Faculty of Engineering

Department of Textile Engineering

Topic/Title: Effect of finishing treatment on the residual change of properties of denim fabric.

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A thesis submitted in partial fulfillment of the requirements for the degree of
Masters of Science in Textile Engineering

Advanced Thesis

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Letter of Approval

November 12, 2020

To

The Head

Department of Textile Engineering

102, Sukrabad, Mirpur Road. Dhaka – 1207

Subject: Approval of Thesis Report of M.Sc. in TE Program.

Dear Sir,

I am just waiting to let you know that this thesis 'Effect of finishing treatment on the residual change of properties of denim fabric' has been prepared bearing ID: 153-32-299 is completed for final evaluation. The whole report is prepared based on proper assessment and investigation. We were directly involved with our work.

Therefore it will be highly appreciated if you kindly accept the Thesis report and considered for final evaluation

Your Sincerely.

Dr. Md. MahbubulHaque

Professor

Department of Textile Engineering

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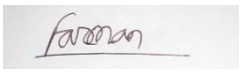
Declaration

I hereby declare that, this project has been done by myself unless otherwise stated in references The Thesis completed under the supervision of **Professor Dr. Md. Mahbubul Haque, and Head, Department of Textile Engineering,** Daffodil International University. I also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree.

Decleared by:



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At first, I express my thanks and gratefulness to almighty Allah for divine blessing makes us possible to complete this thesis with a grand success.

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Finally, I must acknowledge with due respect the constant support of our parents.

Dedication

The study is whole heartedly dedicated to our parents, who have been our source of inspiration and gave us strength when we thought of giving up, who continuously provide their moral, spiritual, emotional and financial support.

And lastly, we dedicated this book to the almighty God, thank you for the guidance, strength, power of mind, protection and skills and for giving us a healthy life. All of these, I offer to you.

Abstract

The work reported in this thesis is shows the importance of finishing treatment carried out with denim fabric. It was observed that after finishing the residual change of fabric properties is minimized to almost acceptable level. This has been assessed by washing both grey and finished fabric samples. The thesis work includes (i) a brief account about the machines used in the finishing department of a denim industry, (ii) the effect of finishing on the various properties of denim fabrics, (iii) effect of wash, weave, thread count etc. on the various fabric properties particularly the shrinkage of denim fabric, finally the (iv) inspection of denim fabric was studied to have idea about faults occurred in denim production. All the works, which included collection processing data at primary level, were carried out in a denim industry in the Gazipur district of Bangladesh. It was observed that finishing has substantial impact of the properties of denim fabrics. When both grey and finished fabric samples were washed and found that finishing has significant effect on the residual change of the properties. This was because after the finishing the fabric becomes more compact as a result washing could not change it too much. At the last stage, 152 fabric rolls (16724 yards) were inspected. Inspection was carried out using 4 point system and grading was done as follows; Up to 20 points/100m = Grade A, between 20-30 points/100m = Grade B, between 30-40 points/100m = C and for more than 40 points/100m was rejected. It was found that among all the faults detected, the loose ends and miss pick were the most predominantfabric fault, while smash, broken pick, slub in the warp were reltively less but also important fault.

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Chapter 1

1. Introduction

Denim is more than just a cotton fabric; it inspires strong opinions within the hearts of historians, designers, teenagers, movie stars, reporters and writers. Interest bordering on passion can be found among textile and costume historians today, especially in the debate over the true origins of denim. In 1969 a writer for American Fabrics magazine declared, “Denim is one of the world’s oldest fabrics, yet it remains eternally young.”
Denim was first made in the 16th Century at a place called Nimes in France. The name ‘denim’ comes from the French words ‘serge de Nimes’ (fabric of Nimes). Around the 1940s denim started to be used in different clothing forms such as wet weather gear and sports clothes. It was not until the 1970s that denim started to become fashionable, particularly with American youth. It is interesting to note that there is some contention about Levi’s and other denim products being cotton; some view the early denim as ‘hemp’

In today’s fashionable era, denim garments is most popular garments in all the age group around the world. Denim garment has a lot of advantages from its buying to wearing. There are so many denim mills in the world which produce the denim fabric and finally it’s converted into denim garments. Those factories have mentioned in this article so that anyone can find those and fulfill their sourcing requirements. “Denim” the term has developed from the city of Nimes in France denim produced for the first ever. From the history it’s known that, in the 19th century heavy cotton fabrics were produced in the Rhone Valley region of France which were known as “Tissue de Nimes” and “Blue de Genes”. Today’s “Denim” and “Jeans” terms derived from those designations.

Denim is a durable cotton twill textile in which the weft passes under two or more warp threads. It is typically used to make jeans, overalls, and other clothing. Denim was traditionally colored blue with indigo dye to make blue "jeans".

Generally denim is a heavy fabric which is made from 100% cotton and woven from coarse indigo dyed warp and grey un-dyed weft yarn. Traditionally produced denim is hard-wearing, high density fabrics containing with a high mass per unit area and 4/1Rsat. 3/1 RHT, 2/1 RHT twill weave construction. Finished fabric has two types- Forward and Reverse. We follow of two types. Sometimes Sattin fabrics forward and reverse finish (Two time finish).

Chapter 2

2. Literature Survey

When I was starting M.Sc then I have got a Denim Factory job. Then I think that, product development strategy of denim fabric a survey is required. Now I am job in a Finishing department. My position is Executive Finishing. I have collect the data is practically, book, journal, internet etc. The internet search is done that most effective. The effect of grey and finished fabric various parameter before is not done. Although before the work was done but it is not correct. Now my work is practical. The below are the article for references

The warp and weft yarn of woven fabric depends on several factors like type of the raw materials, yarn criteria and structure, fabric structure and geometry, conditions during the weaving along with fabric finishing process [1]. Several researchers have done their through work in this area of product development strategy of denim fabrics. Accordingly, some fabric finishing processes that convert the woven or knitted cloth into a usable material and more specifically to any process performed after dyeing the yarn or fabric to improve the look, performance, or "hand" (feel) of the finish textile. Collier 1970 [2]. Postulated the following formula to relate other grey and finished fabric parameter.

$$\{P_2(C_1)^{1/2}+P_1(C_2)^{1/2}\}=es\{D/N_1)^{1/2}+D/N_2)^{1/2}\}$$

Here, P_1 and P_2 is grey and finished fabric width, C_1 and C_2 is warp and weft count. N_1 and N_2 is grey and finished fabric EPI & PPI, D is fabric design, e is denier of threads and s is grey and finished fabric shrinkage. Researchers have found some correlation of grey and finished fabric properties. [3].Gordon, B., Bailey, D.L., et al, mentioned that product development strategy of denim fabric may have some inaccuracy as same is used to test of grey and finished fabric properties. He thought that if a grey and finished fabric different amount of shrinkage change in two fabrics of lab wash.

[4]. According to Greenhalgh, David The grey cloth, woven cotton fabric in its loom-state, not only contains impurities, including warp size, but requires further treatment in order to develop its full textile potential.

[5]. Collier, Ann M Another finishing process is raising. During raising, the fabric surface is treated surface fibers, thereby imparting hairiness, softness and warmth, as in flannelette.

[6].One Denim Mills Limited. One Denim is a small factory. One denim is helped me for practically lab wash data and grey and finished fabric report. Hopefully, grey and finished fabric data is correctly.

[7].Though there are some researches on the grey and finished fabric, there is currently no research about the product development strategy on denim fabric. The present thesis was therefore undertaken to find out new techniques grey and finished fabric parameter change percentage on finishing process.

