



Project
On

**"Study on Yarn Breakage of Rope Denim and Sheet Denim in
weaving loom"**

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Supervised By

Professor Dr. Md. Mahbubul Haque
Head
Department of Textile Engineering
Faculty of Engineering
Daffodil International University

Submitted By

Name	ID No.	Major subject
MD Khaledur Rahman	133-23-3728	FMT
MD. Aminul Islam	142-23-3850	FMT

Department of TE
Faculty of Engineering
Daffodil International University

DECLARATION

We hereby declare that the work which is being presented by us in this thesis entitled, “**Study on Yarn Breakage of Rope Denim and Sheet Denim**” has been done under the supervision of **Professor Dr. Md. Mahbubul Haque**. It has not been presented of any other university and all the resource of information uses for this report has been properly acknowledged.

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

Supervised By

Professor Dr. Md. Mahbubul Haque

Head

Department of TE

Faculty of Engineering

Daffodil International University

Prepared By

Name of the student, ID number & Signature

MD. Khaledur Rahman	133-23-3728
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MD. Aminul Islam	142-23-3850
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Department of TE
Faculty of Engineering
Daffodil International University

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ABSTRACT

At first we went some of denim fabric industries. We observed the denim manufacture from the warping to weaving very carefully. In every steps of production and we collect data and information and also analyze that. We tried to find out the number of faults and the causes of faults. We compare the causes of yarn breakage of rope denim and sheet denim. We found that the breakage percentage of sheet denim is higher than the rope denim production. That's mean there are excessive breakage has on sheet denim than rope denim. We also separate the section wise work according to production process so that we can build an appropriate result which will be perfect for use and help to carry out other activities on the established form of work.

During our project work we watched all the process very carefully. Our efforts were to develop a dependable way so that we can easily visualize or can forecast the result. We took all the data very effectively. The product specification in every section along with machine specification and the major factors which are necessary to calculate different types of breakage. We have tried our best to emphasize on the adjustable points on which the causes of faults to compare the breakage of rope denim and sheet denim. The theoretical as well as the practical knowledge that we collected from the industry, help us to perform our project. For this we specially convey thanks to our honorable teachers.

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CHAPTER-1

INTRODUCTION

Introduction:

Our country Bangladesh has become one of the most popular and significant sections for denim production and export across the world. It is the 2nd largest producer of denim products after China. The growth of denim production in our country is increasing day by day. But there has some problem in production, like stoppage, breakage, irregular maintenance etc. During processing, materials are suppressed to various tensions not only during the machine operation but also during its stoppage. If these stresses overcome a given limits it will inimically affect the quality of the produced yarns, fabrics and the efficiency of the machines. In weaving process, knots, dust, strains on warp ends or weft can command to yarn breaks, loss of quality and shutdowns. Warp breaks still express major problem especially for modern high-speed weaving machines. Warp yarn break due to excess tension than the strength of the yarn. For that reason the production of denim production hampered rapidly. And it's make denim as lower production. Moreover, due to continuous stoppage of machine, this creates different types of problem on the various parts of the machine. In different sector of denim producer yarns may be broken due to many other reasons. Yarn faults create breakage in every weaving process like, both in sheet denim & rope denim.

