manufactured different types of after treatments or washes like stone wash, bleach wash, hand wash, acid wash, over dyed, printed denims and even embossed.

Denim fabrics are used as jeans trousers both for men and ladies. It is extensively used in the world as casual garments, Shirts, jackets, children wears are also made of denim fabrics. Its versatility, finds applications in furniture upholstery, bed covers, curtains, etc. Denim now-a-days is a very demandable product. To make a denim fabric the required yarn for the definite construction should be dyed then make a weavers beam to go to weaving to make fabric

2.3 Flow Chart of Denim Production in Shasha Denims Ltd:



2.4 Fibre used for warp yarn in Shasha denims ltd:

Most of the denims are produced with 100% cotton and cotton-based blends with Tencel, modal, etc. An ideal cotton mix for denim should have the following quality parameters.

2.5 Fibre used for weft yarn in shasha denims ltd:

Cotton is mainly used .Tencel, Modal, polyester, lycra etc also used as per buyer requirements. Cotton-based blends with the fibres may be also used.

2.6 Types of Yarn used:

- Ring yarn
- Polyester
- Lycra yarn
- **Rotor yarn** : Rotor yarn are the best and most widely used yarns in denim production. Because of their very high speed roto are much cheaper than ring spun yarns. Off course rotor can only produce yarns of up to 30 Ne. though cheap rotor yarns areassociated with greater imperfections than corresponding ring yarns therefore knit goods are produced from ring yarns.
- **Yarn count used:**

For warp (Slub + Normal)	For weft (Slub + Normal)	Polyester	Lycra
6, 7, 8, 9, 10, 12, 14, 16, 20, 30	6, 7, 8, 9, 10, 12, 14, 16, 20, 30	150D,300D,400D 600D,800D	10L40D, 16L40D, 16L70D,200L40D, 200L70D,300DL40D etc

- **Quality:** count cv-<1.2, single yarn strength>12.8gm/tex, elongation>6.0,U%<9.5.

- **Slub yarn:** The diameter of slubs varies from1 SD to 2.2 SD(where D is the normal dia of yarn). The periodicity of slub also varies widely. The test result show the distance between two adjacent slubs varies within certain range. Some of the usual range distance between two adjacent slub are from 6cm to 10 cm, 7cm to 20cm,30cm to 60cm.
  As huge amount of slub yarns used today the idea of too much strictU% is not considered.

2.7 Name of yarn suppliers for shasha denims ltd:

There is no spinning mill of Shasha Denims Ltd. So, they have to purchase yarns from the other spinning mills from Bangladesh and from abroad. Name of Some yarn suppliers for shasha denims ltd are listed bellow-

- Square Textiles Ltd.
- Salek Textiles Ltd.
- Akij Textiles Mill Ltd.
- Sinha Spinning Ltd.
- Badsha Textiles Ltd.

Chapter – 3

Warping

3.1 Definition:

In general terms, warping is transferring many yarns from a creel of single-end packages forming a parallel sheet of yarns wound onto a beam or a section beam. The warp beam that is installed on weaving machine is called the weaver's beam. A weaver's beam can contain several thousand ends and for different reasons it is rarely produced in one operation.

3.2 Objects of Warping:

- Construction of warp yarn beam.
- Construction of a parallel of yarn shift.
- Modifying the faults of yarn like thick and thin places, large knots etc.
- Winding the pre-determined length of yarn.
- Combination of small packages.
- Finding long length of warp yarn.
- Accelerating the next process.

3.3 Importance of Warping:

- The tension of wounds ends must be uniform and possibly constant during all the time of with drawl from supply package.
- Warping should not impair the physical and mechanical properties of yarn.
- Pre determined length of warping should be high.
- The surface of warping package must be cylindrical.

3.4 Types of Warping:

There are four types of warping, which are as follows:

1. Direct Warping
2. Indirect or Sectional Warping
3. Ball Warping
4. Draw Warping

In Shasha Denims Ltd they are used high speed warping.

3.5 Direct Warping/ High speed warping:

In direct warping, the yarns are withdrawn from the single-end yarn packages on the creel and directly wound on a beam. Direct warping can be used to directly produce the weaver's beam in a single operation. This is suitable for strong yarns that do not require sizing and when the number of warps on the warp beam is relatively small. This is also called direct beaming. It can also be used to make smaller, intermediate beams called warper's beams. These smaller beams are combined later at the slashing stage to produce the weaver's beam. This process is called beaming.

Figure: warping machine 02 of Shasha Denims Ltd.

3.6 Warping in Shasha Denim Ltd:

The warping section of the Shasha Denim Ltd. is working under the Manager of Preparatory Section. AG CH-9240 Uzwil and AGCH-9240Uzwil warping machine with v-creel is used here. The department is connected with dyeing section directly and working 24 hrs. R&D department inspects the cones which is converted in beams of required length and forwarded to dyeing section.

3.7 Machine Specification:

Direct Warping Machine: 01

Brand name	BENNINGER
Model	AG CH-9240 Uzwil
Machine no	105350/177
Origin	Switzerland
working Width	1800 mm (between the beam-discs)
Manufacturing year	1998
Max. beam disc diameter	1000 mm

Creel type	"V" shaped
Creel capacity	Maximum 540
spindle distance	360 mm
Maximum speed(mechanical)	1200 m/min
Maximum warping speed	800 m/min

Direct Warping Machine: 02

Brand name	BENNINGER
Model	AGCH-9240Uzwil
Machine no	3009840050
Origin	Switzerland
working Width	1800 mm (between the beam-discs)
Manufacturing year	2004
Max. beam disc diameter	1000 mm
Max. Mechanical Speed	1200 m/min
Max Warping Speed	800m/min
Creel type	"V" shaped
Creel capacity	Maximum 520
spindle distance	360 mm

3.8 Briefly discussion about different parts of warping machine:

3.8.1 Creel:

In Shasha Denims Ltd V creel is used there . At the creel, the yarn packages are placed. The machine has travelling package V-creels. The max creel capacity is 540 for first warping machine 520 for second warping machine cones. When one end is on working then the cones for next lot are installed on inner ends. After the one end's stock ends then the creel is moved to other side. Capstan tensioners are installed at the creel. Guide rods are installed at the creel.

Advantages of V-Creel:

- V-creel is used for only in direct warping.
- Suitable for high speed yarn warping.
- No need of yarn guide.
- Provide uniform yarn tension across the wholebeam.
- Free yarn run from creel to the warping machine.
- Less time consumable.
- Less space is consumed.
- Surface friction drive and variable speed drive is commonly used to attain the uniform yarn speed.
- V-creel has a low range of package change. Example: reversible frames, reversible frames with automatic knotter, and with travelling package

3.8.2 Chain system:

Chain system is connected with motor. Use to rotate the creel frame in cone changing process. There are two sides of frame one is in working and second side is stationary till the filling of new cones. Proper oil lubrication is maintained in the system.

3.8.3 Control Devices:

Warp yarns are threaded through capstan tensioners and stop motions at the creel. These tensioners are provided in order to provide necessary tension. When the machine starts running it remain closed for a little time in order to straightening of yarns. After the machine comes in running they open automatically to provide tension.

3.9 Different parts of headstock:

At the headstock, the warper's beam is installed for winding. The beam width is 1800mm. A guide roller guides the yarns to the warper's beam. A pressing roller presses the warp sheet on the warper's beam for winding with proper tension. The yarn build-up is determined by the tension of the warp threads and the press roller force. Uniform thread tension from the middle of the beam to the outside, i.e. from the front to the rear ends in the creel, must be assured. The press roller must ensure compact winding and absolute cylindricity. The first requirement for non-crossed ends is precision thread guidance with minimal free thread lengths from zigzag comb to beam. It must be possible to match the width of the thread sheet exactly to the beam width to avoid errors at the flanges.

The presser roll is of hard paper and has strong end rings to prevent damage. The increasing yarn diameter on the beam forces the press roller back against the resistance of the pre-set pressing force.
The indirect pressing action the winding is always perfectly cylindrical. Upon braking, the press roller is immediately swung away hydraulically. All friction between roll and yarn is avoided.

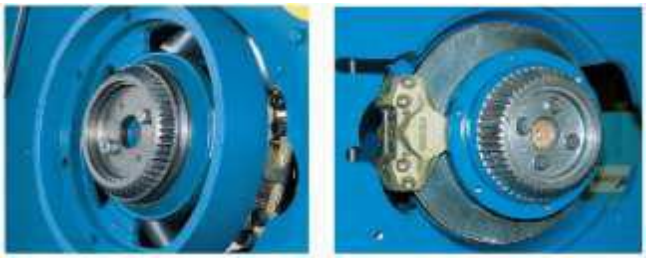


Figure: Internal taper.

The standard equipment is intended for back beams with 40° toothed internal taper. The teeth ensure exact centering as well as non-slip drive and braking. The machine can also be configured to accommodate journal beams. To avoid rolled-in threads, in the event of a thread break the direct warper must be able to be stopped in a short distance, even at the highest speeds and with a fully wound beam. This is performed by hydraulically operated disc brakes mounted to the both sides.

Figure: zigzag comb.

From the creel, the yarns are passed through the expandable zigzag comb. The required warper's beam width required can be set with the help of this comb. Simple insertion of the threads into the comb. The stepped comb is moved apart to simplify laying in the ends. The lateral alignment of the comb on the beam and the setting to the exact warp width are motor driven. The horizontal comb movement guarantees uniform yarn build-up on the beam. The traverse can be set steplessly. Due to the vertical movement, the life of the comb is increased.

3.10 Warping Plan:

The warper gets the required no of ends and the number of beams from the R&D department and then he made the warping plan that how to complete that task whether on one creel or on more no. of creels.

3.11 Warping Procedure:

The creel stand has maximum capacity of six cones per stand. The yarn from the cones is unwounded and passes from rod by cross wound, holed by a catcher guided to the tensioning zone when cone rotates anticlockwise. There are three types of tension in warping i.e. catcher tension, rod tension, and sacker tension. Magnetic tensioner is used for yarn tension. Then the yarn comes to the winding zone or headstock. Combs straighten the yarns towards pressure drum, which supports beam, and yarns in an alignment so that each and every yarn end can wound separately. Static charges due to friction of yarns on metal surface cause static charges, which are removed through an anti static device. Then the yarn is wounded on beam in this way for a required length if beam is changed after one filling of beam then knotting of yarns is made. Similarly if cones are finished on one frame side then trolley system of cone changing is used in this way chains rotates the whole frame of empty side and new filled side of frame is forwarded again knotting is done between the new cones yarn and already winded yarn. Extra yarn is then removed through cutting. Sensors sense any type of yarn breakage and in case of yarn breakage knotting is done.

3.12 Count wise Drum Pressure:

The drum pressure is different for different yarn count. During our Attachment work we found warping tension setting according to the count basis-

Count	Drum pressure(DAN)
6 OE	550
7OE	550
8OE	550
9OE	500
10OE	500
12OE	450
16OE	400
20OE	400
7R/S	550
9R/S	500
12R/S	450
16R/S	400
7OESLUB	550
9OESLUB	450
12OESLB	450
14OESLUB	400
16OESLUB	400

3.13 Following points should be maintained carefully:

- Yarn ends per section
- Number of revolutions
- Warp length
- Number of sections
- Yarn ends per section

3.14 Defects may be occur during warping:

There are certain major warping defects on beam warpers that can be identified as given below.
Lapped Ends : The broken end of yarn is not tied to the end on the warp beam and overlaps the adjoining yarn. The beam is not properly braked and the signal hook fails to operate.

Broken ends on the beam : A group of ends is broken and tied as a bunch or worked-in with overlapping.

Excessive or insufficient number of yarn ends : The number of yarn ends of the beam becomes excessive or insufficient due to the incorrect number of bobbins in warping.

Conical winding on the beam :
It occurs due to incorrect load applied by the pressure roller.

Slacks & irregular yarn tension :
It happens due to any on of these reasons improper threading of the yarn into the tension devices, ejection of yarn from under the disc of the yarn tensioning device, or yarn tension devices of poor quality.

Frequent yarn breakages at the beam edges :
It results due to burrs and nicks on the surface of the warp beam flanges.

Improper length of warping :
It is due to malfunction of the counter, and the brakes of the measuring device & warp beams.

Coarse Knots :
It is due to manual tying-up.

Loose yarn winding :
It happens when the pressure roller is lightly pressed against the warp roller.

Fluff, oily ends and yarn of different density :
It is due to the careless work of the operater, creeler and oiler.

3.15 Yarn breakage during warping:

Serial No.	Yarn count	Yarn length	M/C RPM	Breakage
01	16OE	7550m	800	7
02	12OE/SL	22200m	800	6
03	12R/SL	22200m	800	8
04	7	16000m	800	5
05	9	16000m	800	3
06	10	16000m	800	4
07	30Tencil	20000m	700	0
08	20Tencil	22000m	700	2
09	16R/SL	7400m	800	1
10	20SL Tencil	16000m	700	0
11	28/2	7550m	800	1

Chapter - 4

4.1 Pre wetting:

Before going to dyeing textile warp yarn are subjected to pre wetting to remove that contains natural oil, fats & waxes together with other impurities. During manufacturing oil & adventitious dirt are collected. And these are affected the absorbency of the cloths & leads to uneven dyeing. Oil, fats & waxes are all insoluble in water; they dissolve in organic solvents such as Chloroform, Ether and Petrol etc. Scouring is the process to remove all these impurities to make a more absorbent, hydrophilic & clean fabric.

4.2 Object of Pre wetting:

- To remove natural & added impurities like oil, wax, gum, fatty material as completely as possible.
- To get a clean & even fabric surface for the next process.
- To increase the absorbency of the fabric, i.e. to make the fabric hydrophilic, so that it can absorb dye molecule, water & other processing easily.

4.3 Function of the chemicals used in Pre wetting:

- Alkali : It converts the oil into water soluble fatty acid & soap.
- Wetting agent: A soluble or dispersible material that reduces the surface tension between the material & liquid. Detergency effect helps to clean the material.
- Sequestering agent: It reacts with metallic ions & thus makes the metallic compounds to become a part of complex anion.
- Caustic soda: Caustic Soda is a highly versatile chemical. Included among its many applications are the following: acid neutralization, bleaching in paper making and cotton processing, petroleum refining, production of alumina from bauxite, manufacturing synthetic fabrics such as rayon, production of soaps and detergents, and also manufacturing food products.

4.4 Pre wetting Recipe maintained in Shasha Denims ltd:

Pre-wetting preparation for machine:01

Chemical name	Amount used in kilograms
Wetting agent	2.3
Ladiquest	1.2
Caustic soda	50
Total volume	

Pre wetting for machine: 02

Chemical name	Amount used in kilograms
Wetting agent	4.8
Ladiquest	24
Black	30
Caustic soda	14
Reducing agent	12
Total volume	

Chapter – 5

Dyeing

The procedure by which dye stuff enters into the textile goods is called dyeing. Otherwise,The process by which a textile material is to be changed physically or chemically, so that it looks mono uniform colored is called dyeing. All commercial textile dyeing processes take place by the application of a solution or a dispersion of the dyes to the textile material followed by some type of fixation process. The dye solution or dispersion is almost always in an aqueous medium. A major objective of the fixation step is normally to ensure that the coloured textile exhibits satisfactory fastness to subsequent treatment in aqueous wash liquors. Dyeing is mainly depends on the type of fabric, structure of fabric and the properties of dyes.

5.1 Objects of Dyeing:

- The textile goods are dyed uniformly with single color.
- To increase the attractiveness of the textile goods.
- To make the fabric suitable for various usage.
- To make the textile goods suitable for decorative purposes.

5.2 yarn Dyeing for denim in Shasha Denims Ltd:

Dyeing is consists of two dyes. The indigo blue & Sulphur black is used in the dyeing process of denim. Sometimes brown color is used instead of indigo blue in the factory according to the requirement of buyer.
The classical jeans were produced out of indigo-dyed Denim fabric. The special character of this fabric only the warp thread is dyed makes it necessary to carry out dyeing in yarn form. The yarns applied for Denim were exclusively produced on ring spinning machines in former times. The development of OE yarns by applying smaller rotors with a spinning speed of up to 200 m/min has led to the application of OE rotor yarns both for warp and weft. The yarns applied for weaving must be of high quality, a high fiber for strength, regularity as well as a small part of short-stapled cotton fibres belongs to the basic features of the denim yarn. For regular jeans qualities the warp yarns are spun in a fineness of 6 to 40 Ne. If Denim is made out of Tencel or Modal especially for jeans shirts the finenesses are up to 30 Ne. Indigo and sulphure mainly used in the dyeing process.

Two methods are applicable for continuous dyeing with indanthrene dyes:

- Rapid dyeing and
- Vat dyeing.

While processing the basic colored denim, reactive dyes are used and fixed with hot caustic soda solution. The dyeing process is mainly influenced by the dyestuff characteristics, dyeing

temperature and necessary chemicals used in the process. Indigo dye is the most popular choice as it has good depth of shade and suitable rubbing and washing fastness. When cotton yarn is dyed with indigo, it leaves a ring-dyeing effect, because of which the outer layer of warp yarn is coated with indigo, and the core of the yarn remains undyed. This gives the denim garment a unique 'faded look' and a rich blue shade after repeated use and wash. Originally, the warp yarns or ends were put through the dye bath side by side to form a sheet of yarn, which passed continuously through several dye baths, squeeze rollers or airing sequences. Specially two types of dyes are commonly used in factory. Vat dye and sulphur dye. These two types of dyes are described below.

5.3 Dyes use for Denim in Shasha Denims Ltd:

- Vat Dyes
- Sulphur Dyes

5.3.1 Vat Dyes:

The name vat was derived from the large wooden vessel from which vat dyes were first applied. Vat dyes provide textile materials with the best colour fastness of all the dyes in common use. The fibres most readily coloured with vat dyes are the natural and man-made cellulosic fibres. Vat dyes are more expensive and difficult to apply than other classes for cellulose such as directs, sulphurs, and reactive. Indigo is a special case in the vat dye class. Indigo is attractive for its pleasing blue colour and for the unique fading characteristics of garment dyed with it. Vat dyes are characterized by the presence of a keto group. Vat dyes in keto form are water insoluble pigments.

Dyeing with vat dyes:
The application of vat dyes to cellulosic materials occurs in five stages.

1.Aqueous Dispersion:
The insoluble vat dye is dispersed in water.

2.Vatting:
This step involves the chemical reduction of the vat dye to produce the soluble, reduced or leuco form of the dye. This is achieved by Sodium Hydrosulphite, Sodium Hydroxide and water. The sodium hydrosulphite chemically reduces the vat dye in the alkaline conditions created by the presence of sodium hydroxide.

3.Absorption of dye molecules by the fibre:
The vatted dye molecules are substantive to the cellulosic material when this is introduced into the dye liquor. To achieve adequate exhaustion, an electrolyte is added to the dye liquor and the temperature may be increased depending on the specific vat dye. The application of the dye molecule to the fibre occurs at temperatures specific to a particular vat dye and occurs in a range from 200 C to 600 C. The addition of the electrolyte alters the equilibrium of the dye liquor so as to increase the substantivity of the dye molecules for the fibre. During this stage of dye

application the textile material must be kept immersed in the dye liquor to prevent premature oxidation of the leuco compound.