Chapter 3

3. Experimental results and discussion

Textile Finishing

Textile finishing means, some process which apply on textiles of fabric grey width, finish width, grey pick, finish pick, fabric shrinkage and fabric skew is correct to be test report and its follow the instruction. The aim of textiles finishing is to render textile goods fit for their purpose or end-use.

After all, Fabric shrinkage control and useful to wear apply.

Objects of Finishing

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

To increase service ability and wash fastness.

3.1 Warping

Warping is the parallel winding of yarn from cone or cheese package on to a warp beam. The operation of winding warp yarns onto a beam usually in preparation for slashing, weaving. also called warping.

Beam Warping Machine

The latest beam beam warping machines have a very simple design, which results in higher speed & consequently in output increase.

3.1.1 Main Parts Beam Warping Machine

Figure: 1 direct high speed warping machine

Figure: 2 Direct high speed warping machine

Here, One type of warping machine. This type is direct high speed warping. This brand name is Suker, country of origin Jarmany.

- Creel
- Expanding comb
- Pressure roller
- Beam

3.1.2 Working Principle of Beam Warping Machine

In beam warping, the yarns are withdrawn from the single-end yarn packages on the creel & directly wound on a beam. Direct warping is used in two ways:

- Beam warping can be used to directly produce the weaver's beam in a single operation. This is especially suitable for strong yarns that do not require sizing such as continuous filaments & when the number of warp ends on the warp beam is relatively small. This is also called direct beaming.

- Beam warping is used to make smaller intermediate beams called warper's beams. These smaller beams are combined later at the sizing stage to produce the weaver's beam. This process is called beaming. Therefore, for if the weaver's beam contains 7200 warp ends, hen there would be-say – 12 warper's beams of 600 ends each. If this

weaver's were to be made a one stage, the creel would have to have 7200 yarn packages, which is impossible to manage.

Flow Chart of Warping

Creel
↓
Control system
↓
Reed
↓
Measuring Roller
↓
winding on a roller or beam
↓
Direct Warping

Requirements of Warping

To produce a quality beam suitable for the following must be accomplished:

- The individual ends of the sheet should be spaced uniformly across its full width.
- All the ends in the sheet should be wound at almost uniform tension.
- The density of wound yarn beam should be uniform across the width & from start to end of winding the sheet.
- The yarn breakage during warping should be as minimum as possible.
- Density of the beam should be controlled not by increasing yarn tension but by adjusting the pressure roller on the beam in case of spindle driven beam.
- The yarn should not get damaged during warping; this can happen if the drum surface is not smooth &/or the parts in the yarn path have cut marks.
- The yarn sheet or the beam should not have faults, such as missing ends, cross ends, slack ends, fluff or wild yarn, high variation in tension between ends, damaged flanges etc. that will cause end break or defects at subsequent process.
- Warping should not impair the physical & mechanical properties of the yarn.
- The production rate of warping should be as high as possible.
- A predetermined warping length should be observed.

3.1.3 Faults of Warping

- Warp off center of the beam
- uneven warp beam
- Cress ends
- Snarl is the warp
- Missing ends
- Unequal length of warp
- Hard beam
- Unequal size or weight of package

3.1.4 Types of Warping

1. Sectional or Pattern Warping (conical drum or dresser warping).
2. High speed/ Beam/ Direct Warping (preparatory beam warping).

Sectional or Pattern Warping

In sectional warping sections are made sequentially and because of this the process is rather slow ;it is the practice therefore to produce no more than is required to fill a single weavers beam. The result is that the sectional warping is used mainly for short runs or for complex color patterns. Features of sectional warping. To produce Fancy fabric (stripe/Check)To produce weavers beam from yarns which does not required any sizing material to be applied before weaving. To produce weavers beam of small amount of warp yarn. At first wound section by selection and final weavers beam produce immediately after warping. Production is less, so costly process. A tapered beam or drum is used. [8]

Figure 3: Sectional or Pattern warping

High speed/ Beam/ direct warping

Denotes the transference of yarns from single-end yarn packages, wound packages, directly to a beam in a one step process. This means that there are an equal number of packages in the creel area as there are ends on the beam, except in the case of a magazine creel. A magazine creel connects the tail of one wound package to the beginning of a new wound package for an easy package transfer. From the wound packages in the creel.

Figure: 4 direct high sped warping

Feature of direct warping

- To produce common fabrics in large qualities.
- To produce weavers beam from single yarn.
- For high speed production.
- Weavers beam is produced after sizing.
- A simple flange beam is used.

To produce weavers beam from large amount of yarn

Flow Chart of High Speed Warping

Creel
↓
Beam for sizing
↓
Weaver's Beam

Features of High Speed Warping

- It is used to make common fabrics in large quantities
- It is used to produce weavers beam from single yarn
- The production is high
- Large amount of yarn is required to produce a weavers beam
- Sizing is done
- Simple flanged beam is used and drums are not required

Sectional Warping

In sectional warping equal length of yarn is first wound in small sections or sheets on a drum. Then from the drum it is transferred to the beam. By this process we directly get the weavers beam. This is a two stage method and is used for making fancy fabrics.

Flow Chart of Sectional Warping

Creel
↓
Drum
↓
Beam (Weaver's Beam)

Working Principle of Sectional Warping:

- Sectional warping is used for short runs especially for fancy pattern fabrics.
- In this case sections of the warp which may contain up to 600 ends are first wound onto a drum tapered with a given cone angle.
- So cross wound sections are combined on the drum & thus each layer of warp contains the same number of ends on the drum.
- Then the warp threads altogether are transferred onto a weavers beam by unwinding the drum.
- In this method the warp threads are not necessarily processed in sizing.

Features of Sectional Warping

- This is suitable for making checked, stripped or other fancy fabric.
- We directly obtain weaver's beam from this process
- As sizing is not done, so multi-ply yarns or yarns which do not require sizing are used
- Small amount of yarn is required to produce the weaver's beam
- Sectional warping is used to produce a warp beam with a greater member if ends
- The production is less in sectional warping
- The yarn tension is less uniform
- It is less efficient than high speed warping

3.1.5 Differences between Sectional and High Speed Warping

High Speed Warping	Sectional Warping
1. Beam warping is used for long runs of grey fabrics & simple pattern.	1. Sectional warping is used for short runs especially for fancy pattern fabrics.
2. The amount of colored yarn is less than 15% of the total.	2. Greater amount of colored yarn is used.
3. High production.	3. Low production.
4. Large amount of yarn required.	4. Small amount of yarn required.
5. Single yarn is used.	5. Twisted yarn is used.
6. Less expensive.	6. More expensive.
7. It is most widely used for cotton, linen, woolen & worsted yarn.	7. It is most widely used for silk & synthetic yarn.
8. Uniform tension of yarn.	8. Less uniform tension of yarn.
9. Weavers beam is produced after sizing.	9. Weavers beam is produced after warping.
10. Creel capacity is more.	10. Creel capacity is less.
11. Beam warping is more widely used.	11. Sectional warping is not widely used.

3.1.6 Defects & Remedies of Warping

1. Lapped end

Cause:
The broken end of yarn is not tied to the end on the warp beam & overlaps the adjoining yarn. The beam is not properly brake & the signal hook fails to operate.

Remedies:

- Tying the broken end to the end on the warp beam.
- Proper signal hook.

2. Piecing

Cause:
One broken end is pieced to another yarn end on the warping beam.

Remedies:

- By proper joining.

3. Soft ends on the warping beam

Cause:
Breakage of a group of ends & piecing them in bundle or by lapping. This defect is caused by the careless of the operator.

Remedies:

- Careful operation.
- Broken end should be piece up properly.