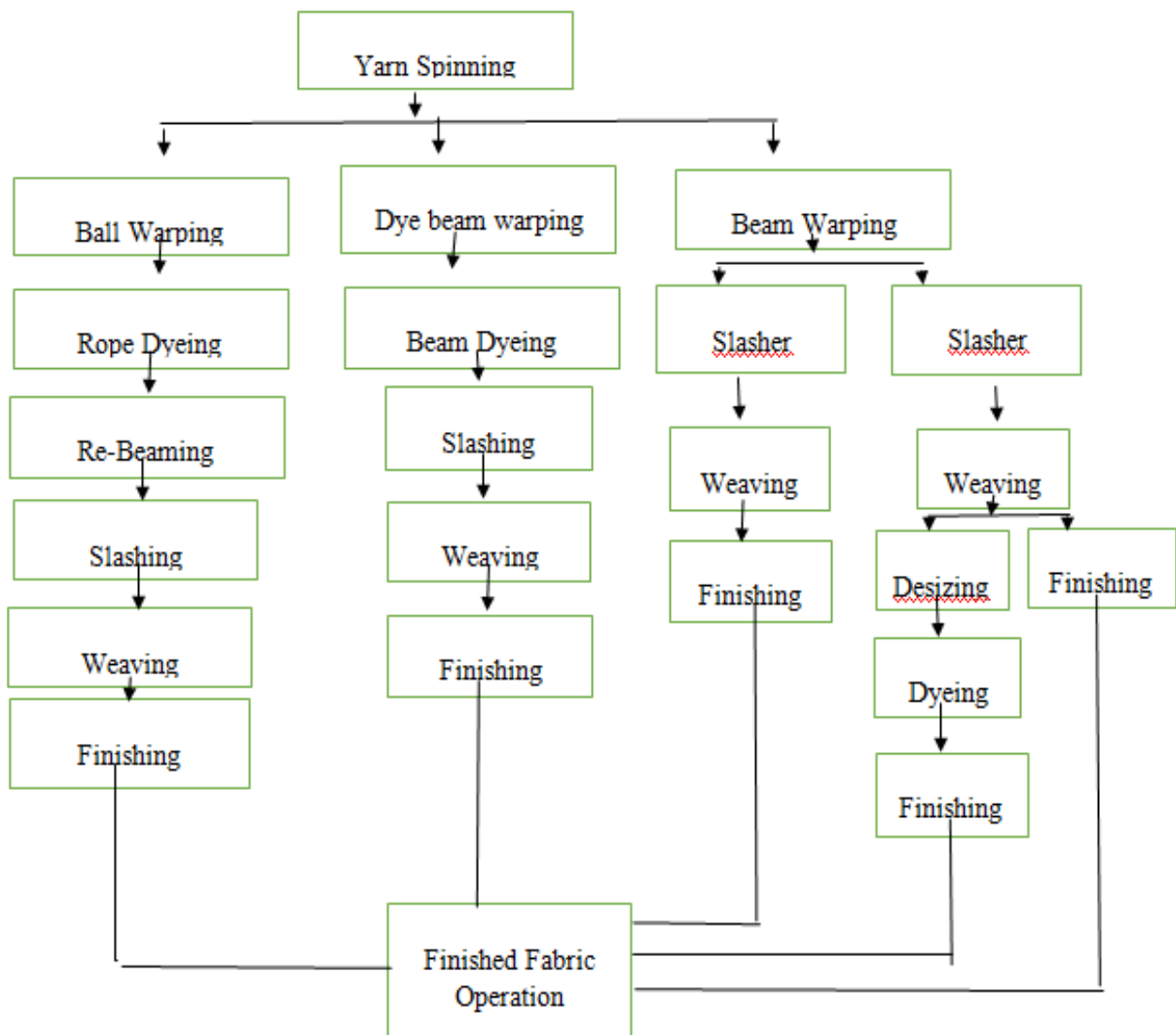
CHAPTER-2

LITERATURE REVIEW

Denim:

Denim is the most widely used most elegant and most multipurpose woven fabric of the world. In present denim is basically used for producing garments particularly trousers, pants, shirts, jackets, for the young people. Denims are basically produced from 5 oz. to 16 oz./ sq. yds in weight. Technically Denim is defined as a 3/1 warp twill but also produced from weaves like: Left hand twill, right hand twill, cross hatches, broken twill, cords, dobby's, etc. Now-a-days denim is a very demandable product. To make a denim fabric the required yarn for the definite construction should be dyed then make weavers beam to go to weaving to make fabric.