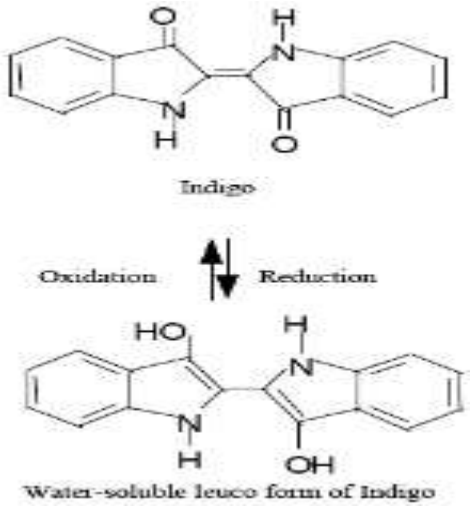


Figure: Water soluble leuco form of indigo

4.Re-oxidation of dye molecules within the fibre:
Once within the polymer system of the fibre the leuco form of the vat dye has to be oxidized and converted to its original colour and the insoluble form of the dye. Oxidation of the leuco compound can be achieved by atmospheric oxygen .

5.Soaping-off vat dyes:
During the previous stage some insoluble vat dye may be deposited on the surface of the textile material. This has to be removed to prevent poor rub-fastness as well as a possible change of shade due to the subsequent removal of this surface deposit. Soaping-off, which is the boiling of the dyed material in a liquor containing some suitable detergent, removes this surface dye. The term soaping-off was derived from the fact that before the development of detergents, soap was used to remove the surface dye.

5.3.2 Sulphur Dyes:

These dyes are so called because they contain sulphur atoms in their molecules. The fibres most readily coloured with sulphur dyes are the natural and man-made cellulosic fibres.

Dyeing with sulphur dyes:

Sulphur dyes are widely used on cotton mainly because they are economical to use. They have good to excellent wash fastness and good light fastness in dark shades. Light fastness of pale shades is poor. Sulphur dyes are usually dull in shade since the molecular structures are complex. As a class, the sulphur dyes are not resistant to chlorine containing bleaches.

Characteristics of Sulphur and Luco Sulphur Dyes on Cotton:

Sulphur dyes have the dullest range of colours of all dye classes but are relatively inexpensive. They are used to dye medium to deep, dull shades on cellulosic materials. There are several excellent blacks giving dyeing with good wet fastness properties. In fact, when black, and deep brown, blue and dull olive green shades are needed, with good washing and satisfactory light fastness at reasonable cost, sulphur dyes are irreplaceable. Sulphur dyes are also used for dyeing denim black, olive, brown and maroon, rather than the traditional Indigo blue, as well as to 'bottom' or 'top' Indigo dyed cotton warps. To 'bottom' or 'top' means that a sulphur dye is applied either before or after the Indigo. The fastness to wet processes and to crocking can be varied almost as required to satisfy the demand for the faded look so popular for denim. This is achieved by allowing premature oxidation of the leuco dye during dyeing, by using short dyeing times so that there is inadequate time for dye penetration into the fibres, and by poor rinsing and soaping after dyeing. The dyeing can then be subsequently treated to produce the faded worn look by removing the surface colour. Although cellulosic goods dyed with sulphur dyes usually have good washing fastness, it can be further improved by resin finishing. The light fastness varies from moderate to good in heavy shades. A major characteristic of sulphur dyes is the poor fastness to chlorine, which distinguishes them from most quinone vat dyes. Dyeing with sulphur dyes cannot be bleached with hypochlorite. In fact, these dyes are readily distinguished from other cotton dyes by their dark, dull colours and the bleaching that occurs when a dyeing is spotted with hypochlorite and allowed to dry. Cotton dyed with some sulphur blacks becomes tendered on storing under warm humid conditions. This is a consequence of the formation of sulphuric acid from oxidation of the sulphur dye in the fibres. It can be minimized by thorough washing after dyeing before the oxidation of the leuco dye, by a final alkaline rinsing with soda ash solution, and by resin finishing. Such tendering is avoided by dichromate oxidation of the leuco dye.

Dyeing with Sulphur Dyes:

Initially the goods are wet out in the bath. Since the dyeing liquor contains appreciable amounts of sulphide, copper fittings must be avoided. If wetting or penetrating agents are used these should be of the anionic type since non-ionic surfactants form stable, non-substantive complexes with the leuco thiols. An anionic product such as phosphated 2-ethylhexanol is suitable. The bath may then be set at 40°C with some sodium polysulphide. Polysulphides in the leuco dyebath prevent premature oxidation of the dye and reduce the tendency to bronziness of deep dyeing of blues, navies and blacks. An addition of a sequestrant such as EDTA avoids precipitation of the leuco thiolate by calcium and magnesium ions. The leuco dye is then added slowly and, since the leuco dyes only have low to moderate substantivity for cellulose, some salt may be added initially, or in portions during dyeing, to promote exhaustion. After dyeing the goods are rinsed, the leuco dye oxidised and the dyeing is soaped as for a conventional vat dye.

Sulphur dyes usually have acceptable substantivity, particularly in the presence of salts, so that stripping in a fresh reducing bath is not easy. Dyeing is often conducted at the boil but this decreases the degree of exhaustion. Sulphur dyes require less salt than reactive dyes and usually have reasonable exhaustion. Low sulphide leuco dyes require more salt and no polysulphide. They do not give good exhaustion in heavy shades and the use of a low liquor ratio is

recommended. For popular shades such as black, it has long been common practice to use a standing bath. This is a dye bath that is re-used for subsequent dyeings after addition of more reduced dye. Any free sulphur that tends to accumulate is dissolved by addition of sodium sulphite to give thiosulphate. This prevents it sticking to the goods. The actual dyeing temperature can vary. At higher temperatures around the boil, the bath exhaustion is less but penetration of the leuco dye into the fibres is better than at lower temperatures.

5.4 Denim Dyeing Process:

There are three processes in the practice for continuous denim dyeing:

- Rope Dyeing
- Slasher or Sheet Dyeing
- Beam Dyeing

5.5 Dyeing process used in Shasha Denims Ltd:

Slasher dyeing and sizing:

Slasher dyeing dyes the yarns in the warp beam form. It is a continuous process which combines dyeing & sizing in a single operation. Dyeing is done by continuously passing warp yarns through several dye bath of indigo dye liquor that varies from machine to machine. The dyed yarns are then sized & wound onto a weavers beam to be ready for use in the weaving process. Slasher dyeing is usually of inferior quality as compared to rope dyeing shade evenness or side-to-side shade variations. With the slasher dyeing, the penetration of dyestuff is poorer, and it is easily reveals an uneven pick-up along its width with the distortion of the pad-roll.

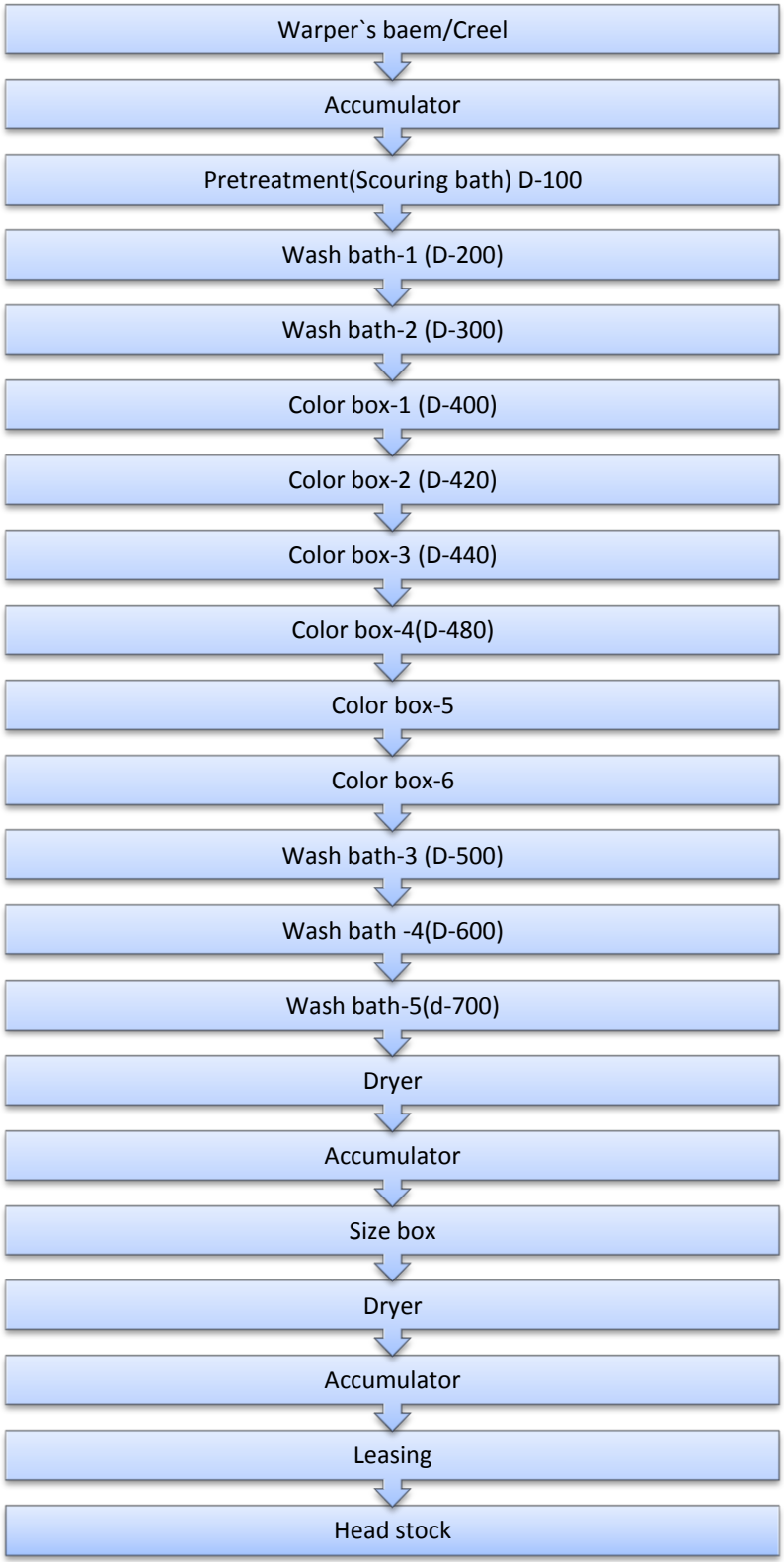
5.6 Specification of Dyeing and Sizing machine-01 for Shasha Denims Ltd.

Brand:BENINGER
Model: BEN SIZE TECH
Machine no: 250173064
Manufacturing year:1998
Storage tank capacity:1000L
No of size box: 01
Creel capacity: 14
Motor power consumption: 400 V / 50 Hz
Origin: Germany
Maximum production capacity(Mechanical): 40 m/min
Maximum production capacity: 30 m/min

Figure: Beninger slasher dyeing and sizing machine1 in Shasha Denims Ltd.

5.7 Flow chart of dyeing machine -1 in Shasha Denims Ltd :

5.8 Flow chart of dyeing machine -2 in Shasha Denims Ltd :



5.9 Specification of Dyeing and Sizing machine:02

Brand:BENINGER
Model: BEN SIZE TECH
No of size box: 01
Creel capacity: 16
Kitchen width: 80''
Storage tank capacity:1000L
Motor power consumption: 400 V / 50 Hz
Origin: Germany
Maximum production capacity(Mechanical): 45 m/min
Maximum production capacity: 35 m/min

5.10 Beam creel section for Shasha Denims Ltd:

- Type- Sliding creel
- Arrangement- Two creels are placed parallel to each others.
- Creel capacity-14 warp beams for first Dyeing machine and 16 warp beams for second dyeing machine can be placed in each creel.

Electronic motor is available to slide the creel as well as mount the beams.

5.11 Dyeing process that is maintained in Shasha Denims Ltd as follows:

- Pure Indigo- Continuous Indigo Dyeing
- Bottoming- Sulphur(Bottom) & Indigo(Topping)
- Topping- Indigo(Bottoming) & Sulphur (Topping)
- Black Denim-Continuous Sulphur Black Dyeing
- Color Denim.

5.12 Chemical used in dyeing For Shasha Denims Ltd:

Chemicals name	Brand name
Indigo Grain	Hanzhou
Indigo BS Grain	Gabrian
Hydro	Jinhe Sodium China
Hydro BASF	BASF
Black sulphar dye	MKS Devo
D -Black RDT-D	Clariant
Reducing agent	Redoxal(Oxford Tech)
Washing agent(Acid)	Qingdao
Wetting agent	Fimbile AS 40(Bozzetto)
Ladiquest	Lidiquest 1097-U-Liq
Caustic soda	Arabian
Antox SD	Antox SD

5.13 Color Codes for piping in Shasha Denims Ltd:

Figure: Color Codes for piping in Shasha Denims Ltd.

5.14 Details of figure of Color Codes for piping in Shasha Denims Ltd:

Serial No.	Chemical name	Color code
1	Liquid indigo dye	Light blue
2	Sulpher black	Black
3	Caustic soda	Orange
4	Tenside(Surfactant)	Brown
5	Reducing agent	White
6	Acetic agent	Red
7	Cationic agent	Browm+White
8	Concentrated color	Dark blue
9	Dilute color	Dark blue+White
10	Effluent	Black+White
11	Hot water(soft)	Green+White
12	Cold water(soft)	Green
13	Uncertain	No mark

5.15 Dyeing recipe: **Antox indigo for machine 01& 02:**

Chemical name	Amount used in kilograms
Water	556
Wetting agent	1.8
Ladiquest	6
Indigo	75
Caustic soda	121
Antox SD	28.5
Hydro	65
Total volume	

Normal indigo for machine :01

Chemical name	Amount used in kilograms
Water	556
Wetting agent	1.8
Ladiquest	6
Indigo	75
Caustic soda	121
Reducing agent	10
Hydro	65
Total volume	

Normal indigo for machine :02

Chemical name	Amount used in kilograms
Water	55
Wetting agent	1.8
Ladiquest	6
Indigo	75
Caustic soda	121
Hydro	65
Total volume	

D . Black for machine: 01

Chemical name	Amount used in kilograms
Water	35
Wetting agent	1.8
Ladiquest	3
Black	780
Caustic soda	25
Reducing agent solid	50
Total volume	

D . Black for machine: 02

Chemical name	Amount used in kilograms
Water	35
Wetting agent	1.8
Ladiquest	3
Black	780
Caustic soda	25
Antox SD	35
Reducing agent solid	35
Total volume	

Pre wetting for machine: 01

Chemical name	Amount used in kilograms
Wetting agent	4.8
Ladiquest	24
Black	30
Caustic soda	14
Reducing agent	12
Total volume	

D-100 pre :10 gpl

Chemical name	Amount used in kilograms
D Black	50
Antox	15
Wetting agent	5.15
Ladiquest	2.5
Caustic soda	10
Reducing agent	12
Total volume	

Feeding Black of 9.5 gpl

Chemical name	Amount used in kilograms
D Black	33
Antox	15
Wetting agent	1.25
Ladiquest	1.25
Caustic soda	21
Reducing agent	7.5
Total volume	500

Pre dyeing preparation for machine:02

Chemical name	Amount used in kilograms
Wetting agent	2.8
Ladiquest	1.4
Caustic	10
Black	20
Reducing agent	12
Total volume	

Pre recipe of Tenside:

Chemical name	Amount used in kilograms
Wetting agent	0.5
Ladiquest	0.6
Total volume	

Pre-wetting preparation for machine:01

Chemical name	Amount used in kilograms
Wetting agent	2.3
Ladiquest	1.2
Caustic soda	50
Total volume	

Preparation recipe of 4 gpl black:

Chemical name	Amount used in kilograms
Wetting agent	2.3
Ladiquest	1.2
Caustic	21
Black	14
Reducing agent	12
Total volume	500

Level indigo preparation for machine : 02

Chemical name	Amount used in kilograms
Indigo (liquid)490 gpl	3
Caustic	1.5
Hydro	1.5
Ladiquest	500 Grams
Wetting agent	500 Grams
Total volume	

5.16 List of some chemicals are used in Shasha Denims Ltd for dyeing with their function:

- **Sodium Hydrosulphite / Hydrose:** It is a reducing agent. It converts the insoluble vat dye to soluble leuco form & also to remove dissolved oxygen from water.

  $$Na2S2O4 + H2O + [O] = 2NaHSO3$$

- **Caustic Soda**: It is scouring agent and removes impurities from the fiber. It is used here as pH controlling agent. NaHSO3 is produced in the vatting bath which has the tendency to destroy leuco compound. To remove NaHSO3, alkali is used.

  $$NaHSO3 + NaOH = Na2O3 + H2O$$

- **Ladiquest:** It is a sequestering agent and use to remove the hardness of water.
- **Antioxidant:** It is used to protect oxidation of dye molecule in dye bath. It is used as reducing agent while Sulphur black is used. It is also known as monohydrate glucose.

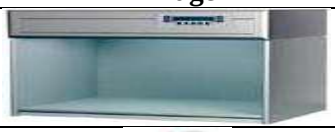
- **Acetic Acid:** It is used to reduce the percentage of pH in dye bath.
- **Tenside:** A solution of caustic soda, wetting agent and ladiquest.

5.17 Different lab tests:

Some different tests are tested in the dyeing lab during dyeing.Such as-

- Hydro: The amount of hydro was tested in dye bath during dyeing.
- Concentration of the different chemical in the dye bath.
- Ph of the dye bath was tested by the Ph tester.
  As a result the main color was faded.
- Shade of yarns by-
  Stripping: At first the sample yarns are tapped and immersed in 68% HNO3 solution for a unit time. ex: for black1.5 minutes.
- Temperature of the dye bath should be maintained:
  For black: 90^0 C
  For indigo: 38^0 C

5.18 Equipments used in Shasha Denims Ltd for dyeing lab:

Name	Image	Function
Color Assessment Cabinet		Color fastness and shade match.
Metrohm meter		pH, Indigo and Hydro measurement.
Portable Spectrophotometer		Black color measurement.
Metrohm pH meter		pH measurement
Digital Balance		Weight measurement
Desktop Computer		Machine control and dosing command.
Micro Oven		Drying

Chapter – 7

Weaving

7.1 Definition of weaving :

The process of producing a fabric by interlacing warp and weft threads is known as weaving. The machine used for weaving is known as weaving machine or loom. Weaving is an art that has been practiced for thousands of years. The earliest application of weaving dates back to the Egyptian civilization. Over the years, both the process as well as the machine has undergone phenomenal changes. As of today, there is a wide range of looms being used, right from the simplest handloom to the most sophisticated loom.

7.2 Weave Designs produced in Shasha Denims Ltd:

- Plain weave
- Twill weave
- Zigzag twill
- Herringbone twill
- Broken twill
- Satin

Most of the other weaves are derived from these basic weaves. The immediate derivatives of these structures are warp rib, filling rib, and basket weave are also produced.

7.3 In Denim Fabrics Twill Weave are most widely used:

Twill Weave:

Twill Weave is produced in a stepwise progression of the warp yarn interlacing pattern. The interlacing pattern of each warp yarn starts on a different filling yarn and follows the same formula. These results in the appearance of a diagonal line called twill line in the fabric, which is then characteristic of this design. Depending on the direction of the twill line, the twill weaves are called right-hand or left-hand twills.