4. Incorrect form of build

Cause:
Caused by non uniform spreading of ends in the guide reed & its improper setting & conical winding in case of none uniform pressure of the warping beam.

Remedies:

- Uniform spreading of ends.
- Appropriate setting.

5. Slacks & irregular yarn tension

Cause:
It happens due to any one 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.

Remedies:

- Proper threading of tension device.
- Good quality of tension device.

6. Broken ends on the beam

Cause:
A group of ends is broken & tied as a brunch or worked-in with overlapping.

Remedies:

- Broken ends should be removed.

7. Conical winding on the beam

Cause:
It occurs due to incorrect load applied by the pressure roller.

Remedies:

- Correct load applied.

8. Improper length of warping

Cause:
It is due to malfunction of the counter & the brakes of the measuring device & warp beams.

Remedies:

- Good measuring device.

3.1.7 How to Improve Beam Warping Process

Beam warping process is the most progressive process ensuring a high quality of produced warps & high efficiency. In cotton weaving, beam warping is mostly used.

- Better uniformity in the tension of individual yarns is the provision of adjusting the tension of separate groups of warp yarns over the height of the warping creel.
- Enlarging the mass of bobbins & warping beam winding.
- Increased number of bobbins when warping yarn of low linear density & a greater number of yarns in the warp.
- Improved shape of winding on the warping beams & uniformity of the specific density of winding.
- Higher accuracy in warp measuring & reduction of wastes caused by irregular unwinding of warps from the beams at sizing.
- Compensation of warp tension at starting & stopping of the machine & slow running at starting a new warping beam.

Increase of labor productivity in warping by partial or full automation of bobbin change

3.2 Dyeing

Dyeing is process in which textile substrate is colored by suitable substances that is dyes or pigment (pigment dyeing). The former is widely used in textile wet processing. A basic knowledge of dyeing process and related terms are quite important to understand dyeing theory. Dyeing can be done at any stage of the manufacturing of textile- fiber, yarn, fabric or a finished textile product including garments and apparels. Textile materials can be dyed using batch, continuous or semi-continuous processes. The type of process used depends on several things including type of material (fiber, yarn, fabric, fabric construction, and garment), generic type of fiber, size of dye lots and quality requirements in the dyed fabric. [6]

Dyeing Process

Figure: 5 Slasher dyeing machine

Here, this is slaser dyeing machine. Above this picture is dyeing process. Creel, let off regulator, dye bath, wash bath, dryer cylender, size box, accumolator and headstock.

3.2.1 Lot wise dyeing & sizing costing report

Production Date:					
Lot No.2827	Order No.18/3836-5	TE:4520	**Customer: ADL (18125-3)**		
Count: 10 r	Color: Indigo	Shade: 8 g/l wetting + indigo 1.08%			
Length in meter	21000	Weight in kg	5605.52		
Dyeing					
Chemical	**Rate**	**Consumed**	**Cost**	**Cost / mt (Tk)**	**Cost / Kg (Tk)**
Indigo	800	61.00	48800.00	2.72	8.71
Hydro	178	116.78	20786.84	0.99	3.71
Caustic	67	106.73	7083.91	0.34	1.26
Marla	278	38.22	10625.16	0.51	1.90
Lufibrol Chelant	625	0.61	381.25	0.02	0.07
Setamol WS	405	2.44	988.20	0.05	0.18
Apsul Black	145	0.00	0.00	0.00	0.00
Sulphur Black	350	0	0.00	0.00	0.00
Sodium Sulphide	87	0.00	0.00	0.00	0.00
Hydrogen per oxide	39	0	0.00	0.00	0.00
Acitic Acid	165	0	0.00	0.00	0.00
Diresul Oxidant	335	0	0.00	0.00	0.00
Sub Total			**88665.36**	**4.22**	**15.82**
Sizing					
Swispol	125	0.00	0.00	0.00	0.00
MS (Orchid)	100	0.00	0.00	0.00	0.00
Apple	64	0.00	0.00	0.00	0.00
MS (Aryanol KC)	100	413.70	41370.00	1.97	7.38
Sizabond TH	250	60.68	15169.35	0.72	2.71
Size PCB	80	0.00	0.00	0.00	0.00
Aryanol HF	200	0.00	0.00	0.00	0.00
Wax	220	16.55	3640.65	0.17	0.65
Sub Total			**60180.00**	**2.87**	**10.74**
Total			**148845.36**	**7.09**	**26.55**

3.2.2 Details of dyes and Chemical

Indigo: one kind of dyes chemical. It is vat dye. It is Insoluble

Hydro: It is Redusing agent. To remove insoluble, so it is use soluble.

Caustic: To Control alkalimity.

Marla: It is weatting agent. To use defoaming agent.

Lufibrol chelant: It is sequestering agent. If water Hardness / alkalimity to removed this.

Setamol WS: It is dispersing agent. It helps good mixing of dyeing molecule.

Apsul Black: It is Liquid black color.

Sulphur Black: It is powder black

Sodium suiphide: Black color soluble increase

Hydrogen per oxide: It is use hot wash and control PH

Acitic Acid: It is control PH.

Dirsul Oxidant: It is use oxidation. It is one kind of weating agent.

Sizing Chemical properties:

Swispol: It is modified starch.It has a good property of all sizing chemical. It is costly

MS (Orchid): It is modified starch.It has a good property of all sizing chemical. It is costly

Apple: It is native starch.

MS (AryanolKC**):**It is modified starch. It has good properties of all sizing chemical. It is costly

Sizabond TH: It is modified starch.It has good properties of all sizing chemical. It is costly

Size PCB: it is liquid agent. Is has more viscosity. It is different yarn to yarn.

Aryanol HF: It is modified starch.It has a good property of all sizing chemical. It is costly

Wax: It is Softening agent. It is work in the yarn all time soft.

3.3 Weaving

Grey Yarn on Cones

Normally yarns received for weaving in cone forms are either from ring spinning or from open end spinning in single or double fold as required. For weaving, yarn used is categorized into:

- Warp yarn
- Weft yarn

Normally for Weaving, yarn used as warp should be sufficiently strong to withstand stress and strains exerted during weaving operations. Hence they are having Count Strength Product (CSP) and further sized to increase its strength. The weft yarn is directly used on weaving machines and in some cases, if required, is rewound also so as to enhance its performance in weaving.

Sizing of yarn in Set/ Beam to Beam Position

The object of Sizing is to improve the strength of yarn by chemically binding the fibres with each other and also improve upon its friction resistance capacity by chemically coating the surface of yarn/fibres. Further, number of threads in warpers beam sheet is very less against number of threads required in whole width of fabric. Hence multiplication of sheets by drawing yarns together from many warp beams and again making one sheet is also performed on sizing machine. On sizing, normally, 8-12 % size material on warp thread is applied. This improvement in strength and frictional resistance characteristic of warp yarn is essential because during weaving, yarn has to undergo severe strain & stress as well as frictional operations.

Drawing–in

Weaving is basically interlacements of two sets i.e. warp and weft threads in desired sequence and pattern. To obtain this interlacement, warp yarn sheet is bifurcated & opened in the form of two layers/ sheet and weft thread is inserted between so opened two warp sheets. This operation is called shedding. to perform shedding the warp yarn needs to be passed through heald eyes of the heald shafts, this operation is called as drawing-in.

Beam Gaiting or Knotting on Loom

The drawn weavers beams are fixed on weaving machines, threads are tied and heald shafts are coupled. This operation is called Beam Gaiting. If undrawn warp threads are directly

knotted to the threads of finished beams, it is called Knotting. These operations are essential because normally weavers beam can carry only certain length of warp sheet on it and when so woven, whole length is converted to the fabric by weaving machine. Further warp length is required to be fed which can be done by knotting or gaiting other beams on weaving machine.