Flow chart of Denim:



Warping:

Warping is the first process in the producing of denim or any other weaving production. Basically warping is transferring many yarns from a creel of single-end packages forming a parallel sheet of yarns wound onto a beam or a sectional beam. Normally, yarns are collected in a sheet form where the yarns parallel to each other onto a beam, which is a cylindrical barrel with side flanges, called or known as beam warping.

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.

✚ **Direct Warping** is used for **Sheet Denim** production.

✚ **Ball Warping** is used for **Rope Denim** production.

Direct Warping:

In direct warping, the yarns are withdrawn from the single-end yarn packages on the creel and directly wound parallel to each other on a slightly wider flanged beam. Direct warping directly produces the weaver's beam in a single operation. This is compatible for strong yarns that do not require sizing. This is also called direct beaming. It also used to make small, intermediate beams called wrapper's beams. These smaller beams are joined later at the slashing stage. This process is called beaming.

Ball Warping:

Ball twisting is for the most part utilized as a part of assembling of denim textures. The warp yarns are twisted on a ball beam as a tow for indigo coloring. After the dyeing procedure, the tow is isolated and twisted on a pillar. This stage is additionally called long chain beaming or re-radiating.

Denim Dyeing:

The pants were delivered out of indigo-colored Denim texture. The exceptional character of this texture, just the warp thread is dyed. The yarns connected for Denim were only created on ring turning machines in previous circumstances. The improvement of OE yarns by applying littler rotors with a turning velocity of up to 200 m/min has prompted the utilization of OE rotor yarns both for twist and weft. The yarns connected for weaving must be of high caliber, a high fiber for quality, normality and also a little piece of short-stapled cotton strands has a place with the essential highlights of the denim yarn. For consistent pants characteristics the twist yarns are spun in a fineness of 50 to 90 tex, for the weft yarn the fineness ranges are for the most part 75 to

120 tex. On the off chance that Denim is made out of Tencel or Modal particularly for pants shirts the finenesses are up to 25 tex.

- ✓ **Slasher Dyeing** is used for **Sheet Denim** production.
- ✓ **Rope Dyeing** is used for **Rope Denim** production.

Slasher Dyeing:

In continuous slasher/sheet dyeing and sizing machine, direct warping beams are used, instead of ball warping logs in case of Indigo rope dyeing system. The Slasher Dyeing machine is capable of handling Ne count from 9/s to 30/s (OE and Slub both). Typical schematic sheet dyeing range is shown in Figure. At the back end of the slasher/sheet dyeing range, the direct warping beams are creeled. The yarns sheet from each beam is pulled over and combined with the yarns from the other beams so that multiple sheets of yarns can be made. When dyeing according to the sheet dyeing method, instead of cables the warp threads are fed to the machine parallel next to each other. These are much smaller compared to the rope dyeing machines. Another advantage is that the cables don't need to be open after dyeing.

Moreover, each yarn wets much faster and in this way reduces the dipping and wetting times during dyeing. All in all, each thread has a larger surface compared to a dyeing cable and this requires somewhat more hydro sulphite to prevent a premature oxidation of the indigo.