Fig: Left-hand twill

Fig: Right-hand twill

Weave design : For example-

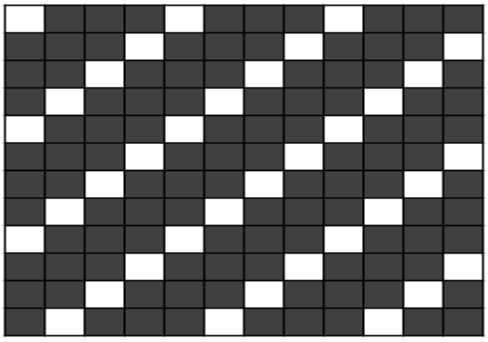


Figure: 3/1 Right Hand Twill (RHT)

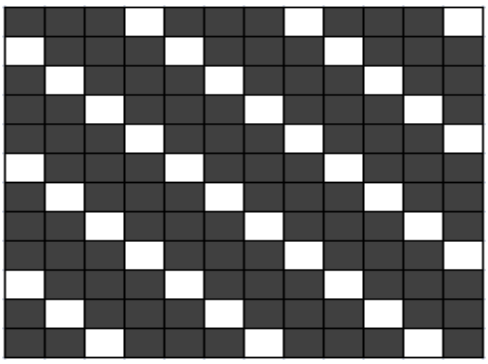


Figure: 3/1 Left Hand Twill (LHT)

7.4 Fabric Construction in Shasha Denims Ltd:

Warp count x weft count/EPI x PPI

Where, EPI= End`s Per Inch.

And PPI=Pick`s Per Inch

For example,

(16OE+16OE)X150L40D/71X60

Here , (16OE+16OE)= Warp yarn count.

150L40D= Weft yarn count.

71= End`s Per Inch

And 60=Pick`s per inch

7.5 More fabric construction used in Shasha Denims Ltd:

(12 RS+12+10 OE)x16L40D/71x50

(7+9+12)x600D/60x40

(28/2x450D L40D)/71x50

(16+16)x16/71x45

(12RS+12OES+10RS)x(9OES+9OE)/83x54

7.6 Classification of Modern Weaving Machines:

Modern Weaving machines are classified according to their filling insertion mechanism. The classification is as follows:

- Rapier
- Projectile
- Air-Jet
- Water-Jet

7.7 Weaving in Shasha Denims Ltd:

In Shasha Denim`s weaving is air Jet & Rapier. There are 83 airjet & 92 rapier machines. The department is working under the good supervision of Mr. Mazharul islam who is weaving AGM and very much dedicated to his work. He is working with all his technical, management hardworking staff. Like some other departments weaving department is running 24 hours a day and meeting the sales requirements.

Weaving department is playing a leading role in denim manufacturing for denim at Shasha Denims Ltd.

7.8 Types of loom in Shasha Denim`s Ltd:

Air-jet

1. Picanol omni
2. Picanol omni plus

Rapier

1.Picanol Gamma
2.Picanol Gammax
3.Picanol Optimax

7.9 Description of different parts of loom used in Shasha Denims Ltd:

7.9.1 Main motor:

The oil-cooled Sumo main motor drives the weaving machine directly, without belt or clutch and brake. The very short drive train is simple and compact, and the machine is up to full speed right from the very first pick. The speed of the motor is controlled electronically, without a frequency converter, thus reducing power consumption and permitting greater flexibility. The shed crossing time is set entirely from the display. This combination of the Sumo motor with electronic settings makes it easy to obtain the highest possible industrial speeds taking into account the yarn quality, number of harnesses and weaving pattern, and considerably reduces the set-up times.

7.9.2 PC Suite:

Picanol PC Suite is a collection of PC software to monitor the design, settings and production data of the weaving shed in a very easy way. Loom Gate makes it possible to communicate between the PC and the weaving machines over the network. Using Loom Gate, machine settings are transferred from the PC to the machines and vice versa, the weaving machine can be updated with new software, or the actual settings and operating parameters of the weaving machines can be consulted. Loom Gate also includes a monitoring function to consult and process machine and shift production data on the PC.

7.9.3 Automatic full pick finding:

- The machine has an automatic full pick finder.
- For picanol omni and picanol omni plus there are two filling detectors are mounted in the profile reed named FD1 and FD2. The FD1 observed that the weft yarn is inserted or not. The another filling detector FD2 detect the length of a single pick as the selection from the operator.
- For Picanol Optimax a sensor is used for pick finding.
- In case of a broken pick the machine stops and only the harness frames are brought in motion automatically so as to free the broken pick, without the reed touching the beat-up line. This reduces the stop time in case of a filling break and avoids starting marks.

7.9.4 Let-Off and Take-Up motion in Shasha Denims Ltd:

- The electronically controlled let-off (ELO) and take-up (ETU) are fitted for the Picanol Optimax.
- The mechanically controlled let-off (ELO) and take-up (ETU) are fitted for the Picanol Omni and Picanol Omni plus.
- The ETU makes it possible to weave fabrics with variable pick densities, with highly accurate settings.

7.9.5 Easy fitting and removal of warp beam and cloth roll:

The warp beam is driven by an electronically controlled let-off system via a separate gearwheel that remains on the machine. Fitting the warp beam and changing the cloth roll are done by means of quick connections no tools are required.

7.9.6 Perfect lubrication:

- Lubrication is by means of a central circulation system controlled by pressure and pressure difference sensors. Constant filtering of the oil ensures perfect lubrication.
- The lubrication system used for the cam box is separate from the centrally lubrication system and it is maintained for each machine separately.

7.9.7 Emery roller:

The emery roller ensures a better grip of the rubber coated roller onto the cloth. Because of the division of the pressure of one pressure roller over two pressure rollers a zone contact is established instead of a line contact (obtained with one pressure roller). This zone contact provides a better control of take-up and allows weaving of heavily beat-up fabrics in an easier way.

7.9.8 Optimized sley drive:

The sley is driven by a cam and cam follower system, for perfect beat-up and balanced lower inertia for higher speeds it is used.

7.9.9 Electronic Selvedge System and Electronic Rotary Leno:

The unique Electronic Selvedge Systems (ELSY) are driven by separate stepper motors that are controlled electronically. The selvedge patterns and crossing times can be programmed independently of the shed crossing. This can be done even while the machine is running, so the weaver immediately sees the result of the new settings. The crossing time of the Electronic Rotary Leno (ERL) can similarly be programmed while the machine is running.

7.9.10 Quick Step filling presenter (Rapier):

The Quick Step filling presenter operates with independent modules, each consisting of an electronically controlled stepper motor with a presenter needle. The system handles up to four colours. The operator enters the weave pattern on the microprocessor keyboard or at the control unit.

7.9.11 Prewinders:

The prewinders have a sensor for the reserve windings and may have a built-in optical yarn break detector. Tthe adjustable motion and force of the magnetic pin, the OMNIplus 800 is able to weave yarns ranging from extremely light to coarse.

7.9.12 Programmable Filling Tensioner (Airjet):

The Programmable Filling Tensioner (PFT) reduces the pick tension in the yarn at the end of insertion when the magnetic pin on the prewinder closes. This makes it possible to weave weaker, more delicate or elastic yarns at higher speeds. The PFT is automatically threaded along with the prewinder when the latter is threaded pneumatically. The PFT is mounted on the balloon breaker ensuring the ideal insertion line together with the fixed main nozzle.

7.9.13 Clamp on the movable main nozzle (Airjet):

At the entrance to the main nozzle a pneumatically controlled mechanical clamp holds the yarn during the non-insertion period, enabling the continuous airlow to be kept at a very low level. This improves the fabric quality and reduces the number of stops with weaker yarns.

7.9.14 Fixed and movable main nozzles (Airjet):

The entirely new air supply system and more efficient main nozzles permit higher performance. The position of both the fixed and the movable main nozzles is simple to adjust. Moreover, the airjet pressure and timing can be adjusted separately, giving reduced air consumption.
The Electronically-controlled Low Continuous Airflow (ELCA) system holds the filling yarn in the ideal position during the non-insertion period. The digital and analog setting for each channel prevents the yarn unraveling or untwisting.

7.9.15 Stretch nozzle (Airjet):

The stretch nozzle is fitted at the right-hand side of the reed and stretches the tip of the pick at the end of insertion. By the air pressure the yarn passes through a profile reed is stretched until the beat up. It is frequently beneficial to include an extraction nozzle. Combined with the programmable filling tensioner, the stretch nozzle ensures the best insertion for a filling yarn.

7.9.16 Selvedge produced for different loom in Shasha Denims Ltd :

- Selvedge is an important role for further processing of a fabric. Air-jet weaving machine can be equipped with various types of selvedge formation devices. Several machinery manufacturers incorporate different types of selvedge formation devices as per requirement of the end products.
- But in case of Shasha Denims Ltd Leno selvedge is produced.

7.9.17 Leno device used is the different looms of Shasha Denims Ltd:

- For picanol omni and picanol omni plus the rotary leno device is used which was mounted on the two sides of the loom. The rotary leno device rotates mechanically by the main motor.
- For picanol Gamma magnetic leno device is used.
- For picanol optimax is used for leno selvedge production.

7.10 Valve and relay nozzle setting for different airjet loom:

For fabric construction: (16RS+16OE)x(150L40D)/71x60

Valve setting:

Main valve	81^0-229^0
Pre winder	75^0 - 151^0

Relay nozzle setting

1	81^0 - 242^0
2	101^0 - 248^0
3	122^0 -269^0
4	145^0 - 282^0
5	166^0 - 302^0
6	188^0 - 317^0
7	209^0 -326^0
8	230^0 - 338^0

For fabric construction: (16OESL+16OE)x150L40/ 71x60

Valve setting

Main valve	88^0 - 227^0
Pre winder	75^0 -159^0
SD	0^0 - 0^0
VSNEX	0^0 - 0^0

Relay nozzle setting

1	79^0 - 240^0
2	100^0 - 255^0
3	124^0 - 270^0
4	145^0 - 287^0
5	166^0 - 302^0
6	187^0 - 316^0
7	208^0 - 333^0
8	223^0 - 348^0
9	0^0 - 0^0

For fabric construction: (7, 9, 12)x600D/60x40

Valve setting

Main valve	85^0 - 226^0
Pre winder	75^0 - 146^0
S.N	0^0 - 0^0
VSNEX	0^0 - 0^0

Relay nozzle setting:

1	80^0 -239^0
2	101^0 - 253^0
3	122^0 - 262^0
4	144^0 - 289^0
5	165^0 - 304^0
6	186^0 - 323^0
7	207^0 - 339^0
8	221^0 – 348^0
9	0^0 - 0^0

For fabric construction: (12+12+10) x300D/ 71x58

Valve setting

Main valve	86^0 -227^0
Pre winder	75^0 - 150^0
S.N	0^0 -0^0
VSNEX	0^0 -0^0

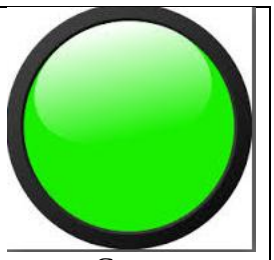
Relay nozzle setting

1	81^0 - 242^0
2	101^0 -257^0
3	124^0 - 270^0
4	144^0 - 285^0
5	166^0 – 306^0
6	187^0 - 321^0
7	209^0 -336^0
8	224^0 -351^0
9	0^0 -0^0

PFT with stepping motor:

Ch	1	2
Mode	PFT/B^+	PFT/B^+
Brake force	3	3
Brake time(T_b)	17^0	17^0
Strength time(Ts)	0^0	0^0
Finger	125^0	125^0
PA expected	140^0	240^0
Minimum	210^0	210^0
Average	221^0 ,219^0 ,223^0 etc	222^0 ,223^0 ,221^0
Maximum	236^0	253^0

7.11 Meaning of the light signal of Air jet:

 Red	 White	 Yellow	 Green
Machine stopped due to warp stop or brake.	Problem with machine.	Machine stopped due to breakage in the weft yarn.	Machine stopped by the operator manually.

7.12 Looming:

Looming covers the process involved in warp preparation after sizing up to setting them to loom. The process can be shown as follows:

Drawing-in → Warp Tying → Loom

During slashing, the exact number of warp yarns required in fabric is wound on to the loom (or weaver's) beam. The warp ends are then passed through the drop wires of the warp stop motion, the heddles of the harness frames and the dents at the reed. This can be achieved by drawing -in or tying - in, the choice depending upon whether or not the new warp is different from the warp already on the loom.

7.13 Drawing-In:

The process of drawing every warp end through its drop wire, heddle eye and reed dent can be performed manually or by means of automatic machines. In both case, a length of warp yarn, just enough to reach to the other side of the frame, is unwound. Leasing (i.e. selecting warp) of the warp at this stage simplifies the separation of the yarns. Then they are threaded through drop wires heddle eyes and reed dents. The automatic drawing machine can handle the leasing-in and drawing -in process in one single operation.

7.13 Tying-In:

When fabric of a particular type is being mass-produced, the new warp beams will be identical with the exhausted beams on the looms. Therefore, if every end on the new beam is tied to its corresponding end on the old beam, the drawing-in process can be omitted. Tying-in may be done by means of a small portable machine on the loom or as a separate operation away from the loom.

7.13 Basic Motion:

In order to interlace wrap and weft threads to produce a fabric, the following motions are necessary on any type of loom:

- Primary motions
- Secondary motions
- Tertiary motions

7.13.1 Primary Motions:

These are fundamental or essential motion. Without these motions, it is practically impossible to produce a fabric. It is for this reason that these mechanisms are called “primary motion”.

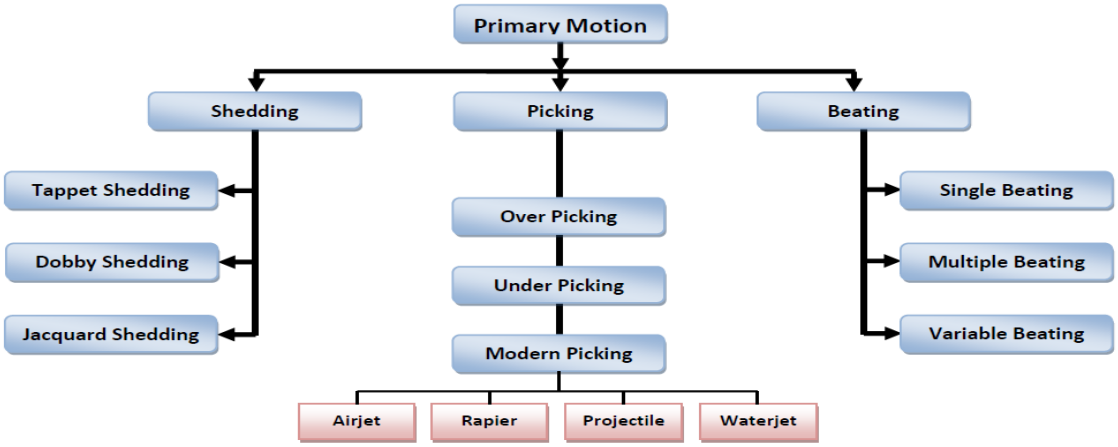


Figure : Primary motion of a loom.

7.13.1.1 Shedding Mechanism:

The shedding mechanism separates the warp threads into two layers or divisions to form a tunnel known as 'shed'. The shed provides room for passage of the shuttle. A shed may be formed by means of tappets, dobby and jacquard.

Shedding Components:

There are two main shedding components:

- Heald frame
- Cam

Healed Shaft:

A healed shaft consists of a wooden or metal frame carrying healed wires. The width of a healed shaft is slightly greater than that of the warp sheet and is usually 36 to 48 cm deep.

The functions of a healed shaft are:

- To carry healed wires and maintain warp yarns in their correct positions
- To form a shed line.

Figure : Heald wire used in Shasha Denims Ltd.

7.13.1.2 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.

Components of Picking Mechanism:

Cone Stand:
The purpose of this stand is to hold the cones. The main components of cone stand are:

- Cone holder
- Disc
- Tensioner

Cone Holder:
The shape of the cone holder is a little bit like an aero plane. It contains two propeller shape rubber stopper so as to stop the forward and backward slippage of the cone during running condition and to provide grip.

Plastic Disc:
The weft yarn from the cones passes through a plastic disc provided with the hole in the center the purpose of this hole is to allow the weft yarn to pass through the disc setting of the disc is in such that at a time of weft yarn from the first and fourth or the last weft yarn passes through the first and second disc respectively. The distance between the discs can be adjusted with the help of the spring provided with the nut. From the disc the weft yarn is delivered to the Tensioner.

Tensioner:
The use of tensioner is to give tension to the weft yarn otherwise the weft yarn coils within its self. This tensioner consists of two small discs or plates. A spring is also provided at the side of one disc so that the discs can adjust themselves according to the count of the weft yarn. If count is fine then low tension is required whereas coarser count needed relatively higher tension. The alignment of the disc and the cone is in such a way that a free path is provided to the weft yarn.

7.13.1.3 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.

Beating Components:

Sley:

The sley is a metal frame. In case of air jet contains profile reed, relay nozzles, filling detector, stretch nozzle and side detector. At its forward motion the last pick is beaten up to the fell of the

cloth, and at its forward motion the weft is allowed to insert through relay nozzles through the open shed. The heavy reciprocating sley with the help of a reed firmly beats up the last pick to the fell with the sufficient velocity.

Reed:

The reed is an arrangement if vertical steel wires spaced a given distance apart a securely fastened at the top and bottom by the bindings. The spaced between two wires is known as "dent". Reeds are made with any desire number of dents per inch, according to the requirements of the cloth that is to be woven. A reed contains a definite number of dents on a given length; this is termed as the count, the pitch, or the number of reed. The reeds are named differently. Reeds are named from the number of dents contained in one inch. The shape and thickness of the metal wires used in the reed is important. Reed selection depends on several considerations including fabric appearance, fabric weight (ends per unit width), beat up force, air space requirements and weave design.

Available Reeds in Shasha Denims Ltd:

Reeds are very expansive machine parts and its correct use makes it long time running. In fine counts reed damages very quickly. A good manager is that who runs his weaving shed with minimum number of reeds rather than investing a large amount on reeds and storing them. In Shasha Denim Ltd the shed of 175 looms is running on following reeds.

Metric count:

For EPI	Reed count
60	590
66	652
83	1085
71	931

Stock fort Count:

For EPI	Reed count
60	40
71	47
90	60
99	66

With these reeds Shasha Denim Ltd has made almost all of these orders by denting in a dent of two, three, four etc.

7.13.2 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:

- Take-up motion
- Let-off motion.

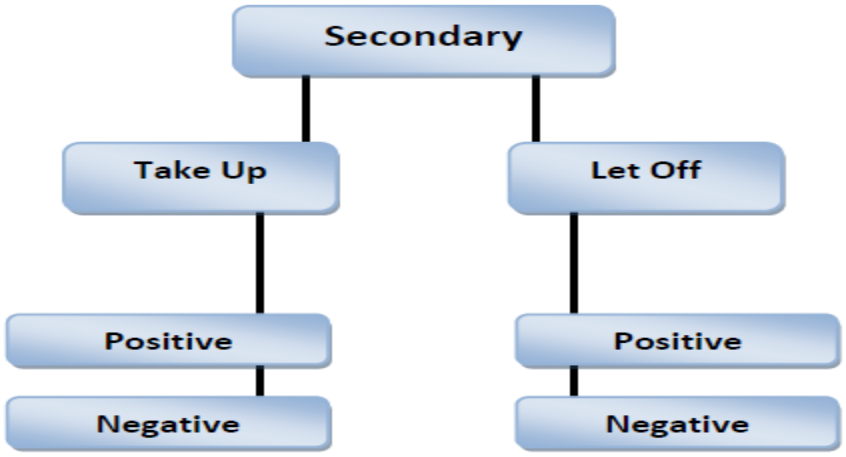


Figure: Secondary motion of a loom.