Weaving

As stated earlier, weaving is interlacing two sets of yarn and making fabric. One set is called warp thread which is in sheet form, the other one is called weft thread which is inserted between two layers of warp sheet by means of a suitable carrier i.e. Shuttle, Projectile, Rapier, Air current, Water current, etc. Depending upon the type of the weaving machines. The different types of technologies available for weaving machines are briefly explained as below:

- Conventional Shuttle Weaving System by Ordinary Looms or Automatic Looms.
- Shuttle less Weaving System by Air jet/Water jet/Rapier/Projectile

Shuttle loom is a conventional Technology with much less production on account of slow speed and excessive wear and tear of machinery. This shuttle loom technology has now become obsolete. Denim is woven through Shuttle less Weaving System by using 96 ZAX-e Type Tsodakoma Corporation's Air jet looms or rapier looms or projectile looms. These looms are distinguished by weft insertion method, which is briefly discussed hereunder.

Air jet Looms

These types of looms adopt the latest development in Weaving Technology where weft insertion is done with the help of compressed air. A very high weft insertion rate up to 1800 meter per minute is achieved. Compared to rapier and projectile looms, these looms are less versatile but are economical and are used in mass textile production unit like denim. [7]

3.3.1 Details of loom

The process of interlacing two sets of yarns namely warp and weft, at right angle to make a fabric, according to design.

Our denim factory has 70 looms. 35 Airjet and 35 Rapiers

Figure 6: An air jet looms in the shed.

Air jet Loom

Model: Omniplus 800
Brand Name: Picanol
Country of origin: Belgium
Machine speed: Maximum 850 r.p.m

Figure 7: Rapier looms in shed

Rapier Loom
Model: Gummax
Brand name: Picanol
Country of origin: Belgium
Machine speed: Maximum 600 r.p.m

3.3.2 Warp and Weft Consumption

Warp Consumption / yds

$$= \frac{\text{Total Ends}}{840\times \text{Warp Count}\times 2.206} + (\text{wastage\%} + \text{crimp\%})$$

$$= \frac{5600}{840 \times 14 \times 2.2046} + (5\% + 10\%)$$

=0.22 kg/yds + 0.033

= 0.26 kg/yds

Here,

Total Ends= 5600

EPI= Ends Per Inches (72 Inches)

PPI=58

Fabric width = 69 Inches

Warp count=14 OE

Weft Count=150+40D

Crimp = 10%

Wastage=5%

Unit = 840 yards

Reed=931/4

Weft Consumption

$$= \frac{\text{Pick space or Reed space} \times \text{Machine Pick}}{840 \times (\text{Weft Count})} \times (\text{wastage\%}+\text{crimp\%})$$

$$= \frac{82{,}5 \times 58}{840 \times 36 \times 2.2046} \times (5\%+10\%)$$

= **0.08**×0.15

= **0.012 kg/yds**

Here,

Fabric width = 69 Inches+2+4=75+7.5=82.5 Inches(weft yarn)

Machine Pick = 58

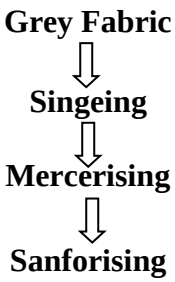
Unit = 840 yards

3.3.3 Textile Finishing

In textile manufacturing, finishing refers to the processes that convert the woven or knitted cloth into a usable material and more specifically to any process performed after dyeing the yarn or fabric to improve the look, performance, or "hand" (feel) of the finish textile or clothing. The precise meaning depends on context.

Basically according to my idea, Finishing is a suitable for wear.

Finishing processing



Grey fabric
Grey fabric comes from weaving section this fabric has a roll. Then the roll fabric loading in the finishing machine.

Singeing
This singeing is a gas singeing. This singeing removed fabric surface neps, hearing fiber and fabric surface smooth.

.

Mercerising
Mercerising is applied on cotton based fabric. Mercerising is improved on fabric lustre, strength and dye affinity.

Sanforising
Sanforising is the main part of finishing. Here, this part has, Infeed, chemical bath, padder, skew setting, dryer, rubber belt, felt calendar, cooling cylinder and finished fabric output.

Here, Infeed the fabric loose, tight control.

Chemical bath I used water, softening or brightening agent on fabric.
Padder roller is pressure of fabrics squizing to remove of water.

Skew setting is depended on according to fabric design. Skew more than (+), skew less than (-). It is depended on buyer requirement.

Dryer temperature 100-125° c. This temperature is depended on fabric quality. Here this control board, I controlled temperature and moisture. Moisture more than fabric output is wet, moisture less than fabric output is wrinkle. So, it is I controlled it.

Rubber belt is control the fabric shrinkage. This shrinkage is processing of rubber belt heat, pressure, tension and fabric quality wise shrinkage control. This rubber belt is the main part of fabric shrinkage control. Local fabric shrinkage is applying on fabric 8-11.5%.

Felt calendar is process of fabric ironing. Increase good outlook, good appearance of finished fabric.

At last, finished fabric output in trolley.

Then the finished fabric inspection and fabric roll packing.

3.4 Machine Parameter of Finishing

Table: 3.1 Shift: A

Customer	Al-Noor
Lot No.	16-3009
Construction	(94×65)/ (14 OE×150+40D)
Quality Code	
Grey Width	69″
Design	3/1 R.H.T
Color	SBIT

Grey wash Report	
Warp shr%	12 – 12.5 %
Weft shr%	30 – 32 %
Quality code	
Width A/W	45.5″– 46.5″
Skew%	3.5%
GSM	10.87 oz

SL	First Time	
1.	M/c Speed	25m/min
2.	Finish Type	Forward
3.	Sinzing	8.0 bar
4.	Infeed Tension	-2.0
5.	Padder Tension	0.0
6.	Padder pressure	3.5
7.	Skew Distance	20+ CM
8.	Dancing-1	6.0 bar
9.	Dancing-2	3.5 bar
10.	Dryer temp bar/gun	110°c
11.	R/B temp bar/gun	2.2 bar
12.	Felt temp bar /gun	4.0 bar
13.	Felt tension	5.5 bar
14.	Moisture	14 %
15.	Trim%	-10 %
16.	Warp shr%	15 %
17.	Weft shr%	16 %
18.	Finish Width	57.5″ -58″
19.	GSM $(yds)^2$	
20.	Chemical GPL	Water
21.	Chemical Temp	Normal

SL	Second Time	
1.	M/c Speed	27 m/min
2.	Finish Type	Reverse
3.	Sinzing	No
4.	Infeed Tension	-8.6
5.	Padder Tension	0.0
6.	Padder pressure	3.4
7.	Skew Distance	0.0
8.	Dancing-1	6 bar
9.	Dancing-2	3.5 bar
10.	Dryer temp bar/gun	110°c
11.	R/B temp bar/gun	2.2 bar
12.	Felt temp bar /gun	4.0 bar
13.	Felt tension	5.5 bar
14.	Moisture	12%
15.	Trim%	-8 %
16.	Warp shr%	
17.	Weft shr%	-20 %
18.	Finish Width	55 – 55.5″
19.	GSM $(yds)^2$	
20.	Chemical GPL	Water
21.	Chemical Temp	Normal

Finish wash Report	
Number of Finish	2 Time
Warp shr%	-3.5 %
Weft shr%	-13 %
Skew	3.5%