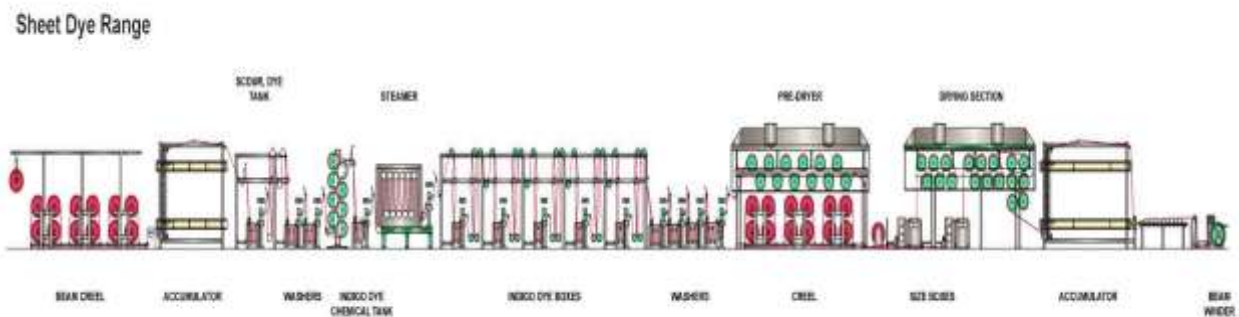


Figure: Sheet Dyeing Range

Rope Denim:

The indigo Rope dyeing technology for denim production is considered a superior dyeing technology, where better uniformity of dyeing is achieved than other Indigo dyeing technologies like slasher dyeing. Indigo rope dyeing was started in USA. Today rope dyeing accounts for a large percentage of warp yarn dyed for denim production. The system offers highest production, due to continuous process, as there is no stoppage for set changes. In this dyeing method, maximum continuity of shades and minimum danger of center to selvage shade variation can be achieved. Flow diagram of rope dyeing is shown in figure. During dyeing process, it forms a coating in the

outer layers of the cotton yarn and fiber. This produces a ring of color around the cotton yarn, with the core remains white core. This dyeing effect is known as ring dyeing.

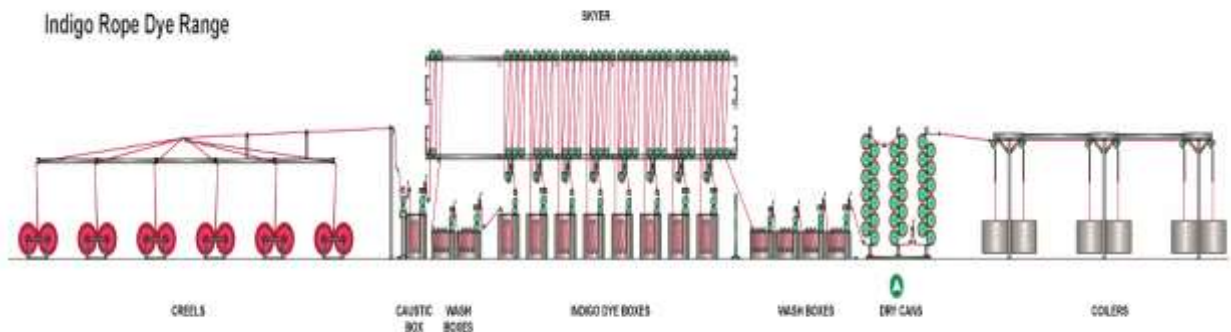


Figure: Rope Dyeing Range

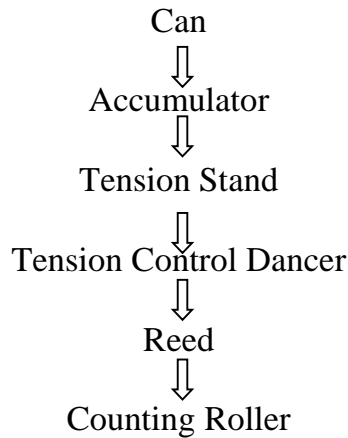
Indigo Rope Dyeing when dyeing according to the rope dyeing or cable dyeing method. 350 - 500 warp threads are bound on the ball warper to very thick cables of 10000 - 15000 m length. On the continuous dyeing installation, 12 to 36 cables are led side by side, wetted, dyed and dried after the dyeing process on cylinders and put into cans. Then the cables are dissolved to warps on the long chain beamer. The warps are added to the sizing machine, sized and then led together to warp depending on the total numbers of threads. In practice, this method has proven to be very good through obtaining an optimum indigo dyeing. However it is important that the cables have a constant tension in order to avoid warp stripes. The disadvantage compared to other methods is that yarn breakages do occur more often.