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. The main part of the mechanism is the take up rollers, which draws the cloth at the regular rate, and the number of picks per inch decides this rate. The take up roller is covered with emery cloth or hard rubber depending upon the type of cloth woven. The drive to the take up roller is by a train of gear wheels put into motion directly from the main shaft.

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. The speed of the servo motor is transmitted to warp beam gear via reduction gear, thus driving beam.

7.13.3 Tertiary motion:

To get high productivity and good quality of fabric, additional mechanisms, called auxiliary mechanisms, are added to a loom. The auxiliary mechanisms are useful but not absolutely essential. This is why they are called the "auxiliary mechanisms". These are listed below.

- Weft stop motion
- Temples
- Brake
- Warp stop motion

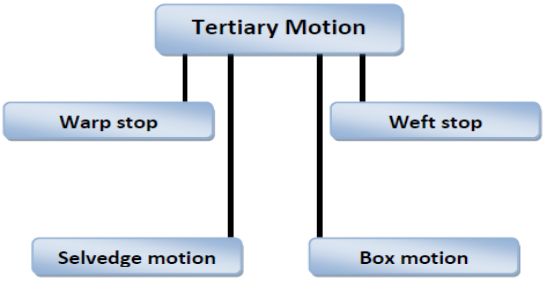


Figure: Tertiary motion of a loom.

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.

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.

Drop wire:

It is the elements of a modern loom which is used as the warp stop motion. The drop wires are mounted on a bar .

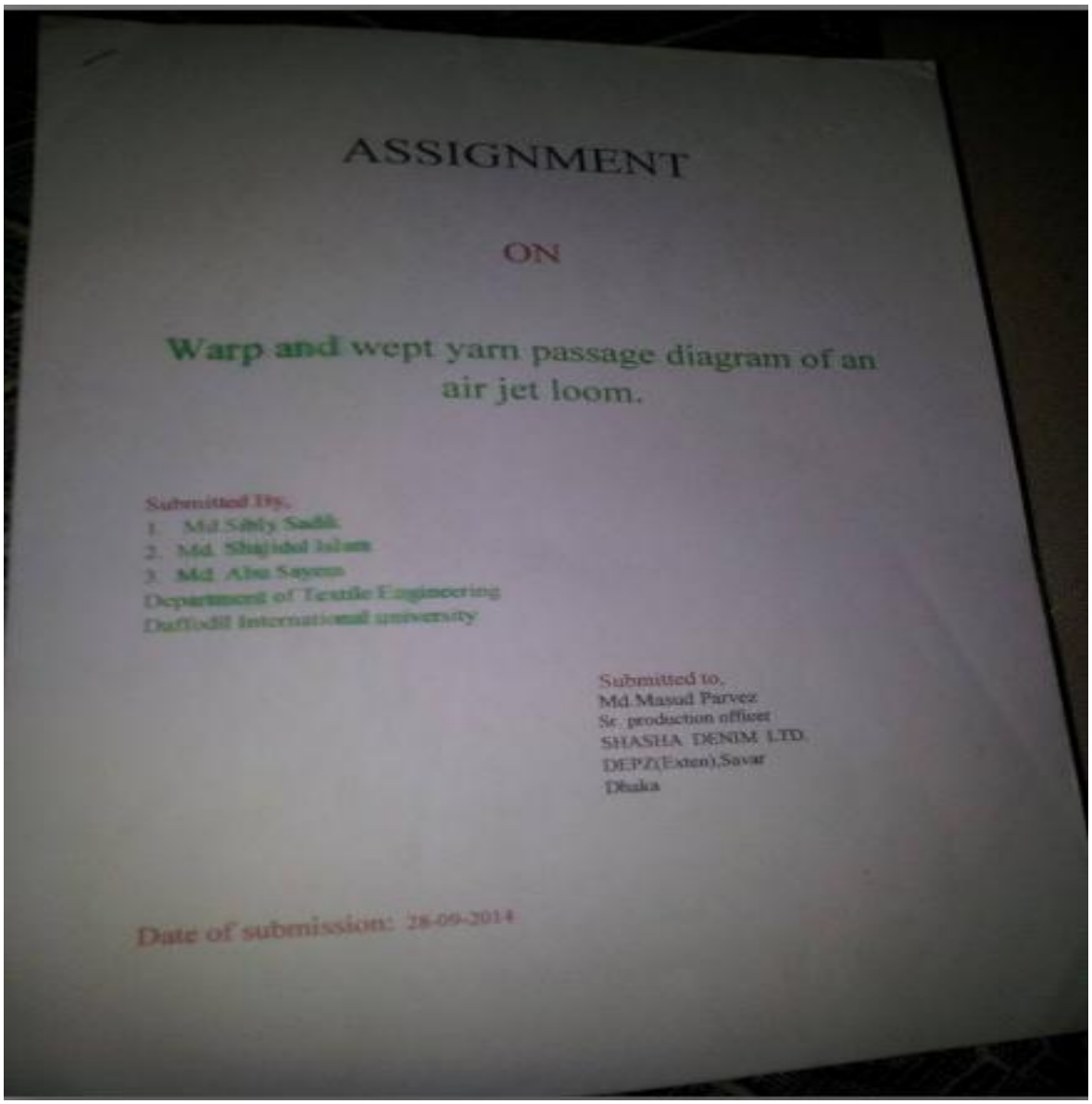
Figure : Drop wire sued in Shasha Denims Ltd.

Brake:

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

7.14 Warp and Weft Yarn Path Diagram of an Airjet loom in Shasha Denims Ltd:

We have done an assignment on Warp and Weft Yarn Path Diagram of an Airjet loom during our industrial attachment which was ordered **Mr.Parvej , senior production officer** , department of weaving in Shasha Denims Ltd.


ASSIGNMENT

ON

Warp and wept yarn passage diagram of an air jet loom.

Submitted By,
1. Md.Sably Sadik
2. Md. Shajidul Islam
3. Md. Abu Sayem
Department of Textile Engineering
Daffodil International university

Submitted to,
Md.Masud Parvez
Sr. production officer
SHASHA DENIM LTD.
DEPZ(Extn),Savar
Dhaka

Date of submission: 28-09-2014

Figure: Front page of the assignment on warp and weft yarn passage diagram of an airjet loom in Shasha Denims Ltd.

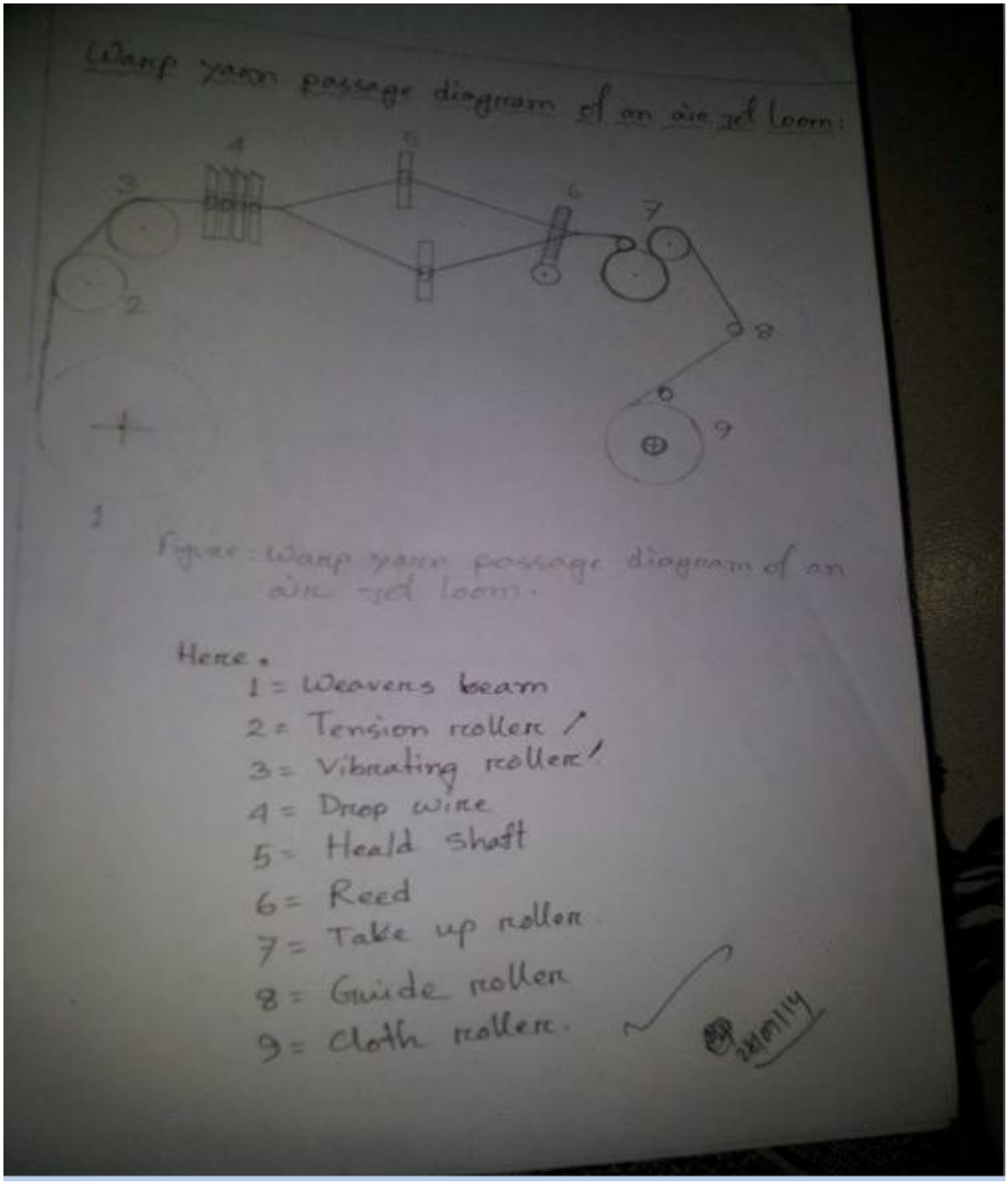


Figure: Warp yarn passage diagram on air jet loom.

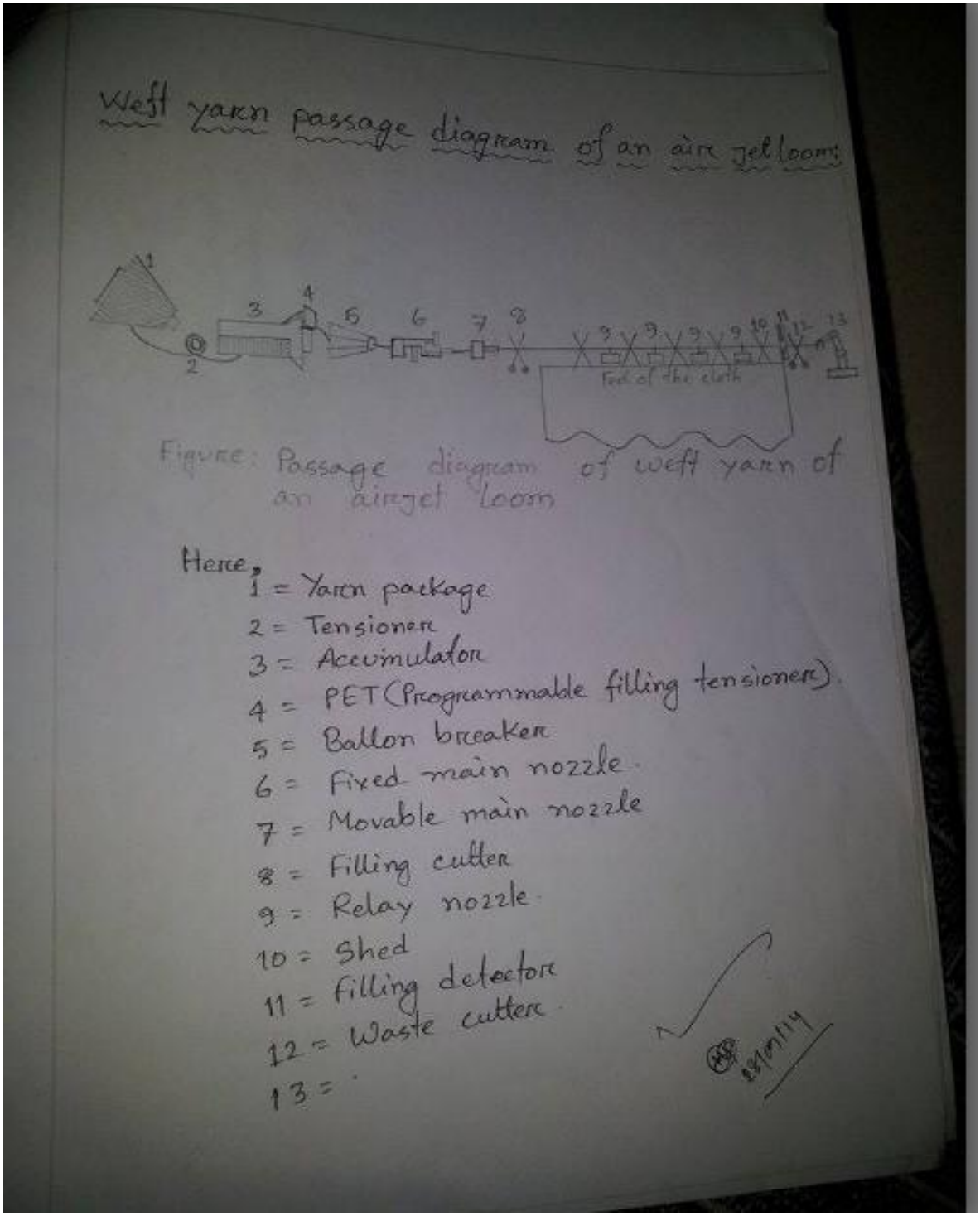


Figure: Weft yarn passage diagram on air jet loom.

7.15 Different parts of the Airjet looms used in the Shasha denims ltd:

7.15 .1Cone Break Detector:

Cone break detector detects filling yarn breaks that occur between the cone and prewinder. The cone break detector stops the weaving machine before the prewinder is empty. Cone break detector between the cone and the prewinder prevents starts up marks.

7.15 .2 The Filling Tensioner:

Filling tensioner are necessary to ensure a most uniform yarn tension between the cones and prewinder drum, therefore ensuring an absolute uniform tension under filling yarn winding without any loop formation.

7.15 .3 Weft Accumulator or Prewinder:

The prewinder draw filling yarn from a cone, winding it on the winder drum which in turn, makes for gentle pick insertion. The weft yarn is drawn off the package and wound on to measuring bands and fingers by the rotating motion of thread guiding tube. The diameter of the measuring band can be adjusted according to the width of the loom. Adjusting the measuring bands and the number of coils sets the pick length. The electro magnetically controlled stopper pin releases the weft yarn at the machine angle set.

7.15 .4 Storage Control:

As it takes time to rise the motor rpm to the standard rpm at starting required weft yarn for next insertion is wound in advance to secure smooth weft insertion. While the loom is running, corresponding length weft yarn to one insertion is supplied to the prewinder, and storage is controlled in the prewinder.

7.15 .5 Measuring Control:

One pick length of weft yarn is measured by releasing or hooking solenoid FDP pin electrically. There are two timings; one is for the first pick at starting and the other is preceding pick at normal operation. These timings secure accurate measuring, storage, measuring and weft insertion are controlled by output of signal command.

7.15 .6 Balloon Breaker:

The balloon breaker reduces the balloon dimensions when drawing yarn from the prewinder. The closer the prewinder to the balloon breaker, the smaller the yarn balloons. When weaving heavy filling yarns, there is the potential to increase the rate of insertion when using a balloon breaker.

7.15 .7 Main Nozzle:

Nozzle is a duct of smooth varying cross section in which air is used to accelerate weft yarn through the shed across the width of fabric. On air jet weaving machines in each channel there are two main nozzles, one is fixed and other is movable.

7.15 .8 Relay Nozzles:

Relay nozzle mounted in sley are connected in groups to electromagnetic valves. The electromagnetic relay nozzle valve starts the air jet. The length of time the valve is opened depends on the reed width and relay valve spacing as well as on the yarn. The compressed air is distributed from the compressed air tank via the valves to the nozzles. Relay nozzles are arranged over the entire length of the reed, the relay nozzles assists the movable main nozzle in blowing the pick through the reed guiding channel. These relay nozzles are divided up into groups, in that each group of nozzle is served independently by a relay nozzle valve. These valves are driven such that the rate of insertion is correct and that yarn flow is uniform.

7.15 .9 Filling Cutter:

The function of cutter cuts the filling at the left hand and right hand side of an insertion. The cutter is driven by the motor and is completely independent of the machine drive. The position, the movement of cutting and the condition of the filling cutter are very important for the insertion. Cutter is mounted on both ends of the fabric. On yarn supply side, yarn is securely cut every time reed is beaten. On driving side preceding yarn is cut between the temple and the space roll. The motion of the cutter cam attached to the main shaft is transmitted through cutter cam lever and cutter rod to cutter edge.

7.15 .10 Filling Detectors:

The filling detectors or sometimes called feelers mounted at the reed holder on the loom and the end of the driving side photo electrically monitors whether there is weft yarn arrive or not.

7.16 Specification of Airjet loom used in shasha denims ltd :

7.16.1 Picanol omni:

- Model: OMNI-2-P
- Origin: BELGIUM
- working-width 2200 mm
- Year of manufacture: 1998 Aproximately
- Maximum heald shaft capacity: 6 shafts
- Colors used in weft: 2
- Dobby used: Staubli electronic (Manufacture by France)
- Dobby Type: 1620B

Figure: Specification of picanol omni airjet loom used in Shasha Denims Ltd.

7.17 Specification of Rapier used in shasha denims ltd :

7.17.1 Picanol Gamma:

- Model: 8R-220
- Origin: BELGIUM
- working-width 2200 mm
- Year of manufacture: 2000,
- Maximum heald shaft capacity: 24 shafts
- Used heald shaft: maximum 6
- Colors used in weft: 2
- Dobby used: Staubli electronic
- Dobby type: 2861

Figure : Picanol Gamma (Rapier)

7.17.2 Picanol Optimax:

- Model: OPTIMAX-2-R
- Origin: BELGIUM
- working-width 2200 mm
- Year of manufacture: 2010,
- Maximum heald shaft capacity: 24 shafts
- Used heald shaft: maximum 6
- Colors used in weft: 2(Maximum 4)
- Dobby used: Staubli electronic (made in france)
- Dobby type: 2622B

Figure: Specification of picanol optimax rapier loom used in Shasha Denims Ltd.

7.17.3 Accessories used for each loom :

- warp-beams diameter of 800 mm
- cloth-rollers
- 6 heald frames
- 6500 heald wires approximately.
- 6500 droppers approx.
- 2 weft-accumulators
- ELSY system
- In loom take-up mechanism is controlled by electrically.
- Batch roller

7.18 Specification of cam used in Shasha Denims Ltd:

7.18.1 For picanol omni and omni plus:

Type: 1620B
Machine N":897A07-17 A1
Fabrication no:-01-1998
Manufacture by: France

Figure: Specification of cam used in Shasha Denims Ltd For picanol omni and omni plus.