Signature

3.4.1 Machine Parameter parts

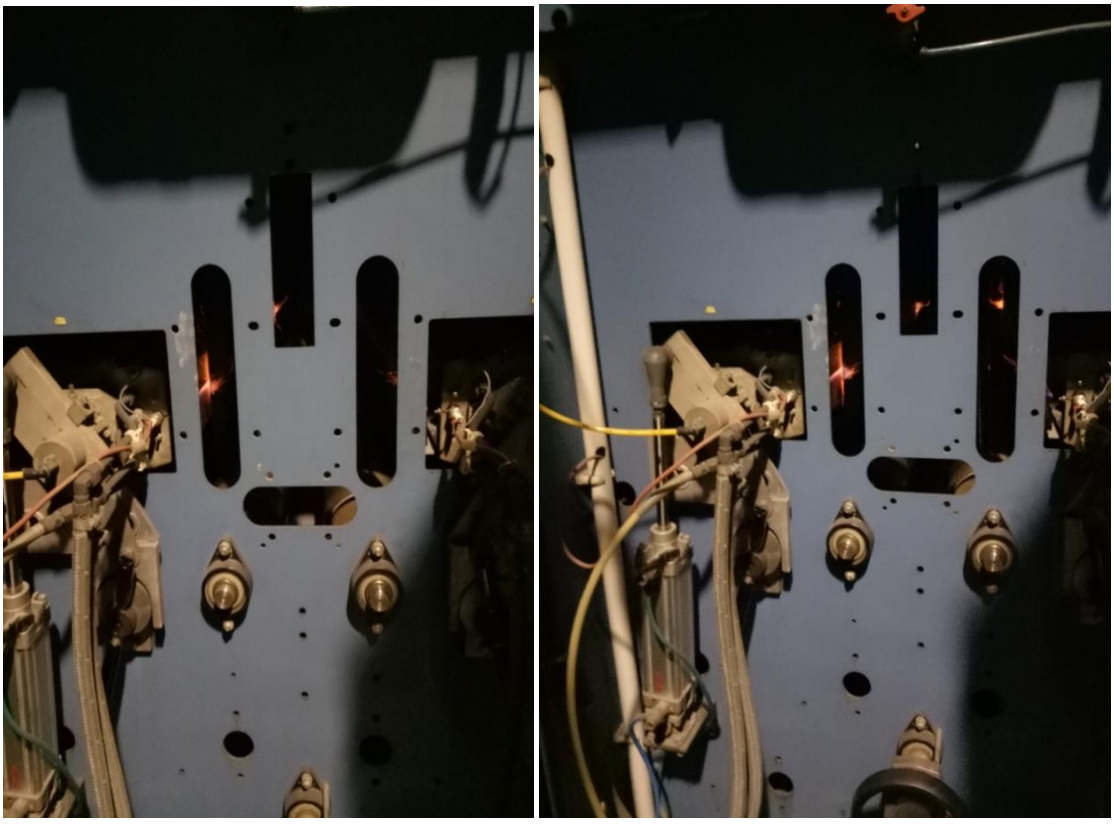


Figure 8: Singeing part

This is sinzing part. Sinzing flame 8.0 bar, sinzing distance 20 mm. If the full part machine running then sinzing speed and machine speed is same, but sometimes just grey fabric sinzing here sinzing speed is up and down. Maximum sinzing speed 78 m/min. [4]

3.4.2 Infeed tension & Padder tension

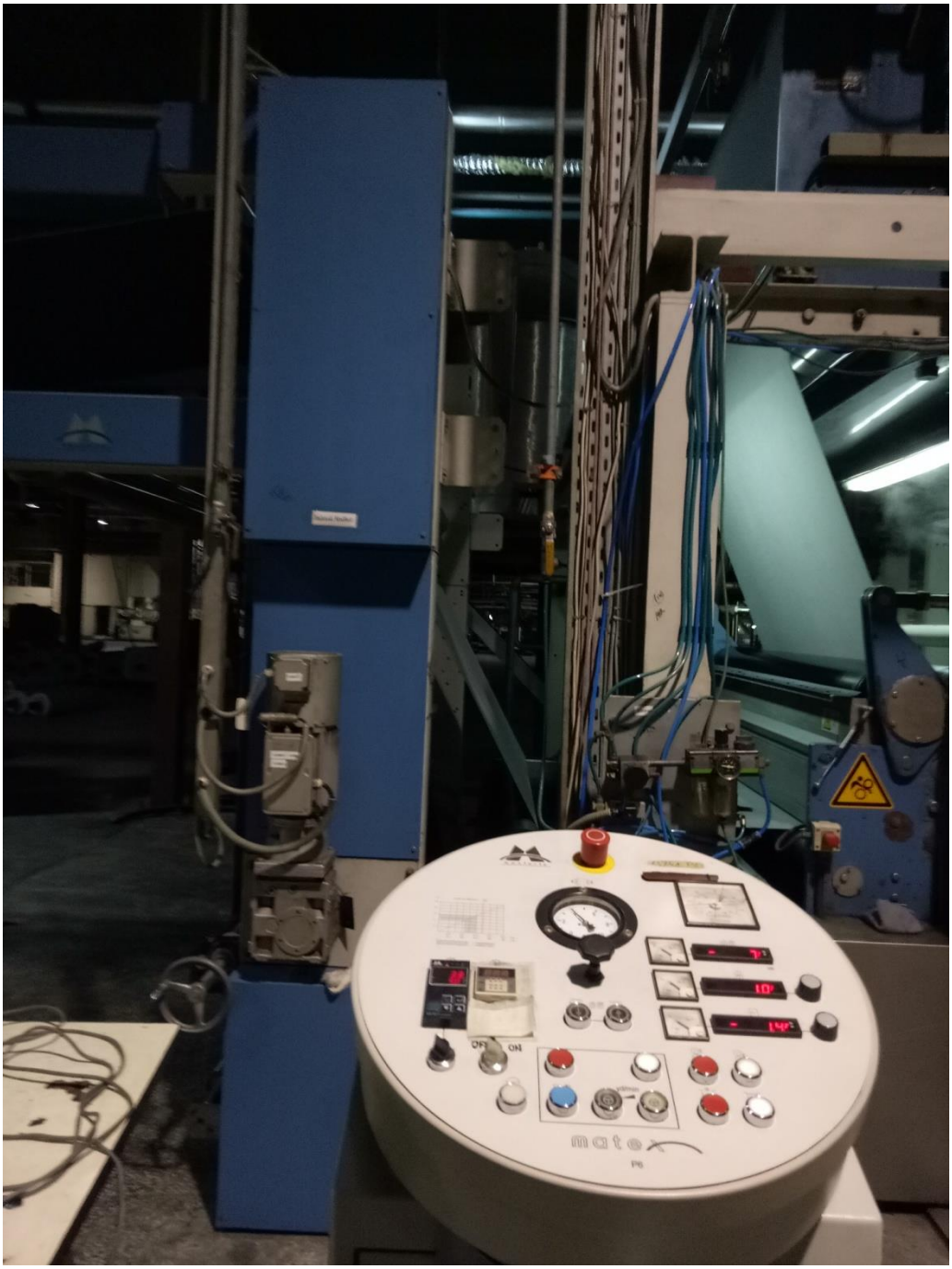


Figure 9: Infeed part

This is infeed & pdder tension control board. Here, I can infeed, padder, skew and machine speed control.