Long Chain Beamer:

In Long Chain Beamer, the yarn arrangement in the colored rope is change from a rope frame to a sheet shape. In the Long Chain Beamer the rope pull from the can by moving them upward to a managing gadget. The directing gadget is mounted over the can, most likely in the roof. The upward development of the rope enables the ropes to unwind before nearing the beamer head and enable the rope to shake free frame from whatever is left of the rope in the can.

After the rope coloring of twist yarn in denim creation, the following activity is the Long Chain Beamer (LCB). At the point when the rope has been colored and dried in the rope coloring range, it is taken in expansive jars in coiler area. In rope coloring range, if the machine has a limit 24 ropes, at that point there will be 24 isolate coilers which convey 24 ropes in discrete jars. These jars are exchanged to the Long Chain Beaming region. The fundamental reason for long anchor beamer is to open the rope into a sheet type of yarn and wind onto a warper pillar which thusly exchanged to the measuring machine.

Process Flowchart for Long Chain Beamer:



Sizing

The process of applying a protective adhesive coating upon the yarn surface is called sizing. This is the most important operation to attain maximum weaving efficiency specially for blended and filament yarns.

Objects of Sizing:

- ❖ To improve the weave ability of warp yarn.
- ❖ To increase the tensile or breaking strength for cellulose yarn.
- ❖ To maintain good quality fabric.
- ❖ To reduce hairiness, weakness of textile materials.
- ❖ To remove electrolytic formation for synthetic or blended yarn.
- ❖ To increase elasticity.

Techniques of Sizing:

There are several techniques to impart size materials into the yarn. These are:

- ❖ Hot melt sizing
- ❖ Foam sizing
- ❖ High pressure sizing
- ❖ Electrostatic sizing
- ❖ Emulsion sizing
- ❖ Combined sizing
- ❖ Slasher sizing

Types of sizing according to application:

Pure sizing: When sizing is done in yarn which produces unbleached fabric is called pure sizing. So, ingredients are on the weight of yarn 7 to 10%.

Light sizing: This is used for dyeing and printing. 11 to 15% sizing ingredients are used on the weight of yarn.

Medium sizing: For increase of strength and weight of the yarn 16 to 40% sizing ingredients are used on the weight of yarn.

Heavy sizing: It is used to increase the weight of yarn. Above 40% sizing ingredients are used on the weight of yarn.

Warp Breakage in Sizing:

Sizing is called heart of weaving because it increases breaking strength, abrasion resistance, stiffness, elasticity, frictional resistance, yarn diameter and decreases extension, electrostatic charger, hairiness. In spite of huge it's having huge advantages, it causes yarn breakage problem.

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 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.

CHAPTER-3

METHODOLOGY

3.1. Methodology:

Methodology is the systematic, theoretical analysis of the methods applied to a field of study. It comprises the theoretical analysis of the body of methods and principles associated with a branch of knowledge. Typically, it encompasses concepts such as paradigm, theoretical model, phases and quantitative or qualitative techniques.

A methodology does not set out to provide solutions - it is, therefore, not the same as a method. Instead, a methodology offers the theoretical underpinning for understanding which method, set of methods, or best practices can be applied to specific case, for example, to calculate a specific result.

It has been defined also as follows:

- ✓ The analysis of the principles of methods, rules, and postulates employed by a discipline.
- ✓ The systematic study of methods that are, can be, or have been applied within a discipline.
- ✓ The study or description of methods.

3.2. Breakage in Slasher Denim:

In slasher denim production, yarns come individually from the creel of warping section through dyeing and sizing process up to weaving zone. As a result yarn gets lot of stress& tension. So yarn may break. Moreover lots yarn may frequently break due to faulty yarn through the slasher denim production process. For slasher denim production, direct warping is used.

3.2.1. Breakage in Weaving:

In weaving section, we observed there are two types of breakage, one is warp yarn breakage and other is weft in breakage. As two types of yarn breakage, as a result machine is off several times for breakage.