7.19 Specification of cam used in Shasha Denims Ltd For picanol optimax:

Figure: Specification of cam used in Shasha Denims Ltd For picanol optimax.

7.23 Specification of dobby used in Shasha Denims Ltd For picanol optimax:

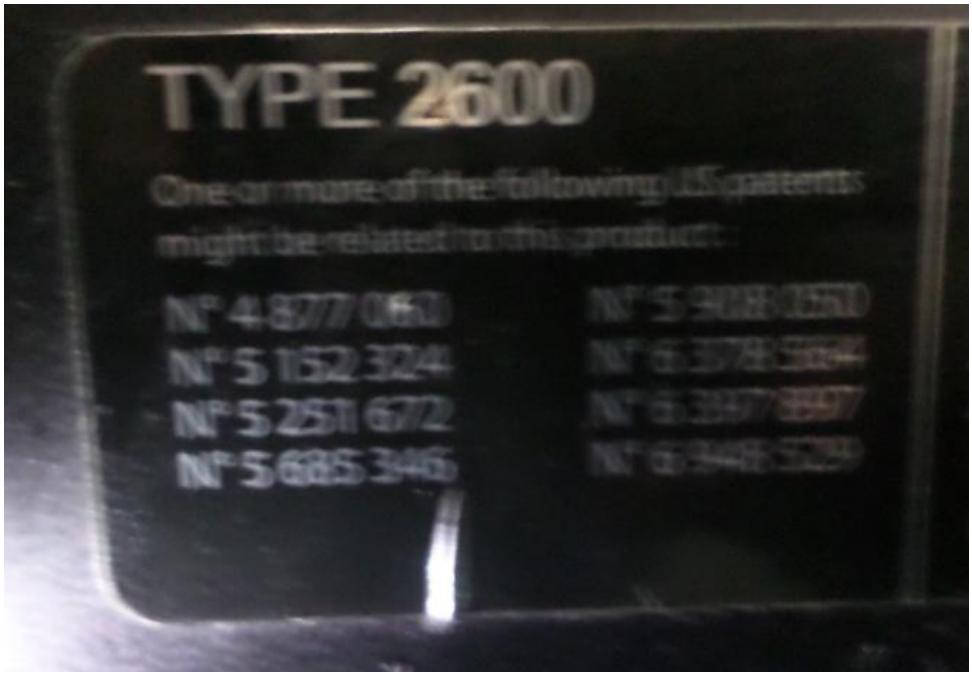


Figure: Specification of dobby used in Shasha Denims Ltd For picanol optimax.

7.20 Knotting machine:

There are four knotting machine used in Shasha Denims Ltd.

7.20.1 Specification of knotting machine in Shasha Denims Ltd:

Model: TOPMATIC
Brand name: STAUBLI
Origin: Switzerland
Type: TPM 300 S
Manufacturing date: 1998
Maximum rpm: 600

7.20.2 Features of knotting machine:

- For cotton, wool, silk, blended yarns, filament yarn, monofilaments, technical yarns it can be used.
- Yarn count range from 0.8-500 tex / Nm 2-1250 / Ne 1.2-740 (depending on material)
- 600 knots per minute maximum tying speed, automatic repetition in case of fault
- All combinations of lease types including irregular leases
- Mechanical double end detection with lease
- Electronic double end detection with or without lease
- Models available for single or single and double knot, selectable
- Electronic control for display, color repeat and process data

7.20.3 Needle used during knotting for different count in Shasha Denims Ltd:

Yarn count	Needle No
7 RSL	28
7+9+12	28
12+12+10	25
28/2	28
16 OE	25
16 OESL+16OE	20
20 Tencil	18
(20 SL+20OE) Tencil	20
30 Tencil	20

Chapter -8

Finishing

8.1 Definition of finishing:

In general, before marketing, all the process which are applied on the fabric after weaving is called finishing. In short sense, finishing is the process by which the fibers, yarns and fabrics are made as presentable to the customer and these processes are implemented after coloration. The term finishing covers all those treatments that serve to impart to the textile the desired end-use properties. These can include properties relating to visual effect, handle and special characteristics such as waterproofing and non-flammability.

8.2 Objects of Finishing:

- To increase the attractiveness of fabric.
- To increase the service ability.
- To increase the beauty and glitterness of fabric.
- To increase the fineness and to ensure smoothness.
- To ensure the softness of the fabric.
- To free from hairiness of the fabric.

8.3 Types of finishing:

There are mainly two types of finishing -

1.Physical/Mechanical Finishing: The finishing process which is performed by machines but not using of chemicals is called Physical /mechanical finishing.

Example: Calendaring, embossing, raising, sanforizing, rubbing etc.

2.Chemical Finishing:

The finishing process which is performed by application of chemicals which reacts with fibres is termed as chemical finishing.

Example: Starching, Mercerizing, resin finishing, Desizing, Water Repellent Treatment, Flame Retardant Treatment, etc.

8.4 Denim 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. The finishing process may vary from harsh hand (loom state), soft hand (desizing) and sulphur over dyeing.

8.5 Finishing In Shasha Denims Ltd:

In Shasha Denim, finishing department is a well-established modern section with a suitable range of the finishing processes required for denim. Department is working under the supervision of Mr. Rabiul Islam,manager finishing.

Proper finishing process is necessary otherwise the fabric will be rejected by the buyer. In case of denim mainly controlling of the shrinkage and the skew of the fabric is done. Besides, finishing process finishing section of shasha Denim have to do a lot of others job like fabric storing, inspection, quality control,sample processing etc. So a finishing section in a denim industry plays a vital role. Finishing section of Shasha Denim Ltd isresponsible for the following:

- Finishing process
- Inspection
- Quality control
- Sample processing and preservation
- Finished fabric storing and delivery

The following types of finishes are applied to the denim fabric at Shasha Denim.

- Singeing
- Softening
- Skew control
- Mercerizing
- Calendaring

8.5.1 Specification of finishing machine: 01

Name	Monforts Finishing machine
Manufacturer	Monforts Textilmaschinen Gmb H & Co.
Model	Monfortex
Origin	Germany
Production capacity	15- 32 m/min

8.5.2 Features of Monfort finishing machine:

With modern range engineering and innovative application technology, denim can be finished today far more easily and more effectively than ever before.

Traditional process steps can now be completely eliminated. The closely harmonised Monforts technology plays a key role here.

The special design details of the new thermex hotflue with integral stretching unit make it particularly suitable for denim finishing. With significantly lower stretching forces than in a normal stretching unit, the fabric is treated more gently with the result of a finished width and fabric appearance with an exact weft thread draft.

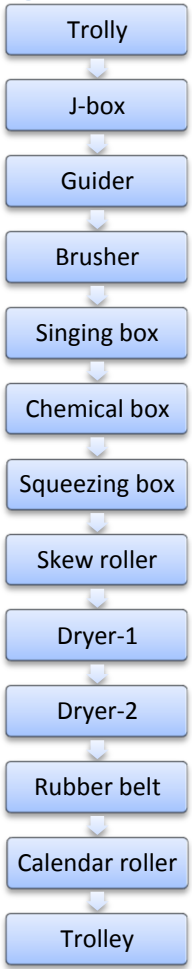
The drying treatment in the hotflue permits a considerably more precise temperature control than with the conventional drying methods and hence more precise residual moisture contents before shrinking.

The drying of denim in the hotflue requires significantly less space than with other range systems. For denim articles with elastane fibres, a fixing step for fabric stabilisation is possible by heating up the fabric in the hotflue and fixing the width under control on a short stretching section.

Selected range examples for new finishing methods for denim:

- Range with foam application. Hot flue with stretching unit function. For classic woven fabrics. Also for woven fabrics with elastane fibres in the weft if they are previously washed and dried. Without fixing of the elastane fibres.
- Range configuration for articles of 100% cotton and of cotton with elastane fibres. With washing machines and hotflue/stenter combination as fixing section for the cotton/elastane fabric.
- Range configuration for various treatment processes. With washing machines and hotflue/stenter combination in continuous line configuration for fixing of the elastane fibres. Monforts offers complete finishing lines for finishing, over-dyeing, stripping, bleaching, desizing, mercerising and for fixing.

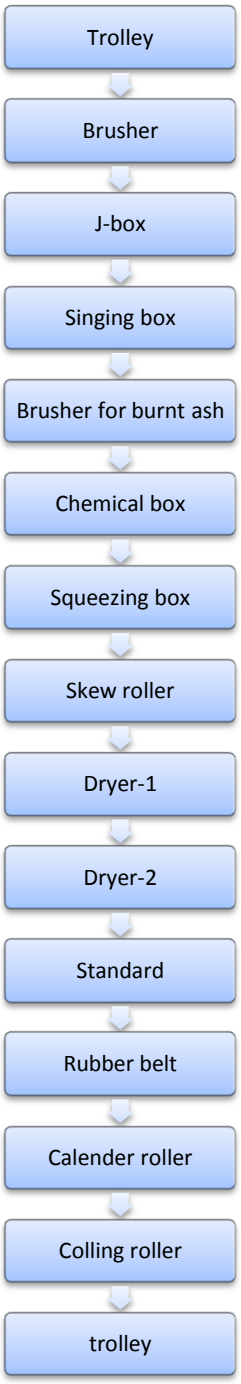
8.6 Process flow chart of Finishing machine-1:



8.7 Specification of finishing machine: 02

Name	Sperotto Rimar
Manufacturer	Santex-group.com
Origin	Switzerland
Model	FLEXA D.
Manufacturing no	4121
Production speed	30-42 m/min
Rated Current	101A
Nominal Power	70KW
Voltage	400V
Frequency	50Hz
PHASES No	3

8.8 Process flow chart of Finishing machine-2:

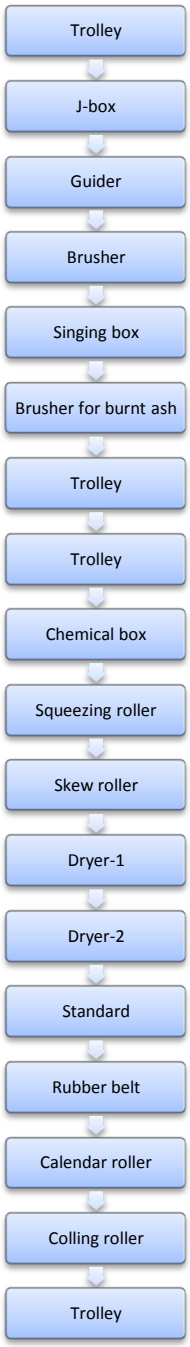


8.9 Specification of finishing machine: 03

Finishing machine specification

Brand	Cibitex
Model	Italy
Year of manufacturer	CBDENIM
Total machine	01
Roller width	2010
Working width	200cm
Steaming Cylinder dia	180cm
Shrinkage bench cylinder dia	64cm
Felt Calender Cylinder dia	61.2cm
Felt calendar drying cylinder dia	200cm
Felt calendar drying cylinder dia	80cm
Mechanicla speed	Up to 80m/min
Production speed	Up to 50 m/min
Shrinkage value	Up to 18%
Average steam consumption at 6 bar	1000kg/hr
Average soft water consumption at 2-3 bar	5-6m/hr
Power consumption	106Kw

8.10 Process flow chart of Finishing machine-3:



8.11 Specification of mercerizing machine:

Name: dhall

Origin: India

Production Speed: 15-32 m/min

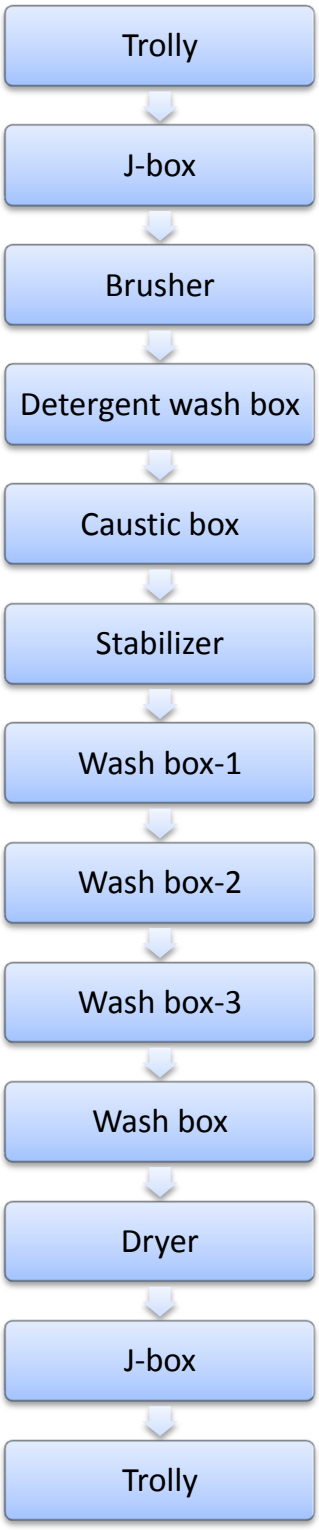
Combi-soft+flat finishing range

Dhall Enterprise & Engineering Pvt. Ltd.

P.O Saijpur, bogha, Ahmedabad-382345, India

Figure: Mercerizing machine of Shasha Denims Ltd.

8.12 Process flow chart of mercerizing machine:



8.13 Process Sequence of Denim Finish Line:

Brushing:
In the brushing stage, the grey fabric is brushed to remove the loose lint and loose fluff from the fabric surface. It also raised the protruding fibers on the fabric surface which are removed in the next stage of singeing process.

J-Box:
Store the fabric for some while during the process. This unit is important when change of batcher. Stored fabric supports the continuous operation.

Singeing:
The fabric is then singed in both or only face side which burn off the protruding fibers from the fabric surface. Normally denim fabric is singed twice in a single passage of a singeing machine. The denim finished fabric must have soft and pleasant handle.

Reasons for Singeing:

- Textiles are first and foremost singed in order to improve their wear and end use properties.
- The burning-off of protruding fiber ends which are not firmly bound into the yarns results in

clean surface which allows the structure of fabric to be clearly seen.

- Fabrics which have not been singed soil more easily than singed fabrics.
- The risk of pilling, especially with synthetic fibers, is extremely low in case of singed fabric.
- A closely singed fabric is essential for printing fine intricate patterns.
- The risk of skitter dyeing with singed piece dyed articles in dark shades is considerably reduced as randomly protruding fibres cause a diffuse reflection of light.

Singeing process facilitates and speeds up desizing. This effect, however, is achieved only if the fabric is impregnated with desizing liquor immediately after singeing.

Fabric before and after Singeing:

Figure: Before Singeing

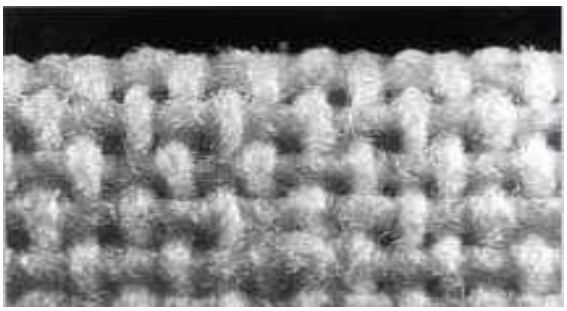


Figure: After Singeing

Types of Singeing:

Singeing can be classified into two types:
1. Direct singeing
2. Indirect singeing

1. Direct singeing is the most popular procedure. The fabric passes either glowing metal with contact(mainly for pile fabric) or a direct gas flame. Important for both techniques: when the machine stops, the fabric is moved from the metal and the flame stops, too.
2. The indirect singeing works with highly heated ceramic modules. Infrared beams are burning the loose fibres. Speed controls the singeing effect.

Singeing Parameters:

- Fabric speed (m/min)
- Flame intensity (mbar)
- Fabric temperature (^{o}C)
- Singeing positions
- Burner fabric distance (mm)

Singeing Techniques on Fabric:

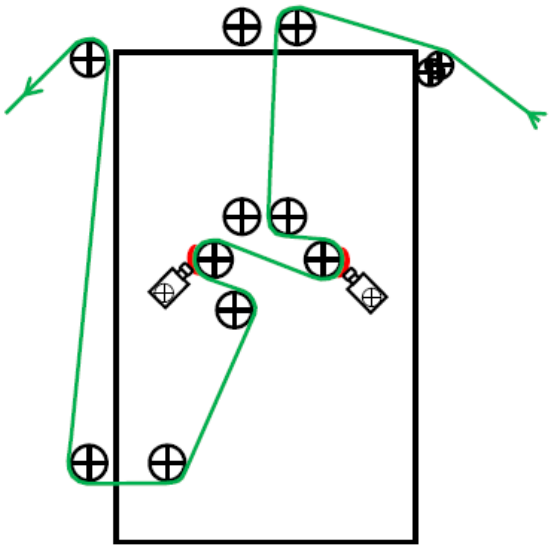


Figure: Both side singeing

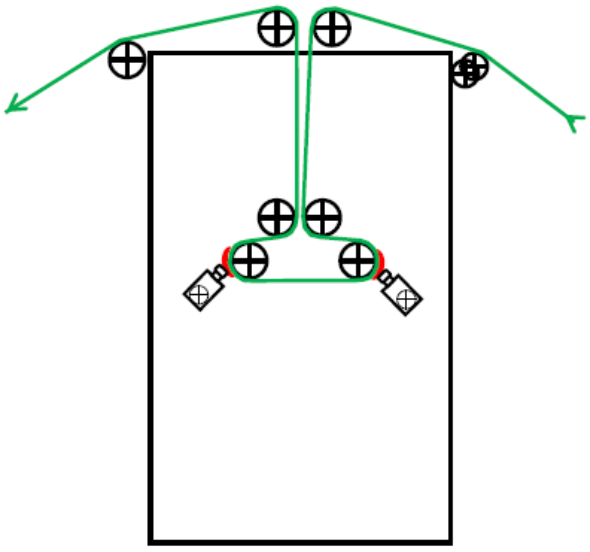


Figure: Double singeing

Softening:

After the singing range, the fabric is subjected to a chemical pad treatment. Softeners are often used in the chemical treatment in order to impart soft feeling of the fabric.

Skewness:

Skewness is a condition in fabric which can result from the angular displacement of filling yarns or knitted courses from a line perpendicular to the edge of the fabric.

Skewness control in denim fabric:

The skewness in denim fabric, particularly in twill weave creates a serious problem in subsequent garment manufacturing and its washing. Leg twist is a major problem in denim manufacturing. Due to this problem the leg is rotated in the opposite direction of the twill of the fabric after laundering. Leg twist is assumed to be happening due to the directional yarn stresses. These are inherent in regular twill weave fabrics and developed during weaving. During washing the yarn stresses is relaxed which change the regular position of interlacement between warp and filling yarns. Due to this reason the legs are twisted. Normally leg twist not shown on garment stage. It only observed after laundering of the garment. Although leg twist appears after first laundering and it increases progressively with repeated launderings.