3.4.3 Chemical Bath

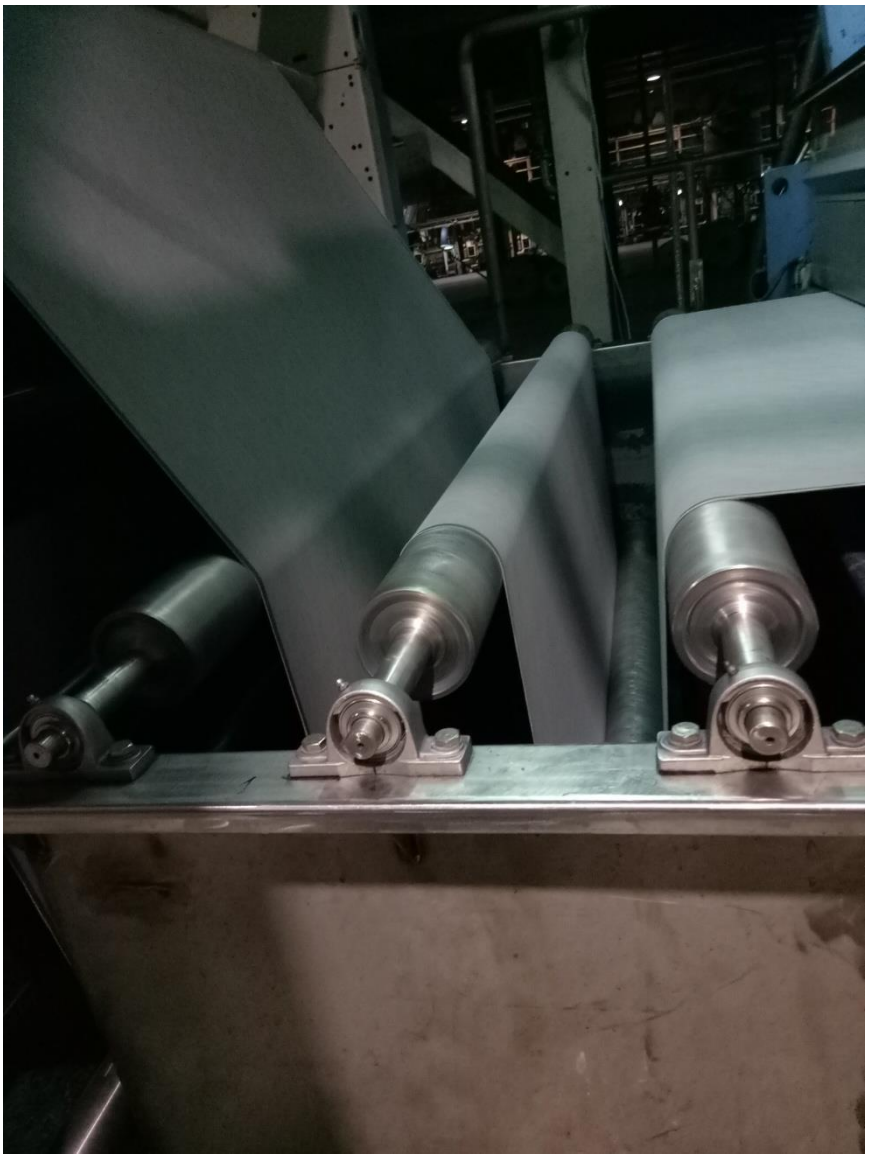


Figure 10: Chemical bath

Here, this is chemical bath. We can use chemical of finishing process. We use different types of chemical. They are – softening and brightening agent. Softening and brightening is doing fabric soft and brighter. Softening and brightening agent we use according to buyer requirement. We can use chemical bath temperature 60-80°c.

Softening agent: Etasoft, Texosoft, perapreat

Brightening agent: Bittex ox (BYB)

3.4.4 Skew distance

Figure 11: Skew part

Here, The Machine upside skew roller skews scale setting. According to fabric design I skew setting from control board. Skew scale indicate number 0-100 (+) or 0-100 (-). If fabric skew is less then skew scale is up (+) and fabric skew is more, then skew scale is down (-).

3.4.5 Dancing 1 & 2

Figure 12: Dancing part

Here, I can see dancing 1 & Dancing 2. I can set the fabric tension of fabric quality. Finished fabric width is depended of fabric tension.

3.4.6 Dryer

Figure 13: Dryer part

Here, this is twelve dryer. Maximum Dryer temperature is 120-130 ° c. The dryer is continuing steam.

3.4.7 Rubber belt

Figure 14: Rubber belt

Here, this is rubber belt and machine control board. From the control board I control Machine speed, fabric shrinkage, moisture and dryer temperature all setting. This is the main part of finishing. If moisture is 14% fabric process is right, then moisture is 14% more then I have seen wrinkle. Wrinkle is one time is finishing fault, and then I quickly control moisture.

If moisture is 14% less then I have seen fabric wet. However, fabric finished is not wet. It is doing all time soft and dry. Then quickly moisture control and 14% to increase then after few times moisture control and good fabric finished.

3.4.8 Felt calendar

Figure 15: Felt calender

Here, this is felt calendar. Here the fabric is calendar process. I follow good quality and good operate is continue.

3.4.9 Fabric output in trolley

Figure 16: Finished fabric output

Here, the last part of finishing. The fabric folding roller output on the trolley. Here I can see the meter. The fabric measure output how many yards of fabric.

3.5 Finishing Machine Introducing

Figure17: over view of finishing machine

Machine name: Finishing Machine

Brand Name: Monforts

Country of Origin: Jarmany

Machine Speed: 50 m/min (we driving speed average 35 m/min)

A. Monforts Textilmaschinen GmbH & Co. KG
Blumenberger Strasse 143-145
D-41061 Mönchengladbach
Telefon: +49 - (0) - 21 61-401-0
Telefax: +49 - (0) - 21 61-401-498
Internet: www.monforts.de
email: info@monforts.de
PUBLISHED BY MONFORTS MARKETING GROUP

3.6 Fabric Finishing Processing

At first fabric loading in a finishing machine, then fabric brushing and fabric accumulator in j box. Then the fabric passing the Gaiderin singing section. In singing section the gas burner remove neps, hairing fiber etc. Then the fabric again the brushing in folding section and dancing roller passing the Gaider in come from Infeed section.Infeed section working in control fabric loose and tight. Then the fabrics enter Chemical bath. This bath use chemical, water and Temperature. Then the fabric padder roller and weft stretching, Dancing 1 Padder roller working squising out of water and Weft stretching working less the fabric width and the fabric passing the Gaider and enter in the Drying Cylinder. Drying Cylinder working the fabric drying and maintain the temperature (100-130°c), control moisture. It is very important of moisture. We control moisture according to fabric construction. Every time we follow it. If we are not control of moisture then has wrinkle (Wrinkle is finishing fault) the fabric passing again dancing roller. Dancing roller 2 again work" the control fabric width and speed". Then the fabrics enter the Rubber belt. Rubber belt working Control the fabric Shrinkage. Then the fabrics enter in the felt calendar. Felt calendar working the fabric calendaring. And finally the fabric output in Trolley. [5]

It is the fabric finishing processing.