3.2.1.1. Observed Machine Specification of Weaving:

Yarn breakage may vary with respect to different type's machine. Our experiment run on which machine about breakage that machine specification is following-

Table: 1: Observed Machine Specification Weaving.

Brand Name	Picanol
Model	OMP 800
Origin	Belgium
Machine Speed	850 rpm
Reed	Profile Reed
Shedding	Tappet Shedding Mechanism
Air Pressure	9.5bar
Total Relay Valve	14
Number of Heald Shaft	4
Let Off Motion	Electrical
Take Up Motion	Electrical

3.2.1.2. Observed Data from Weaving Section:

We are three member of our group worked at the Weaving floor in the industry to collect data of yarn breakage. At the time of our internship on 06 April, 2017 we ran our experiment. During our observation the machine speed is 20-25 m/min. Those experimental data are given bellow-

Table: 2: Observation of Breakage of Yarn in Weaving Section(sheet denim)

Obs. No.	Yarn Count	Observed Fabric Length	Total Ends	RPM	No. of Warp Breakage	No. of Weft Breakage	Reasons of Yarn Breakage
1	7.2 Ne	550m	4226	600	8	18	<ol style="list-style-type: none"> 1. Excessive machine speed. 2. Damaged yarn in the dyeing or sizing section 3. Weak weft yarn. 4. Excessive air pressure
2	8 Ne	550m	4260	550	13	22	<ol style="list-style-type: none"> 1. Faulty preparation of warp. 2. Repeating warp streaks. 3. Thin place 4. Hard sizing or excessive concentration of sizing. 5. Faults of worker.
3	7 Ne	550m	4226	600	10	10	<ol style="list-style-type: none"> 1. Excessive machine speed. 2. Hard sizing or excessive concentration of sizing. 3. Weak warp yarn. 4. Insufficient care of machine

3.3. Breakage in Rope Denim:

In rope denim production, yarns come independently from the creel of distorting area to the headstock of this same segment. Accordingly, in here yarn breakage probability is much since pressure shifts on singular yarn. From headstock every one of the yarns get together and make rope without turn and after that breeze on pillar. The rope from yarn is goes through coloring area for coloring. In here there is less plausibility of yarn breakage because of yarns pass rope savvy and strain on yarn is by all accounts uniform. At that point the go to LCB segment and again these yarns are injured exclusively on warper beam. In here each cut yarn is repaired or expelled. After that measuring and weaving process is done individually. Again this procedure contains heaps of yarn breakage. For rope denim production, ball warping is used.

3.3.1. Breakage in Weaving:

In weaving, a warp sheet of parallel sized threads is subjected to various complicated stresses such as cyclic tensile stretching, bending, compression and abrasion. The weave ability of a yarn depends on the resistance of yarn to these stresses, which, in turn, is influenced by the grey yarn characteristics and the treatment the yarn receives in the processes subsequent to spinning, particularly sizing. On the basis of yarn breakage in weaving, depends fabric quality and production. Not only warp thread but also weft yarn may break. Weft yarn may be broken due to various reasons such as mechanical defects of the machine parts, excessive air pressure, defective nozzle etc. How much reduce of yarn breakage in weaving, production and fabric quality will increase much as well as save time.

3.3.1.1. Observed Machine Specification of Weaving:

Yarn breakage may vary with respect to different type's machine. Our experiment run on which machine about breakage that machine specification is following-

Table: 3: Observed Machine Specification Weaving.