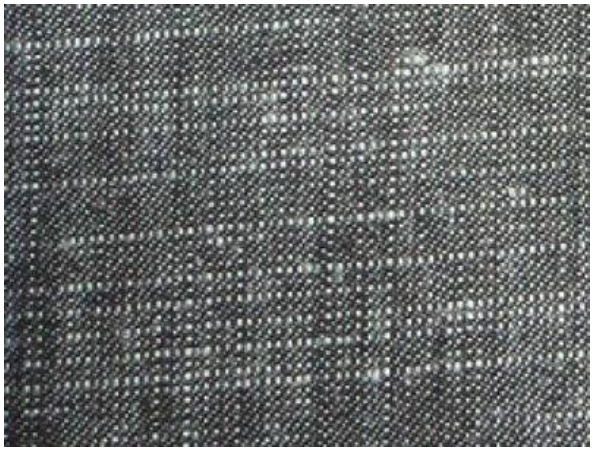


Figure: Fabric with skew

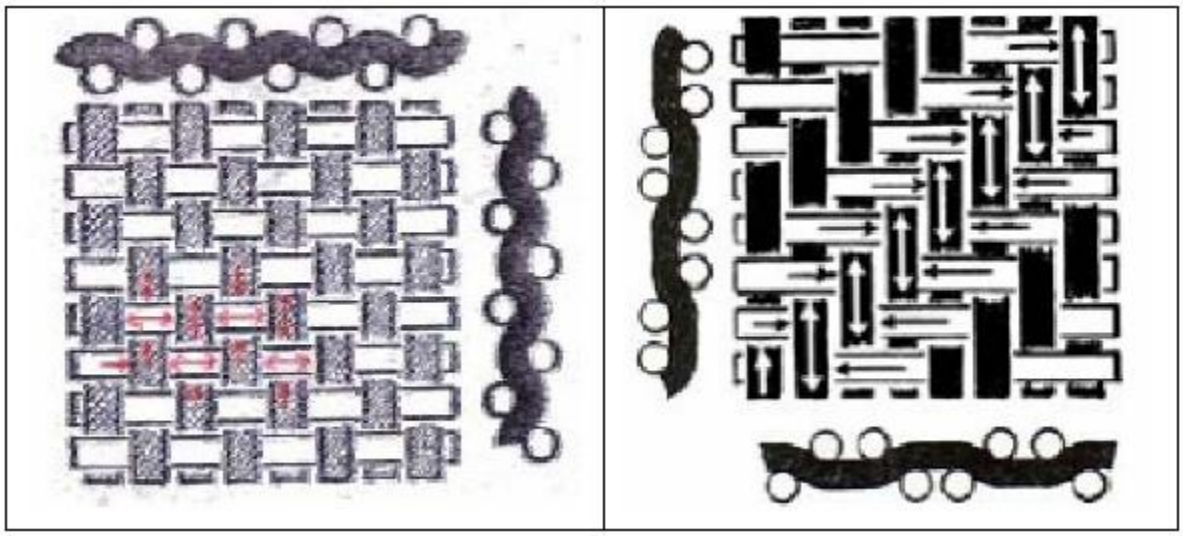
Figure: Fabric without skew

Ideally warp and weft should be at right angle to each other in normal fabric. Skew in the fabric occurs when the warps are displaced from their vertical position or when the weft is displaced from their horizontal position.

The leg twist is created due to tensions in the fabrics. It is related to the twill direction. Normally a right hand twill fabric twists in the counter clockwise direction. Similarly a left-hand twill fabric twists in the clockwise direction. These leg twist problem can be eliminated through compensating the tensions by deliberately skewing the fabric in the counter clockwise direction for right-hand twills (RHT) and in the clockwise direction for left-hand twill (LHT).

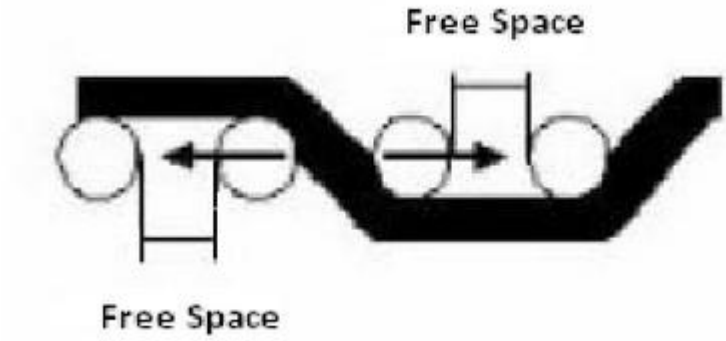
Hence the RHT denim fabric should be skewed by advancing the right selvage with respect to the left selvage in the fabric of face up. This results in counterclockwise skew. Similarly a LHT fabric should be skewed by advancing the left selvage when run face up. The amount of the skew

to be applied depends upon many factors, such as the type of twill weave, the weight of the fabric, the yarn sizes, and the twist of the yarns. The twill angle is also an important factor.



Structure of fabric

The movement of yarn in a plain fabric the movement of yarn in a twill fabric In case of plain weave fabric, the free spaces in warp and weft direction is equal. Hence the forces acting on all sides of each float are equal, which makes the fabric more stable. However in case of twill weave fabric, at the portion of a float; there is a gap or free space equal to the actual diameter of the yarn. Due to this free space, there may be possible that the floating yarn push away the crossing



yarn.

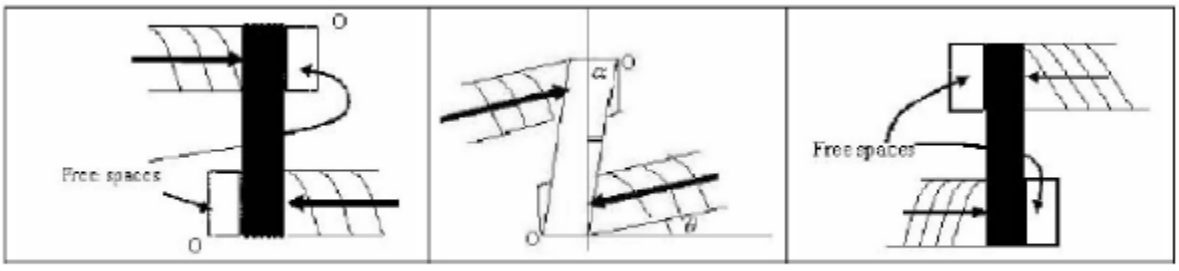


Figure: A Figure: B Figure: C

The floating yarn to push away the crossing yarn at the interlacing point

The two forces acting opposite to each other in the floats makes them like an in-plain lever (Fig. A). The position of the free spaces on either side of the float determine the direction in which the float to be skewed. For a right hand 2/2 twill fabric, the location of the free spaces, as shown in Fig. A will skewed clockwise shown in Fig. B. For a left hand 2/2 twill fabric, as shown in Fig. C, the floats will be skewed anticlockwise.
Herringbone or any other types of zigzag twill, there is no risk of the fabric becoming skewed, as in such weaves, floats (in-plane levers) act oppose to each other. The degree of skew movement depends upon yarn characteristics, weaving tensions, and the fabric structures.

8.14 Finishing report of shasha denims ltd:

Serial no.	Style	Weave design	Grey pick	finished pick	Length shrinkage %	Grey Width	Finished width	Width shrinkage %
01	1050-301	3/1 R`H.T	48.5	56.5	-16.5	56	54	-3.5
02	L-242	3/1 R`H.T	60	68	-13.3	52	47.5	-8.6
03	PL-288	3/1 R`H.T	60	68	-13.3	51	47.5	-6.8
04	L-1736	3/1 R`H.T	50	58	-16	56	54	-3.5
05	P-336	3/1 R`H.T	50	57	-14	63	60	-4.7
06	SL-1800	2/1 R.H.T	60	67	-11.6	66	62	-6.1
07	L-GAB-773	3/1 R`H.T	60	68	-13.3	59	41.5	-29.6
08	8000-130	2/1 R.H.T	41	48	-17.1	64.5	54.5	-15.5
09	PL-210	4/1 R.H.T	60	67	-11.6	50.5	49	-2.9
10	L-877-mer	3/1 R.H.T	49	56	-14.2	57.5	56.4	-1.9
11	PL-282-mer	4/1 R.H.T	60	67	-11.6	53	47.8	-9.8
12	L-1559(EOS)	2/1 R.H.T	43	50	-16.2	57.8	56	-3.1

Table: Finishing report of Shasha Denims Ltd.

8.15 Inspection

8.15.1 Inspection in Shasha Denim:

Quality is ultimate concern; every single yard of the denim goes through inspection department and rated by a point count system to ensure that quality is up to standard before packing. Defective fabric pieces are rejected and sold as seconds and relatively minor defective points are marked clearly using stickers to alert cutters.
The inspection department is working under the supervision of Mr. Mahfuz, Manager, Finishing. Ten inspection frames of Taiwan are used. Input is finished fabric & output is inspected fabric roll.

8.15.2 Inspection Process:

Fabric batcher is set at the back side of machine equipped with rollers which provides fabric unwinding. Inspection table is laminated white to enhance the defect identification. Four tube lights are provided to optimize the lighting. Measuring counter is provided in front of the inspection table for controlling length. It has forward, reverse, start and stop button controls. Inspection is carried out on white board table. The cloth is pulled over the white board table by a variable speed motor and different cloth defects are recorded for quality control purpose. They inspect the fabric according to 4 point system. After inspection fabric is wound on roller.

8.15.3 Four (4) Point System:

This is issued by the American Society for Testing and Materials with reference to the designation: ASTM
D5430-93.
Faults are scored with penalty points of 1, 2, 3 and 4 according to their size and significance.

Size Of Defect (Length in Inches)	Penalty Points
3 inches or less	1
Over 3 inches but less than 6 inches	2
Over 6 inches but less than 9 inches	3
Over 9 inches	4

8.15.4 Machinery Description:

Figure: Fabric inspection machine in Shasha Denims Ltd.

8.15.5 Specification of inspection machine used in Shasha Denims Ltd:

Brand name: STT Machinery
Model: STT-IE W102 . 72IN
Origin: Taiwan
Manufacturing date: 2004/06
Motor power: 3 HP
Size of inspection board: 72 inch

8.16 Major Fabric Faults found in inspection section of Shasha Denims Ltd :

8.16 .1 Classification of fabric defects :

Fabric Defects are divided into two types:

- Removable defects
- Non removable defects
- The defects which can remove when inspection is called removable defects.
- The defects which cannot remove when inspection is called non removable defects.

8.16 .2 Description of different faults:

Starting mark:

Causes:

- Main cause is loom stoppage.

Remedy:

- This can not be avoided but can be controlled by starting mark setting.

Reed mark:

Causes:

- If any fault occur at reed Faulty denting in the reed.

Remedy:

- Right selection of the reed and right denting.

Snarl:

Causes:

- Excess main nozzle pressure
- Low filling tension

Remedy:

- Main nozzle air pressure control
- Correct setting of the PFT finger value

Double pick:

Causes:

- Cutting problem of the cutter
- Faulty setting of the air pressure.
- Remedy:
- Cutter position is to be set correctly.
- Air pressure should be reset.

Miss pick/ broken pick:

Causes:

- Excess air pressure of main nozzle

Remedy:

- Main nozzle air pressure should be reduced

Warp breakage:

Causes:

- Bad sizing
- Low strength of the yarn
- Crossing of the warp yarn

Remedy:

- Re knotting Proper sizing

Loose or Tight (sizing Fault):

Causes: knotting is given, when yarn breaks, the yarn tension does not match with other yarn as a result Loose or tight occurs.

Filling Stop:

Causes:

- If weft is failed to reach FD1
- If weft is too long & reach FD2

Remedies:

- Correct setting of the weft length
- Correct setting of main nozzle
- Correct setting of relay nozzle
- Proper setting of air pressure
- Proper setting of pre-winder
- Proper setting of creel position

Oil Mark or Crease, Hole:

- When fabric gets spots of oil lubrication from any part.

Contamination:

- It is a yarn fault, Plastic Others are mixed with yarn.

Patti:

- It is the dark color or thick weft lines in the fabric.

Crease Mark:

- Creases occur due to improper finishing.

Shade variarion:

Causes:

- The fabric has the equal dye affinity and if pretreatment e.g. scouring and bleaching has taken place in different machined.
- Liquor ratio changed
- In each batch, time of the fabric ropes passing through the nozzle is changed.
- Dyeing procedure is different for each batch.
- Temperature and added bulk chemicals changed.
- Low quality water especially PH, hardness and sodium carbonate content.

Remedies:

- Check that the fabric has the same dye affinity and if pretreatment e.g. scouring and bleaching has taken place in different machined
- Ensure that in each batch the fabric rope passes through the nozzle of the machine the same number of time during the actual dyeing process.
- Use the same stand procedure for each batch..
- Standards on your dyes and auxilarities..
- Check your water supply daily, especially the PH, hardness and sodium carbonate content.

Uneven printing:

Causes:

- Uneven pressure on printing rollers.
- Uneven lapping of central drums in printing machines.
- Diameter of printing rolles is uneven
- Printing paste level not maintained.
- Printing table is not proper cleaned.

Remidies:

- Pressure of printing roller should be optimum.
- If the printing roller have a problem , it should changed.
- Printing table should be cleaned very well.

8.17 Quality Assurance Procedure:

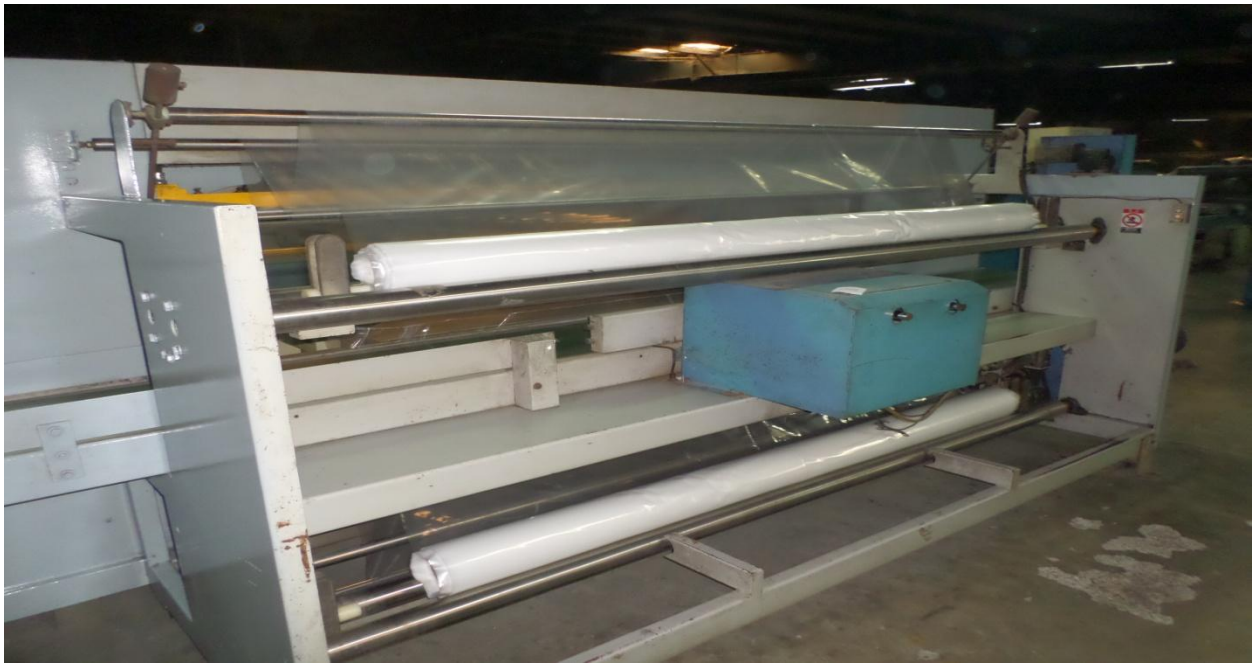
At first grey fabric is inspected thoroughly with the help of the inspection machine if any defect is
present there then the fault code number is written in inspection sheet. When 100 yards fabric inspections is completed then stop the operation & fabric is cut by scissor. Next, types & no. of fault is converted into point system as mentioned below. This point is expressed as percentage by using the following formula:
Inspection Calculation Formula = Total Point × 36 × 100 Fabric length × Fabric width

Point Range	Class	Class Name
Up to 20 Points / 100 m.	Class A	Elite
Up to 20 – 30 Points / 100 m.	Class B	Zenith
Up to 30 – 40 Points / 100 m.	Class C	Insta
More than 40 Points / 100 m.	Rejected	Rejected

After calculation, the operator place the 'Identification sticker' on the fabric roll with mentioning details
of the fabric as Order no, Usable width, Fault grade, Roll length, Total point, set, style etc.
Finally, Fabric roll goes to packing section & then Stored or delivery

8.18 Specification of the roll packing machine of Shasha Denims Ltd:

Model: STT-7200
Serial no: 3079-1
Origin: Taiwan
Manufacturing Date:2007/09
STT MACHINERY



8.19 Heat seating of fabric roll:

In Shasha Denims Ltd there is an heat seating machine used for the shrinkage the polybag covering the roll of fabric:

8.19.1 Specification of the heat setting machine :

Model: STT-7500

Serial no: 3079-2

Manufacturing date:2007/09

Origin: TAIWAN

SHIAW TAI TDNG MACHINERY COMPANY LTD

8.20 Denim Washing:

Shasha Denim Ltd is not a washing plant although they have a small washing unit. It is just used for product development and buyer swatch match. Though it is an important topic that's why we tried to give some information for understanding about Denim washing. Beside these washes, Basic washes are carried out in Shasha Denim Ltd which is described after the introduction part.

8.20.1 Basic Concept:

Denim has been used as clothing material for centuries due to its high durability. But today's fashion arena likes denim jeans due to its attractive shades, designs, attractive styles and various types of wash appeal, rather than for its robustness. Denim jeans in the past were worn in a raw, rigid and starch-finished form. But today's fashion requires various types of washing

treatments, such as desizing, enzymatic washing with or without stones, decolorization, neutralization, brightening and finishing.
Normally denim washing is carried out in sewn garments. The denim jeans are subjected with different washing techniques, such as rinse wash, bleach, enzyme wash, acid wash, stonewash, moon wash, sand wash, sun wash, over dyed/ tinted look, whiskering, damaged, used look. In denim washing, enzymes played an important role to get clean, smooth, fuzz free fabric surface with reduced tendency of pill formation and improved fabric handle. Traditionally, indigo denim fabric is deep blue in shade. Denim finish may be of two types, such as raw denim and prewashed denim. In raw denim, the denim is not washed after weaving. Raw denim jeans shows natural shade of indigo which is faded during wear and subsequent washes at home. However in some cases it is believed that, raw denim is not practical as it creates some problems of rubs off on other materials which come into contact with it. The unfixed dye on the surface of the fabric may cause stains to other fabric.
In order to overcome this problems, denim jeans is washed after sewn. The main plus point of pre-washing of denim jeans is that the colour is not transferred to other fabrics or surfaces during wear.

8.20.2 Types of Denim Wash:

Denim washing are of two different types.