Figure 18: Brushing 1, J box and singeing

Brushing 1, J box and singeing

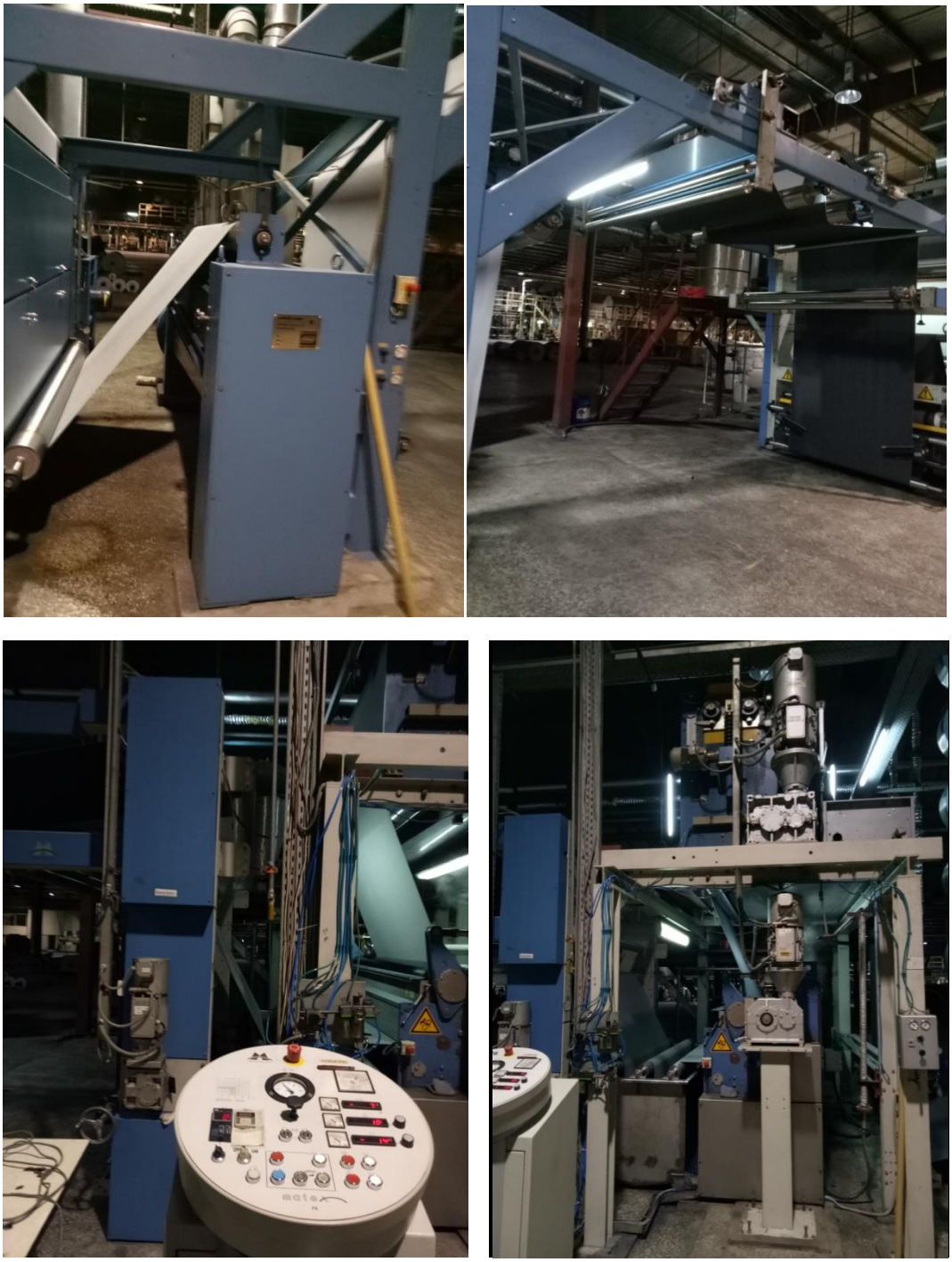


Figure 19: Brushing 2, folding, infeed, chemical box, padder & weft streatching

Brushing 2, Folding, Infeed, Chemical Box, Padder and weft streatching

Figure 20: Dryer

Dancing1, Gaider, Dryer cylinder and Dancing 2

Figure 21: sanforising

Rubber belt, Felt Calender, cooling cylinder and finished fabric output in trolley.

3.6.1 Checking of quality on Grey and Finished fabric

At first, the grey fabric lab wash then I see the lab wash report. The lab wash report details fabric width, EPI, PPI, Weight, skew, bowing, shrinkage I follow the report then I decision of some finished fabric. After finished fabric again lab wash, then I check finished fabric report. The Finished report is according to the grey report is same. Then I decided the fabric finished.

Figure 22: Grey & Finished Washing Machine

3.6.2 Physical Inspection

Figure 23: Grey fabric width and grey pick check

Grey width and Grey pick Measurement.

Here,

The fabric grey width = 64.7 Inch

The fabric grey pick per Inch (PPI) = 62.8 Inch

Figure 24: Finished width and finished pick check

Here,

Finish Fabric Width =62.5, 62

Finish pick per inch = 61.5

Finished skew

Finished skew Measure is as like as half yards cutting of finished fabric and fabric turning it is measured by measuring tape of fabric distance/angle (I get measure 3cm). This distance is finished skew.

It is depending on according to the fabric design I am setting skew.

Figure 25: Skew check

Here,

Finished Fabric skew = 3cm

Skew calculation:

= 3÷2.54

= 1.18

= 1.18×100

= 118÷61.5

= 1.92%

Here,

1 cm = 2.54 inch

100= percentage

61.5= Finished fabric width

Finished bowing

Finished fabric Bowing is 0% or 0.5%. Actually all finished fabric bowing are same. Sometimes according to fabric construction this bowing value is greater or less. So, every time fabric trolley I check this bowing.

Figure 26: bowing check

Fabric output in trolley

Figure 27: Finished fabric output

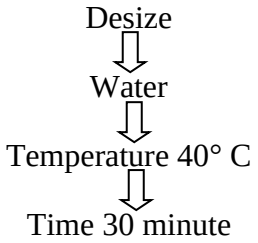
3.6.3 Chemical Inspection

1. for normal wash

Fabric
⇩
Water (135 liter 3 or 4 fabric)
⇩
Desize 150 gram
⇩
Temperature 60° C
⇩
Time 30 minute

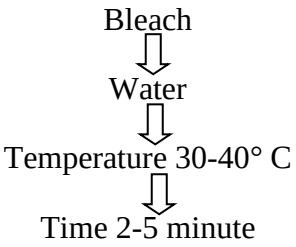
The fabrics in washing machine with 130- 135 liter water the fabric desize in 60° C temperature with 30 minute time continue the process.

2. Enzyme wash



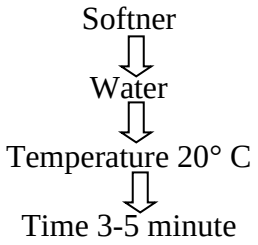
The fabrics in washing machine with water the fabric desize in 40° C temperature with 30 minute time continue the process.

3. Bleach wash



The fabrics in washing machine Bleach with water the fabrics in 30-40° C temperature with 2-5 minute time continue the process.

4. Softner wash



The fabrics in washing machine Softner with water the fabrics in 20° C temperature with 3-5 minute time continue the process.

5. Hydro process squize of the fabric maximum time 1-2 minute. It is depended on the fabric quality.

Figure: 28 Hydro processes

6. Dryer it is work of dry fabric. The dry processing maximum time 30 minute. It is depended on fabric quality.

Figure 29: Dryer processing

7. Conditioning on the floor of the fabric 20-30 minute.

Figure 30: After conditioning

3.6.4 Finished fabric types

Finished fabric two types:

1. Forward Finished

2. Reverse finished

Forward Finished

Forward finished is fabric back part is up fabric finishing process it is called forward finished. (See figure 17)

Reverse finished

Reverse finished is fabric front part is up fabric finishing process it is called Reverse finished. (See figure 24)

Finished fabric fault

Finished fabric fault different types

1. Wrinkle
2. Crease Mark
3. Fabric weaby
4. Machine stop fault

3.7 Experiment of data

The whole study done at Effect of finishing treatment on the residual change of properties of denim fabric**,** I have collected practical data from denim factory. The practical data is actual. Now, I am how done grey and finished fabric parameter change I will details described below

At First, grey fabric wash report; I am see follow the report then I will applied the finished fabric process. Here this finishing process we control machine speed, singeing, skew, chemical bath, dryer temperature, shrinkage, moisture, pressure, tension, steam, water. Then again finish fabric wash report and I will follow the report, the report according to buyer requirement is same the report is ok. If not same then the machine speed, tension I will greater or less and change machine parameter. I follow this instruction of fabric finishing process.