Brand Name	Picanol
Model	OMP 800
Origin	Belgium
Machine Speed	850 rpm
Reed	Profile Reed
Shedding	Tappet Shedding Mechanism
Air Pressure	9.5bar
Total Relay Valve	14
Number of Heald Shaft	4
Number of Cutter	2
Let Off Motion	Electrical
Take Up Motion	Electrical

3.3.1.2. Observed Data from Weaving Section:

We are three member of our group worked at the Weaving floor in the industry to collect data of yarn breakage. At the time of our internship on 06 April, 2017 we ran our experiment. During our observation the machine speed is 20-25 m/min. Those experimental data are given bellow-

Table: 4: Observation of Breakage of Yarn in Weaving Section (for Rope Dyeing yarn use).

Obs. No.	Yarn Count	Observed Fabric Length	Total Ends	RPM	No. of Warp Breakage	No of Weft Breakage	Reasons of Yarn Breakage
1	7.2 Ne	550m	4226	600	5	11	<ol style="list-style-type: none"> 1. Excessive machine speed. 2. Faulty preparation of warp. 3. Irregular Air Pressure 4. Weak warp yarn. 5. Entanglement
2	8 Ne	550m	4260	500	6	12	<ol style="list-style-type: none"> 1. Repeating warp streaks 2. Faulty preparation of warp. 3. Thin Place 4. Hard sizing or excessive concentration of sizing. 5. Faults of worker.
3	7 Ne	550m	4226	650	8	10	<ol style="list-style-type: none"> 1. Excessive machine speed. 2. Weak warp yarn. 3. Hard sizing or excessive concentration of sizing.

CHAPTER-4

DISCUSSION

4.1. BREAKAGE ANALYSIS IN SLASHER OR SHEET DENIM

4.1.1. Reasons analysis of Yarn Breakage in Weaving Section: (For sheet dyeing)

These faults are frequently occurred but we did not find during our observation. We have talked with machine operator, supervisor, production officer and manager of industry about breaking fault, they told us following faults.

Mechanical Reasons:

- ❖ Defective machine parts
- ❖ Insufficient care of machine
- ❖ Faulty adjustment
- ❖ Faulty setting of backrest according to yarn count
- ❖ Rough surface of drop 21 wire

1

Operational Reasons:

- ❖ Excessive machine speed
- ❖ Improper and uneven tension upon the warp yarn
- ❖ Faulty preparation of warp
- ❖ Repeating warp streaks
- ❖ Bad sizing
- ❖ Crossing of warp ends
- ❖ Bad knotting
- ❖ Thick place & thin place

Others Reasons:

- ❖ Relative humidity
- ❖ Moisture content
- ❖ Faulty warp yarn
- ❖ Due to unskilled worker

4.1.2. Assessments:

- From above table no 15 and 16. We came to know that, all the criteria are same but the yarn breakage rates are different. As it one is from direct dyeing and another is from rope dyeing. So, we can decide that, the breakage rate of direct dyeing is higher than the Rope dyeing. Because the individual yarn tension varies during direct dyeing. But the individual yarn tension of rope dyeing remains same. For this reason the yarn break during weaving is higher than the rope dyeing.
- **Machine Speed Variation.** Variation Machine speed variation is very big effect on yarn breakage in direct warping for denim production .when machine is high, yarn breakage is

more. Its average machine speed is 600-800 rpm to maintain the production of yarn breakage

- **Reasons of Majority Breakage:** Weaving the majority yarn breakage occur due to yarn fault and tension variation. Moreover some problem of process and mechanical faults also responsible for yarn breakage.
- **Average Yarn Breakage Rate:** Average yarn breakage rate during weaving (from above tables) is 12-14 times respect to regular length, number of ends and yarn count.
- **Backrest Roller Setting:** For reasons backrest roller setting the yarn breakage is also ups and down. Yarn the backrest keep parallel for the higher count. But for the lower count backrest keep higher position for making higher tension.
- **Air Pressure:** When the air pressure is high, then it may be broken down.

4.2. BREAKAGE ANALYSIS IN ROPE DENIM

4.2.1. Reasons analysis of Yarn Breakage in Weaving Section: (for rope dyeing)

These faults are frequently occurred but we did not find during our observation. We have talked with machine operator, supervisor, production officer and manager of industry about breaking fault, they told us following faults.