- Mechanical wash
- Chemical wash

Mechanical denim washes are stone washing and micro sanding. During stone washing, stones are used in order to achieve typical wash down effect. There are three types of micro sanding, such as:

1.Sand blasting
2.Machine sanding
3.Hand sanding

- Whiskering
- Shot gun denim
- Water jet fading
- Super stone wash
- Ice wash
- Thermo denim
- Laser technology finish

Chemical washes of denim fabric may be of different types:

- Denim Bleaching
- Enzyme washing
- Acid washing
- Rinse wash
- Cellulose wash
- Ozone fading
- Snow wash
- Salt water denim

- Flat finish
- Over dye
- Sun washing
- Super dark stone

8.20.3 Bleach wash:

Denim bleach wash normally carried out with a strong oxidative bleaching agent such as sodium hypochlorite or KMnO4. It may be carried out with or without the addition of stone. The bleaching washing effect and de-coloration usually depends on strength of the bleach liquor, liquor quantity, temperature and treatment time. The bleached fabric materials should be properly antichlored or after washed with peroxide to reduced the subsequent yellowing or tendering of the bleached denim fabric.

Limitations of bleach wash:

There are some limitations of bleaching, such as:

- The same level of bleaching is very difficult to achieve in repeated runs.
- Bleaching treatment sometimes damage to cellulose resulting in strength losses and or pinholes at the seam, pocket, etc.
- Bleaching liquor is harmful to human health. This may also causes corrosion to the machine parts.
- Bleaching treatment needs antichlor treatment in order to eliminate the subsequent yellowness to the fabric.

8.20.4 Stone wash:

Stone washing of denim fabric gives "Used" or "Vintage" look on the garments. This is due to the varying degree of abrasion in the garment. The traditional stone washing of denim garments normally carried out with pumice stones to achieve a soft hand and desirable look. The pumice stones having oval and round shape with a rough surface, work as an abradant in washing cycle. The variations in shape, composition, hardness and porosity gives different washing effect in the denim fabric. During washing, these stones scrap off dye particles from the surface of the yarn of the denim fabric which shows a faded, worn out and brilliance effect in the denim fabric. Due to ring dyeing of denim fabric and heavy abrasion during stone washing, the fading is more apparent but less uniform.

In order to get the desired washed effect, the stone should be of proper hardness, shape, and size. For heavy weight denim fabric large and hard stones are suitable and also last longer. Similarly, smaller and softer stones are suitable for light weight denim fabrics.

The degree of colour fading during stone washing depends on several factors, such as, garment to stone ratio, washing time, size of stones, material to liquor ratio and load of garments. The washing time may varies from 40 - 120 min. Stones may be reused until they disintegrate completely.

Pumice is a natural volcanic stone used for stone washing garments. It is crystallized with substantive pores. Pumice is mostly used for stone washing due to its durability to chemicals treatment, its strength and light weight.

Limitations of stone usage:

Stone washing of denim fabric with pumice stones has some disadvantages and limitations,

such as:

- ❖ Stones may cause wear and tear of the fabric and may damage to washing machine due to abrasion of the stone with fabric or machinery parts.
- ❖ It may also create the problem of environmental disposition of waste of the grit produced by the stones.
- ❖ Increase the labor cost to remove stone dusts from finished garments. The denim garments is required to wash several times for complete removal of the stones.
- ❖ The stone washing process may cause back staining and re-deposition.
- ❖ The process is non-selective.
- ❖ Metal buttons and rivets in the denim garments as well as the drum of the washing machine sometimes get abraded which substantially reduces the quality of the garment and the life of the equipment.

8.20.5 Enzyme wash:

In order to minimize the adverse effect of stone-washing, the denim garments is washed with enzymes. The enzyme breaks the surface cellulose fibers of the denim fabric and removes during washing. During enzyme washing certain amount of indigo dye and cellulose fibers from the surface of the fabric are removed.

Enzymes are proteins, found in all living organisms, plants, as well as animals and microorganism. All organisms produce a wide range of enzymes. Enzyme washing is ecologically friendly due to the natural origins of enzymes. Enzymes basically catalyse specific chemicalreactions and are known as 'bio-catalysts'. Enzymes act on living cells and can be work at atmospheric pressure and in mild temp and pH.

8.20.6 Sand Blasting:

Sand blasting is a mechanical process in which localized abrasion or colour change on the denim garment is created. The process involves blasting an abrasive material in granular, powdered form at a very high speed and pressure through a nozzle onto certain areas of the garment such as knees and elbows. The garment treated surface shows distressed, abraded or used look. The common blasting materials used are sand and metal granules.

During sand blasting process the garment are first subjected to stone wash to the desired degree of washing. It is then sand blasted.

A solution of sodium hypochlorite or potassium permanganate often sprayed in desired area of the garment in order to obtain the same look. The garment is then neutralized, rinsed softened and dried. The sand blasting is a water free process therefore no drying required.

8.20.7 Acid wash:

Acid wash on denim jeans is becoming very popular due to its significant contrasts and attractive appearance in color. Acid wash can be carried on Indigo & Sulphur base fabric garments. Acid wash was a chemical wash process on denim which stripped the top layer of color and makes a white surface while the color remained in the lower layers of the material, giving it a faded look. Acid was first launched in 1980's as a new innovative finish on denim garments. This wash was being carried out by soaking stones in bleach and then followed by neutralization.

Acid was of denim garment normally carried out by tumbling the garments with pumice stones presoaked in a solution which contains sodium hypochlorite (5 to 10%) or potassium permanganate (3 to 6%). This cause localized bleaching which produce non uniform sharp blue/white contrast.
In this wash addition of water is not required. The color contrast can be increased by optical brightening treatment. Acid washed denim fabric sometimes become yellowish after washing. This is due to incomplete neutralization, washing or rinsing, so that manganese not removed from the garment. However the manganese can be removed by washing with addition of ethelene-diamine-tetra-acetic acid as chelating agent.
The process of acid washing jeans involves soaking of porous pumice stones and chlorine or potassium permanganate (PP) bleach. Sodium-bisulfate is used for neutralization. It is recommended to use two separate washing machines for Acid Washing & Neutralization etc.

Precautions for acid wash:

During acid washing, the workers should wear mask & aprons. The operator should use protective rubber gloves and safety glasses.

8.21 Denim washing in Shasha Denim Ltd:

When an order comes from buyer in form of washed sample the technical person determine the shade percentage, amount and type of washing to that fabric to get the appearance like the sample. So it is very important to wash the sample fabric to justify his assumption.
Partex denim only gives washed sample receipe so that buyer can get his desired design but does not run mass production.
Types of Sample washing are done in Shasha Denims Ltd.

- Enzyme wash
- Acid wash
- Bleach wash
- Stone wash

8.21.1 Machine used in washing unit:

Features of Washing Machine used in Shasha Denims Ltd:

- Single door design for general washing, sweater and sample washing machine.
- Automatic washing timer and pre-set front and backward rotation.
- Option to install 4 steps gear box or frequency controller for speed control for different requirement of garments.

Specification of washing machine: 01

Capacity: 300 LBS
Model: AIW-100(S)
Origin: Singapur
MFD : year 2000/09 month
Serial no: A109050(67)
SUTLICK TRADING (SINGAPUR)PTE LTD.
Office : 14 shaw road, #) 04-03
BTC Building, singapur 367952

Specification of washing machine: 02

Capacity: 600 LBS
Model no:SSWM-001
MFG Year : 2011
Net weight : 1500kg

Specification of washing machine: 03

Capacity: 250 LBS
Origin : Bangladesh

8.22 Some important steps in the process of Denim Washing:

- Pre treatment (Desizing, Rinsing, Scouring etc.)
- Enzyme or Stone wash
- Clean up to adjust the desire effect
- Bleaching
- Tinting / Dyeing
- Softening & Much more

8.23 Pre treatment:

This is very first & basic step but most important step of washing. Here the fate of denim garment is decided that it's going to appear good or bad. Good Pre treatments avoid streaking, stiffness & color loss. This process removes impurities, starch & stains during handling of fabric. This step is also called desizing (Removal of Size applied during denim fabric making in weft yarn). All the woven fabric contains size on them due to reasons to strengthen the yarn for weaving. There are many types of sizes available in the market but they can be divided in two major groups.

1. Water Soluble (CMC or PVA based sizes)
2. Dissolvable sizes in water (Starch based). Starch based sizes are most commonly used due to cheap prices & readily availability.

8.23.1 Methods of Removing Sizes from Denim Jeans:

- Washing with High Alkaline agents (i.e. Soda ash)
- Washing with High Acidic agents (i.e. Acetic acid)
- Washing with Oxidative chemicals (i.e. Hydrogen Peroxide)
- Enzymatic desizing with Alfa amylase. This is eco friendly & convenient.

8.24 Desizing:

The sized denim fabric consists of cellulose fiber coated with a film of starch. Cellulose and starch are chemically related. During weaving the warp yarns are subjected to considerable stress and strain due to fast moving reed and other machine parts. In order to prevent the end breakages, the warp yarns are sized. Although several other substances have been developed, still sizing is still based upon starch. The starch makes the cloth less absorbent which impairs the uptake of bleaches, dyes, and other chemicals. Hence complete removal of the size is extremely essential.

There are various methods of desizing. Traditional desizing is carried out with acid, alkali or oxidative desizing agents. However, these chemicals having some limitations and disadvantages. The cellulose material may be damaged and loses strength with these chemical treatments.

With the introduction of desizing with enzymes (amylases), the limitation and drawbacks of traditional desizing process has been removed. The enzymatic desizing is considered to be the best and safest. Conventional desizing degrades the cellulose which is not occur in case of enzymatic desizing. Enzymes are very specific in their action and act only on the starch without reacting on cellulose.

The enzymatic desizing process is performed by using alpha amylase enzyme which hydrolyses the cellulose. The enzyme desizing process offers high efficiency and specific action. Amylases completely remove the size. These enzymes are harmless to the fabric and are environment friendly.

8.24 .1 Advantages of enzymatic desizing are:

- There is no adverse effect of enzyme on cellulose, on machinery and on other bath auxiliaries. Hence loss of strength in desized fabric is minimum.
- In enzymatic desizing, multiple washing is not required to remove the residual chemicals and hence there is saving of water in enzymatic desizing.
- Enzymatic desizing is carried out in moderate temperature, and the process time is also reduced. This ultimately leads to increase in productivity and saving in energy.
- Neutralization is not required in enzymatic desizing.
- Enzymatic desizing offers softer feel and less hairiness on the fabric.

8.25 Water Extractor:

Features of Water Extractor used in Shasha Denims Ltd:

- Special Design for Industrial Laundry
- Stainless steel inner basket, durable and strongly built
- Equipped with shake absorbing spring
- With hand clutch for fast-stop
- Installed with insulated motor and automatic clutch for fast start and longevity.

8.26 Specification of other machine used in finishing department:

Specification of squeezer machine used in shasha denims ltd:

Model: SHE-30
MFD: 2000 year, month 9
Serial no: S10905120
SUT LICK TRADING(Singapore)PTE LTD.

Specification of dryer machine:01

Capacity: 200 LBS
SHILPA SAMBHAR MFG INTL. CO. LTD.
Model: SSDMS

Specification of dryer machine:02

Capacity: 300 LBS
Model: SSDMS-S-003
MFG Year :2011
Net weight: 750kgs
SHILPA SAMBHAR MFG INTL. CO. LTD.
BASIC INDUSTRIAL AREA
SAGARICA ROAD, CHITTAGONG
BANGLADESH

Chapter – 9

Utility

9.1 Definition:

The definition of utilities can be expressed in many ways.A Company that generates transmits and/or distributes electricity, water and/or gas from facilities that it owns and/or operates.A utility system used in industrial facilities. This area includes boilers, chillers, cooling towers, air compressors, and their associated fluid distribution systems.

Utility department of Shasha Denims Ltd. is related to the following things:

- Electricity: Gas Generator, Rural electrification Board (REB)
- Water: Deep Tube well
- Gas: TITAS
- Steam: Boiler
- Compressed air: Air compressor
- Chiller
- Humidification plant
- Workshop
- Effluent Treatment Plant (ETP)
- Water Treatment Plant (WTP)

9.2 Water Supply:

Water is supplied by deep tube well. There are two tank main & reserve tank for water storage. The level of water is monitoring continuously and reading is taken in every hour. A daily report is prepared for that and this water is supplied to many sections like dying, boiler, generator, compressor etc.

Total water consumption: 900m3/day(Approximately).

9.3 Boiler:

A steam generator or boiler is usually a closed vessel made of steel for supplying steam. Boiler function is to therefore the heat produced by the combustion of fuel (here gas is used) to water and ultimately to generate steam. The steam produced in the boiler section supplied to different section of mill.Supplied sections for steam:

- Dyeing unit
- Sizing
- Finishing
- Washing unit
- Chiller

9.4 Specification of Boiler :

There are two fire tube boiler in Shasha Denims Ltd.

Specification of Boiler 1:

Name: SHELLMAX
Model: SM5004110.54/13
Origin: India
Fuel used: FO-HSS/ GAs
Design Pr : 10.56 kg/cm2 415 v 3 PH 50 HZ
Evaporation: 5000 kg/hr. F&A 100 degree
Year of manufacture : 2000
Output:3.13 MW
Conn.load : 32.2 Kw

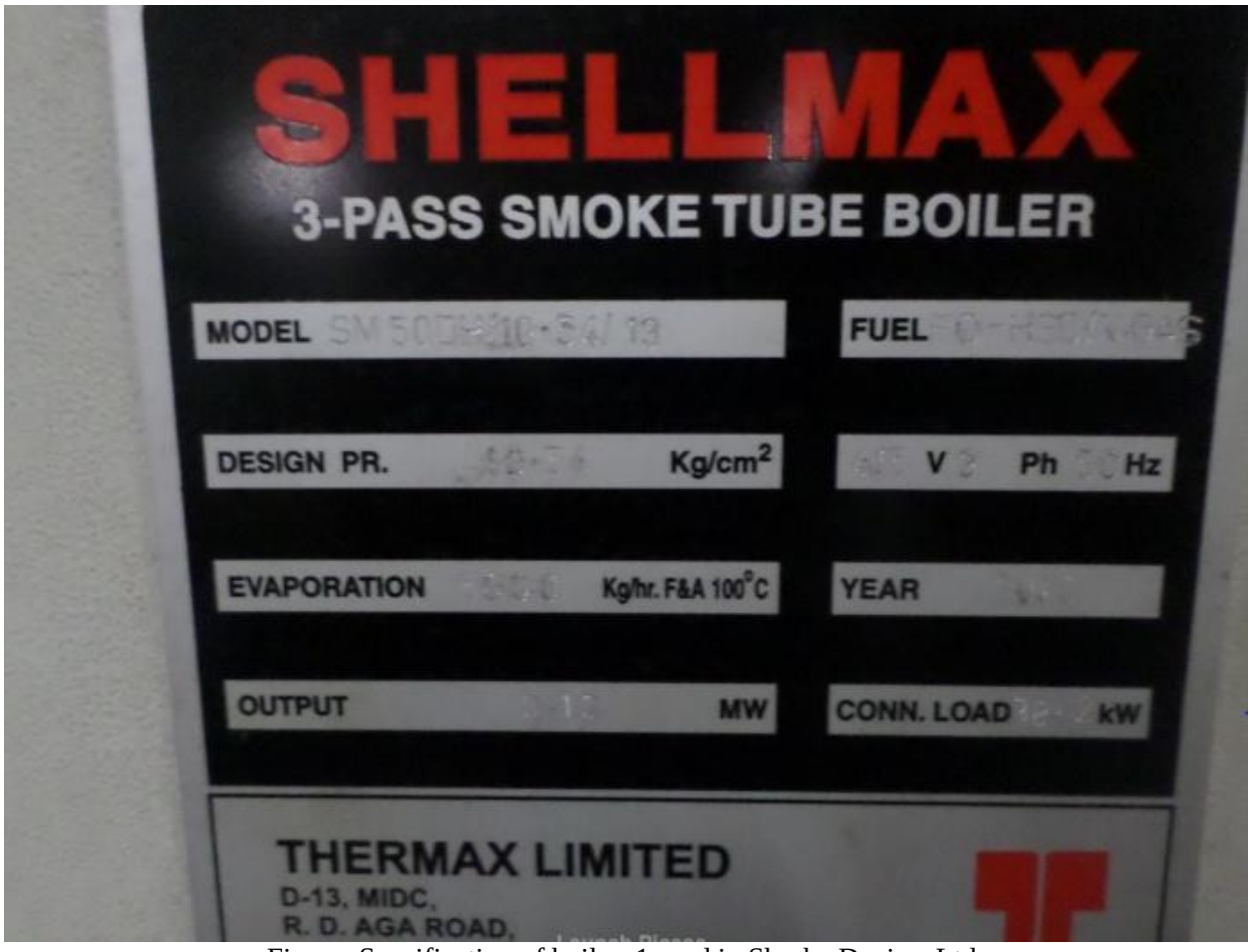


Figure: Specification of boiler 1 used in Shasha Denims Ltd.

Specification of Boiler 2:

Name: Omnical
Model: DDHI 10.0-10
Origin: India
Fuel used: FO-HSS/ GAs
Max Heat capacity: 6.5 MW
Max steam output: 10.0 t/h
Evaporation:188 degree
Working pressure gauge: 10 bar
Year of manufacture : 1998

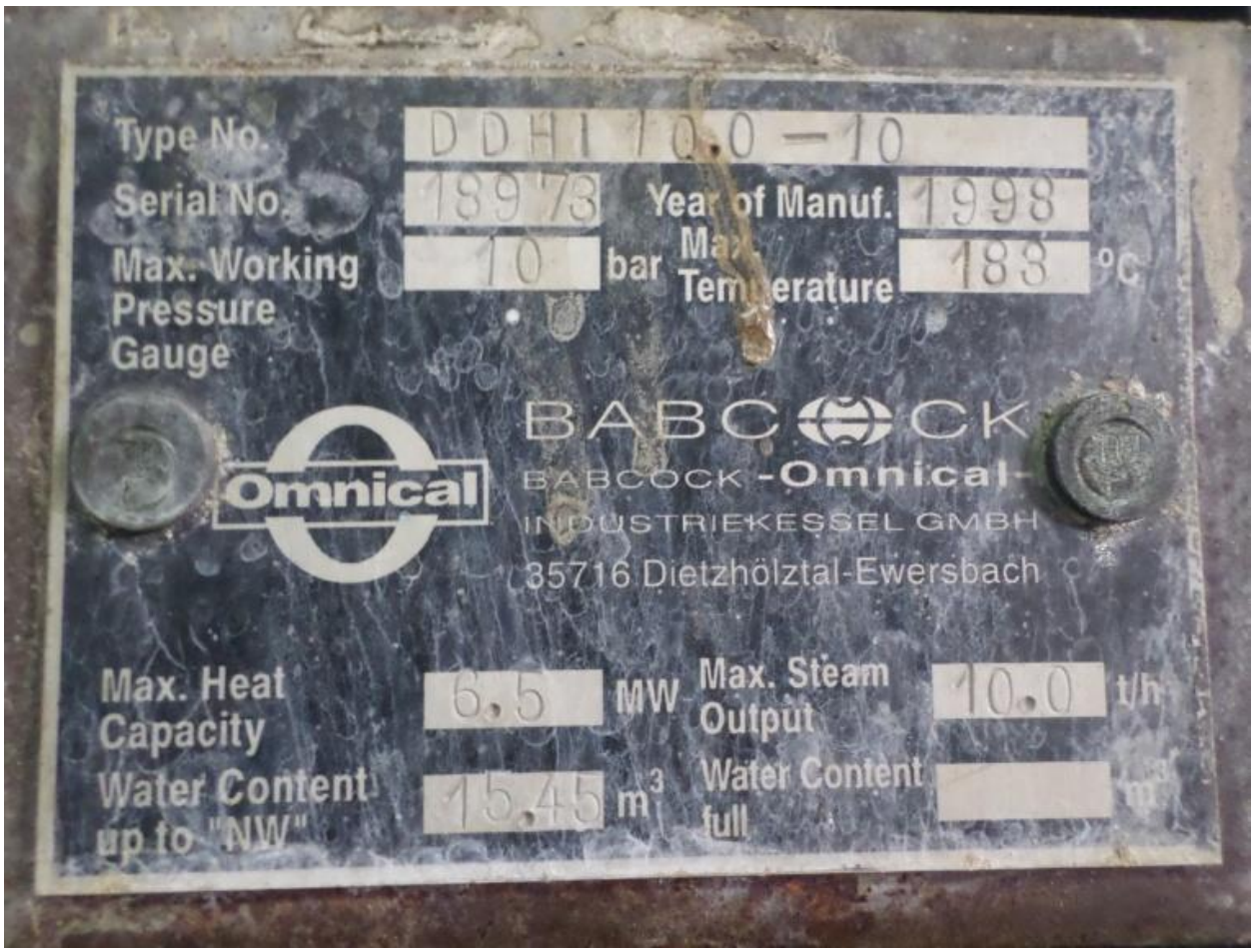


Figure: Specification of boiler used in Shasha Denims Ltd.

9.5 Generator:

An electrical generator is a machine, which converts mechanical energy into electrical energy. The energy conversion is based on the principle of the production of dynamically induced e.m.f.
Features:

- 12 cylinders turbocharged and intercooled
- Fully integrated engine diagnostic and control system including:
- Spark timing control
- Turbocharger control
- Speed governing
- Individual cylinder knock detection
- Air/Fuel ratio control
- Fuel tolerance
- High altitude capability
- Low Btu option

Specification of Generator used in Shasha Denims Ltd :

- Model no: VHP5904GSID
- Serial no: C-94801-901/1
- Date: OCT05
- Weight : 17650 KGS
- R.P.M: 1000
- Phase: 3
- Volts: 415/240
- HZ: 50
- P.F: 0.8
- Duty: CONTINUOUS
- Kw: 900
- K.V.A: 1125
- AMPS: 1565
- Maximum site altitude: 5 METERS
- Maximum ambient temp: 30 DEG.C
- Performance class: NO OVERLOAD ALLOWED
- Engine serial no: C-9/1801/1
- Generator serial no: CAM 5254
- IS2000

Figure: Specification of generator used in Shasha Denims Ltd.

Specification of Alternator used in Shasha Denims Ltd:

SYNCHRONOUS ALTERNATOR
Model: MTG 846
Serial no: CA8L5254
EMI: 68601000
Date: 08/05
KVA: 1125
AMB: 40 DEG.C
KW: 900
ALT: 1000M
P.F: .6
EXC VOLTS: 30
VOLTS: 240/415
EXC AMPS: 7.0
AMPS: 1565
TEMP RISE: 105 C
OVERSPEED: 125 0/0

ENCLOSURE: IP-22
ROTATION: CCW
WEIGHT: 4763 KG
HZ: 50
INSULATION: H
RPM: 1000
STATOR CONN: WYE
PHASE: 3
ARRANGMENT: P316099A
RATING: PRIME

9.6 Air Compressor:

Compressed air along with gas, electricity and water is essential to most modern industrial and commercial operations. It runs tools and machinery, provides power for material handling system and ensures clean breathable air in contaminated environment. In Shasha Denims Ltd both screw type compressor and Boge type compressor is used.

Machine Specification:

Brand : Kaeser
Country of origin : USA
Year of manufacture : 2005
Total machine : 08
Compressor Output : 20.5 m3/min/mc
Dryer Output : 52.5 m3/min/mc
Output Pressure : 9-9.5 bar
Power Consumption : 132 kWh/mc

Features of Air compressor used in Shasha Denims Ltd:

- With one-to-one drive, the air end is directly connected to the motor via a maintenance-free coupling that eliminates transmission losses.
- Direct drive screw type compressors deliver outstanding performance and increase energy savings.
- It uses oversized air ends specifically selected to produce the required output in flow and pressure.
- Compared to compressors using small, high-speed, gear-driven air ends, the one-toone drive provides significant savings.
- No-loss power transmission.
- Lower power consumption.
- Reduced maintenance and related downtime costs.

9.7 Air Dryer:

The atmospheric air drawn into a compressor is a mixture of gases that always contains water vapors. However, the amount of water vapor that air can carry depends on the temperature. As air temperature rises – which occurs during compression – the air's ability to hold moisture increases also. When the air is cooled its capacity to hold moisture reduces which causes the water vapor to condense. Removing the moisture from the compressed air not only prevents costly breakdowns and production downtime, but also keeps maintenance and repair costs to a minimum. Refrigeration drying is usually the most efficient solution for the majority of compressed air applications.

Features of air dryer used in Shasha DenimsLtd:

- Low pressure drop, non-fouling heat exchanger.
- Low pressure drop filtered separator with microprocessor controlled filter monitor removes liquids and particulates to 3 microns.
- "No-loss" electronic Eco-Drain for reliable condensate removal.
- On/off load digital scroll refrigeration compressor (Dual Control models only).
- Hot gas bypass control (Demand Manager models only).
- Optional cold coalescing oil removal filter eliminates oil aerosols to 0.008 ppm.

9.8 Chiller:

A chiller can be generally classified as a refrigeration system that cools water. Similar to an air conditioner, a chiller uses either a vapor compression or absorption cycle to cool. Once cooled, chilled water has a verity of application from space cooling to process use.

Chiller used in Shasha Denims Ltd:

There are three vapour absorption chiller which are used for the cooling of weaving floor 1, 2 and 3.

Specification of the chiller used in Shasha Denims Ltd:

Thermax vapour absorption chiller :

Machine model : ES33046
Serial no : 2
Year of manufacturing: 2005
Cooling capacity: 878.5 KW
Country of Destination:
Operating Weight: 9.6 ton
Heat source: Bioler
Type: DESFF
Inlet pressure: 415 v
Power supply: 6.1 bar (9)
Frequency: 50 Hz

Chiller Tower Specification:

Brand : Spacco
Model : SPC 600 RT
Year of manufacture : 2005
Capacity : 2060 m3/h
Water in : 37OC
Water out : 32OC
Fan motor power : 20 HP
Air Capacity : 132400 m3/min

Chapter – 10

Effluent Treatment Plant (ETP)

Recently for the increasing of production rate, the waste water created more which they can not treated in their ETP. As a result they transferred their whole waste water to the central ETP of DEPZ.

So, we could not see the Effluent Treatment Plant (ETP) of Shasha Denims Ltd.

Chapter – 11

Maintenance

Machine, Building & 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 to repair & recondition them so as to elongate their life to extent it is economically & physically possible to do so.

It is in this in the context that maintenance assumes important as an engineering function .It is made responsible for provision of a condition of these machines, buildings, & service that permit uninterrupted implementation of plans requiring their use.

11.1 Objectives of maintenance:

- To keep the factory plants, equipments, machine, tools in an optimum working condition.
- To ensure specified accuracy to product & time schedule of delivery to customer.
- To keep the down time of machines to the minimum thus to have control over the production program.
- To keep the production cycle within the stipulated range.
- To modify the machine tools to meet the need for production

11.2 Types of maintenance:

Maintenance can be classified as following way:

11.2.1 Reactive/Break-down Maintenance:

Reactive maintenance is basically the "run it till it breaks" maintenance mode. No actions or efforts are taken to maintain the equipment as the designer originally intended to ensure design life is reached.

Advantages:

- Low cost
- Less staff

Disadvantages:

- Increased cost due to unplanned downtime of equipment
- We are spending more dollars associated with capital cost because, while waiting for the equipment to break, we are shortening the life of the equipment resulting in more frequent replacement or repair.
- If it is a critical piece of equipment that needs to be back on line quickly, we will have to pay maintenance overtime cost.
- Possible secondary equipment or process damage from equipment failure.

11.1.2 Preventive/Schedule Maintenance:

Preventive maintenance can be define as action performed on a time or machine-run-based schedule that detect, preclude or mitigate degradation of a component or system with the aim of sustaining or extending its useful life time to an acceptable level.

Advantages:

- Increase component life cycle.
- Flexibility allows for the adjustment of maintenance periodicity
- Reduce equipment or process failure & estimated 12% to 18% cost saving over reactive maintenance program.

Disadvantages:

- Labor intensive
- Includes performance of unneeded maintenance.
- Potential for incidental damage to components in conducting unneeded maintenance.

11.1.3 Predictive/Planned Maintenance:

Predictive maintenance can be define as measurements that detect the degradation of machine, thereby allowing casual stressore to be eliminated or controlled prior to any significant deterioration in the component physical state. Results indicate current & future functional capability.Basically, predictive maintenance differs from preventive maintenance by basing maintenance need on the actual condition of the machine rather than on some preset schedule.

Advantages:

- Increased component operational life & availability.
- Allows preemptive corrective actions.
- Decrease in equipment or process downtime & estimated 8% to 12% cost saving over preventive maintenance program.
- Better product quality.
- Improved worker & environmental safety.
- Decrease in cost for parts & labor.

Disadvantages:

- Increased investment in diagnostic equipment.
- Increased investment for proficient manpower & staff training.
- Saving potential not rapidly seen by management.

11.1.4 Capital Replacement:

If it is seen that the repairing cost of machine parts is more or equal or little less than buying a new one,then the old one is replaced instead of repair. It is known as capital replacement.

11.1.5 Maintenance Department of Shasha Denims Ltd:

There is very active maintenance team in Partex Denim. Every group having a leader and two assistant fitters. They all are very efficient and hard working. They can fix any type of mechanical problem of machines. No necessity happens to hire others from outside to fix machine maintenance. There are electro-mechanical groups to work for electrical problem of machineries. They work for overall factory.

Maintenance Procedure:

- For there is any mechanical fault of machine which is responsible for production hamper, operator informs mechanical fitters in duty. Mechanical fitters come and observe the problem firstly, and then they begin to fix it.
- If mechanical fitters be unable to fix it, then they inform technical in-charge, he then comes in spot and fix it.
- For there is any electrical problem of machine or serious founding mechanical problem, mechanical and electrical department are informed, they come and fix the problem. They commence at work after informing of production manager. For restore active maintenance, senior production officer orders mechanical fitters to fit required machine.

Cleaning Types:

Section	Cleaning
Warping	Every day (by air)
Dyeing	Every shade change (by water)
Weaving	Every day (by air)
Finishing	In a week/month (by water)

11.2 Requirements for Good Maintenance:

- Good supervision & administration of maintenance department.
- Operators should be well trained.
- Proper maintenance record should be maintained.
- Adequate stock of spare parts should always be kept.
- Manufacture of the machine tools should be consulted as & when required.
- Maintenance department should remain in contact with planning & purchasing department
  deciding the type of machine tools to be purchased

Chapter – 12

Research & Development (R&D)

12.1 R & D Department in Shasha Denims Ltd:

Research & Product development department is an important department for any textile industry. This plays a direct role on developing a product. Shasha Denim Ltd. has also a Research & Development (R&D) department with modern amenities which correlates very well with the upcoming new product. Continuous research programmed is carried-on here, which is completed by product development. The R&D department is independent and equipped to promptly invent new designs for new fashion and develop buyer's requirements timely. This department keeps all documents from dyeing recipe to fabric construction and keeps master roll to keep shade in same consistent even over a longer discontinuity. Partex always researches to develop new fashion as per the world requirement as well as to maintain comfort & durability.

Most often this department creates new product on the basis of new design & structure by their own creativity according to the current market demand and then give it to thebuyer. If this design is approved by the buyer then it is stored. They already developed over 5000 samples.When an order comes from buyer in form of washed sample. The technical person determines the shade percentage, amount and type of washing to that fabric to get the appearance like the sample. So it is very important to wash the sample fabric to justify his assumption. For this purpose a small washing unit is established in the factory.Every order firstly comes into R&D department via marketing peoples by mail or swatch. The R&D experts analyze these samples and match it with their developed samples. If they find similar samples then this is sent to buyers for approve. If buyers approve it then the R&D section goes for production.

12.2 Developed Samples:

12.2.1 Samples according to Weave :

- 3/1 (both RHT & LHT)
- 2/1 (both RHT & LHT)
- 3/2 (both RHT & LHT)
- 4/1 (both RHT & LHT)
- 2/2 canvas
- 1/1 plain weave
- Broken Twill
- Herringbone Twill
- Zigzag Twill
- Fancy Design

12.2.2 Samples according to yarn used :

- Regular – OE & Ring
- Rotor
- Slub, Cross Slub, Stretch Denim
- Polyester Denim
- Lycra

12.2.3 Samples according to Weight:

- 4.5 Oz/Yd2 to 15.75 Oz/Yd2
- Light weight: 4.5 Oz/Yd2
- Medium weight: 7.5 Oz/Yd2
- Heavy weight: 15.75 Oz/Yd2

12.2.4 Samples according to Width of finished fabric:

- 45''
- 46''
- 47''
- 48''
- 50''
- 58''
- 59''
- 60''

Average 45''-60'' width fabrics are produced in Shasha Denims Ltd according to buyer requirement.

12.2.5 Samples according to Color :

- Indigo, Special Indigo
- Dark Indigo, Blue Black, Black, Ash
- Reactive color denim

12.2.6 Samples according to Finish :

- Coated Denim
- Printed Denim

The R&D department also performs different testing solutions. Most modern and efficient lab Instruments from Atlas, UK which is operated by trained technicians. The variable light box, Spectrophotometer, rubbing tester, Washing Fastness, Tensile strength tester etc. gives accurate results and helps to keep quality good and more consistent. Lab reports of a running lot are constantly maintained. After each process a sample for testing is sent by the production staff usually after many meters of run. Lab reports contain information about various tests performed according to buyer requirements and their results with remarks of responsible staff about the fabric.

12.3 The tests that can be performed in R& D department :

- Skew
- Weight (Oz/Yd2)
- Shrinkage warp %
- Shrinkage weft %
- Pilling ICI
- Tensile strength
- Wash fastness
- Rubbing Fastness

12.4 Equipments Used in R&D of Shasha Denims Ltd:

- Quick wash Plus
- Pilling Tester
- Rota wash
- GSM balance
- GSM cutter
- Shrinkage Measurement Scale
- Tensile Strength Tester
- Rubbing Tester
- Pilliscope
- Spectrophotometer
- Grey Scale

Chapter – 13

Store and Inventory Control

Inventory control of raw materials, semi-finished goods, finished goods and other miscellaneous goods lead smooth production. As shasha denims Ltd. follow the correct way of inventory control system, it can have a good and huge production as it demands.
There are huge rooms for storing and inventory control.

13.1 Scope of inventory control:

- Raw materials
- Yarns
- Dyes store
- Others chemicals store
- Finished fabric
- Spare parts
- General store
- Capital equipment
- Accessories
- Stationary
- Maintenance parts.

13.2 Inventory System for Raw Material maintained in Shasha Denims Ltd:

The main raw material of denim fabric is yarn, which is stored in two stages such as-
1. Long time storage
2. Storage before production

1. Long time storage:
Amount of yarns which are required for the production of several months as prerequisite.

2. Storage before production:
The amounts of yarn, which are loaded in the store, room concern with the production section for continuous speed of production.

13.3 Inventory System of Spare Parts maintained in Shasha Denims Ltd:

The spare parts of different section such as preparatory & dyeing, weaving section, finishing section are stored. If a machine is innovated its slightly effected parts will be stored as spare after repairing needed. In addition, these parts are used in conjunction with new parts.

13.4 Inventory System of Finished Goods maintained in Shasha Denims Ltd :

After the completion of finishing, the finished fabric is stored from where the finished fabric is delivered to the buyer.

13.4 Other Inventories maintained in Shasha Denims Ltd:

Other inventories like empty packages or packages with few yarns & cartoons are stored in wastage room. From this, packages with few yarns are used for sample production. Mechanical equipments for maintenance are stored in mechanical room, lubricants are stored in lubricant room & a drum is kept in the shed as stand by requirement.

Chapter – 14

Marketing Activities

The commercial section of Shasha Denim Limited performs the following functions:

- Official dealing with buyer
- Communicate with factory in charge for issuing delivery date
- Dealing with bank
- Preparing different necessary documents

14.1 Procedure of Export Business by Shasha Denims Ltd:

14.1.1 To get order:

Like any other factory, Shasha Denims Ltd do not need to any kind of product marketing to get order. It is so much renowned denim factory in Bangladesh that they do not knock the buyer's door for order.
Buyers come here with query for definite sample or style for their own interest.

14.1.2 Sample preparation:

Shasha denims Ltd already prepared over five thousand types of fabric sample. So they have huge number of fabric sample collection. If buyer's requirement match with any of earlier fabric then a sample from stock is send to them, otherwise a new sample is prepared and sends to buyer.

14.1.3 Issuing of P.I (Performa invoice):

If the buyer approves the sample, then Shasha Denims Ltd issues Performa invoice to the buyer.

What is P.I. (Performa Invoice)?
Performa invoice is a paper where all the terms and condition of that business dealing is write down. Shasha mainly notice the following points in their PI:

- Description of the product.
- Price
- Last date of L.C open by the buyer
- Date of delivery
- Date for bill payment after delivery
- Some other official terms and condition

14.1.4 L.C. (Letter of credit) opens by the buyer:

If the buyer agrees with the terms and condition on the P.I then the buyer open L.C against that order.

What is L.C (Letter of Credit)?
L/C (Letter of Credit) is credit contract whereby the buyer's bank is committed (on behalf of buyer) to place an agreed amount of money at solicits disposal under some agreed condition.

Chapter – 15

Security

15.1 Security Section:

The main objective of the security is to safe handling of the goods from/to the mill premises. For the achievement of such objective a team of security guards has been employed by the Company. All the keys relating to the mills office, labor colony, quarters) are lying into the responsibility of the security officer. No outside visitor can come into the mills premises without the permission of the security guards or administration department.

15.2 Security Main Gate:

This office has been made to keep the record of each and every thing coming into and going out of the mills gate. This office keeps and maintains the time record of all the workers on time cards and pay register for the final costing of the workers' salaries. It keeps the attendance records, which is then used to calculate the salary to be paid to the Workers on monthly basis.

It keeps the records of the overtime, leaves; number of days worked of all the workers and then calculates their overtime on the basis of the basic salary of each worker.

For 24 hours close attention to the production floor and also the outside, there are several close circuit camera all over the factory. This operation is done by the administration department from administration office.

Chapter – 16

Conclusion

We have completed our industrial attachment successfully by the grace of Allah. Industrial attachment sends us to the expected destiny of practical life. Though it was established only a few years ago, it has earned "very good reputations" for its best performance over many other export oriented textile mills.

We are enough fortunate that I have got an opportunity of having a training in this mill. During the training period we have received co-operation and association from the authority full & found all man, machines & materials on appreciable working condition. All stuffs & officers were very sincere & devoted their duties to achieve their goal.

Finally We would like to wish Shasha Denim Ltd. to have a blast & thanks to administration of Shasha Denims Ltd for their cordial attitude to us.

Limitations of the report:

- We had a very limited time. In spite of our willing to study more details it was not possible to do so.
- Some of the points in different chapter are not described as these were not available.
- The whole process is not possible to bind in such a small frame as this report, hence our effort spent on summarizing them.