Mechanical Reasons:

- ❖ Defective machine parts
- ❖ Insufficient care of machine
- ❖ Faulty adjustment
- ❖ Faulty setting of backrest according to yarn count
- ❖ Rough surface of drop wire

Operational Reasons:

- ❖ Excessive machine speed
- ❖ Improper and uneven tension upon the warp yarn
- ❖ Faulty preparation of warp
- ❖ Bad sizing

- ❖ Bad knotting
- ❖ Thick place & thin place

Others Reasons:

- ❖ Relative humidity
- ❖ Moisture content
- ❖ Due to unskilled worker

4.2.3 Assessments:

From above table no 15 and 16. We came to know that, all the criteria are same but the yarn breakage rates are different. As it one is from direct dyeing and another is from rope dyeing. So, we can decide that, the breakage rate of direct dyeing is higher than the Rope dyeing. Because the individual yarn tension varies during direct dyeing. But the individual yarn tension of rope dyeing remains same. For this reason the yarn break during weaving is higher than the rope dyeing.

- **Machine Speed Variation:** Variation Machine speed variation is very big effect on yarn breakage in direct warping for denim production .when machine is high, yarn breakage is more. Its average machine speed is 600-800 rpm to maintain the production of yarn breakage
- **Reasons of Majority Breakage: :** The yarn breakage occur due to cut cone, loose yarn, bad knotting, bad Slub, pig tail, entanglement, thin place, tension variation, dust, weak yarn etc. Some mechanical faults are occurs during the yarn breakage
- **Average Yarn Breakage Rate:** Average yarn breakage rate during weaving (from above tables) is 10-12 times respect to regular length, number of ends and yarn count.
- **Backrest Roller Setting:** For reasons backrest roller setting the yarn breakage is also ups and down. Yarn the backrest keeps parallel for the higher count. But for the lower count backrest keep higher position for making higher tension.
- **Air Pressure:** When the air pressure is high, then it may be broken down.

4.3. COMPARISON BETWEEN SHEET DENIM AND ROPE DENIM

Table no: 5: Comparison between sheet and rope denim

NO	Sheet Denim	Rope Denim
1	There are more yarn breakage than rope denim	There are less yarn breakage than sheet denim
2	Low production	High production
3	Less strength	More strength
4	Need less time	Need more time
5	In same time only one beam or sheet can dyed	In same time minimum 24 beam can dyed
6	Mixed yarn cannot dyed	Mixed yarn can dyed easily
7	It may more yarn fault	It has less yarn fault than sheet denim

CHAPTER-5

CONCLUSION

Conclusion:

After complete our thesis we come to know that breakage occurs in sheet dyeing section compare to rope dyeing section. We found out the sheet dyeing breakage rate. It's occurs due to roller pressure, excessive dyeing. In sheet dyeing breakage rate is more compare to rope dyeing. In rope dyeing sizing breakage is less compare to sheet dyeing sizing. We compare sheet dyeing weaving breakage & rope dyeing weaving breakage. Breakage is done due to excessive air pressure, weft breakage; weak yarn, sizing defects etc. When breakage is increase then will increase production cost, production will be hamper. If the fabric quality is decrease then it also takes more time for production. We have to find out some solution of those problems. By this we can also reduce the breakage like faults yarn, loose yarn, reduce impurities, production quality etc. If we can reduce the breakage factory will earn more profit, time will be saved, factory will be improved in market value.

We hope by this way, one day the market of denim in Bangladesh produce denim in lowest rate than any other countries. Because if we can reduce the breakage percentage of yarn than the production cost automatically decreases, then we can deliver denim product in lowest price to the customer.

CHAPTER-6

REFERENCE

- 1) <https://textilestudycenter.com/>
- 2) <http://www.textilestudent.com/>
- 3) <http://www.textilestudent.com/>