3.8 Effect of Finishing on Grey and Finished fabric properties

Table 3.4 I have discussed grey and finished properties. It is depended on fabric construction. Fabric construction same but fabric shrinkage is different. It is different of fabric properties of before and after lab wash.

3.9 Measurement of width

Table 3.5 I have discussed measurement of width. here fabric before and after wash so it is change of fabric properties. if fabric width of lycra fabric then fabric shrinkage is more and without lycra fabric then fabric shrinkage is less.

3.10 Measurement of weave

Table 3.6, it is depended on fabric weave. Fabric weave is same but others parameter is different. This table have Weave 4/1 Right Satin, 3/1 Right Hand Twill, 3/1 Left Hand Twill and 2/1 Right Hand Twill. Here, four qualities of fabric weave. So, fabric weave is same, others parameter is Different. We follow this data, it is apply finishing process.

3.11 Measurement of color

Table 3.7, I have discussed the effect of color. Here, five qualities of color. They are: SBIT (Sulpher Bottoming Indigo Topping), IBST (Indigo Bottoming sulpher Topping), indigo, Topping and Blue Black. Here, this parameter is depended on fabric Color. So, Color is same, but others parameter is different. Many colors uses in Denim factory.

3.12 Measurement of count

Table 3.8, I have discussed warp and weft count. This table has five qualities of warp count and four qualities of weft count. They are: Warp Count: 30/2, 14 OE (Opening), 90 OE (Opening), 10 OE (Opening) and 10 R (Ring) Weft Count: 450 Dint White+12PCS (450DenierIntermangle White+12PolyesterCottonSlub), 450DintB+450DintW (enrIntangleBack+45DenierIntmangle White), 150+40 Dly White (150+40DnierLycraWhite) and 9 OE (Opening). Here Table 5, Warp and Weft count same, But fabric others parameters is different. This data is applied in my Finishing Department.

3.13 Measurement of EPI and PPI

Here Table 3.9 I have discussed fabric EPI and PPI. EPI Means Ends per Inches and PPI means Picks per Inches. This EPI and PPI depend on fabric construction. Let, Grey fabric PPI= 65 and then we will finished this fabric the PPI is greater 70 or 71. We measure a pick counter. This PPI is depending on buyer. If we see that, greater picks then we will control picks and we will change machine parameter. Here above Table 6, EPI & PPI before Wash and after Wash is Change.

3.14 Measurement of Fabric weight

Table 3.10, I have discussed the Fabric Weight. Fabric weight system: At First, Finished fabric we will cutting by the GSM cutter and it will measure by a weight machine. Then we get a value of weight fabric. This weight fabric we will into the 100 and we get a value. This value is divided by 33.91.It is depended on buyer requirement. Then we get a fabric weight.

Formula: Let, Fabric Weight=3.19

$=3.19\times100$

$=319$

$=\frac{319}{33.91}$

=9.40 OZ

3.15 Measurement of fabric shrinkage

Here Table 3.11, I am discussed grey and finished different. It is Calculation of following: grey fabric Calculation Let, Grey fabric Width= 65 Inches and Finish fabric Width= 62.5 Inches

Here, Width= 65-62.5= 2.5 is less. (It is grey and finished fabric different)

$=2.5\times100$

$=250$

$=\frac{250}{65}$

=3.84% (It is grey and finished fabric different %) It is depended on grey and finish fabric width. If machine parameter is change, sometimes this value is change.

Measurement of skewing and bowing

Finish Fabric Width =62.5, 62 Finish pick per inch = 61.5 It is depending on according to the fabric design we setting skew

Here,

Finished Fabric skew = 3cm

Skew calculation:

= 3÷2.54

= 1.18

= 1.18×100

= 118÷61.5

= 1.92%

Here,

1 cm = 2.54 inch, 100= percentage

61.5= Finished fabric width

Finished fabric Bowing is 0% or 0.5%. Actually all finished fabric bowing are same. Sometimes according to fabric construction this bowing value is greater or less. So, every time we check this bowing

Procedure of lab wash

Table 3.4 I have discussed fabric lab wash. Only for shrinkage wash of enzyme wash at first I were finished fabric desizing of time 10-20 Minute. Then I were use of softener and bath temperature is 35-40 º C, time is 30 minute process is continuing and then the fabric dryer temperature 80-90 º C the process of lab wash complete. Then the fabric conditioning the shrinkage scale by the shrinkage measurement of after wash.

Table 3.2: Effect on various changes of properties Grey and Finished fabric

Fabric type	Width (Inches)		Count		EPI		PPI		Weight (Oz / yd)		Shrinkage%	
	B/W	A/W	Warp	Weft	B/W	A/W	B/W	A/W	B/W	A/W	Warp	Weft
G	64.7	61.4	30/2	450 Dint W+12 PCS	100	105.5	66	73	9.55	10.46	-9.50%	-5.50%
F	62.8	61.8	30/2	450 Dint W+12 PCS	103	104.5	71	72.5	10.32	10.26	-2%	-1.50%
G	64.9	60.6	14K	450 Dint B+450 Dint W	99	106	61	68.5	10.58	11.85	-11%	-7%
F	62.5	61.4	14K	450 Dint B+450 Dint W	103	104.5	62	64.5	11.23	11.2	-4%	-2%
G	65	62.3	14K	450 Dint W+12PCS	100	104.5	65.5	71.5	9.87	10.55	-8.50%	-4.50%
F	62.5	61.5	14K	450 Dint W+12PCS	103	104.5	66.5	69.5	10.38	10.2	-4.50%	-1.50%
G	65.5	63.3	14K	600 Dint B+12 PCS	100	103.5	59	67	9.9	10.91	-12%	-3.5
F	62.5	61.2	14K	600 Dint B+12 PCS	104	105	62	64	10.64	10.7	-3.50%	-1.50%
G	66.5	47.5	14 OE	150+40 Dly White	98	137	65	73.5	7.07	10.35	-12%	-28.50%
F	57	49.8	14 OE	150+40 Dly White	113	130	69.5	73	8.58	9.93	-5%	-13%
G	63.2	43.5	10 R	150+40 Dly White	72	104	52	60	6.78	10.55	-14%	-32.50%
F	53.7	45.5	10 R	150+40 Dly White	84	99.5	59	59.5	8.9	10.02	-1.00%	-15.50%
G	62.4	41.1	10 R	150+40 Dly White	72.5	110	53	62	6.9	11.14	-14%	-34%
F	54.1	46.6	10 R	150+40 Dly White	83.5	97	59.5	59.5	8.84	9.76	0%	-14%
G	64.9	45.0	14 OE	150+40 Dly W	99.5	144	61	69	6.95	10.97	-12%	-31%
F	53.9	48.0	14 OE	150+40 Dly W	120	135	65	68	8.93	10.23	-5%	-11.50%
G	63.1	42.7	10 R	150+40 Dly W	71.5	105.5	52	60.5	6.95	11.11	-14.5%	-32.50%
F	53.5	46.0	10 R	150+40 Dly W	84.5	98	59.5	59.5	8.99	9.79	0%	-14%
G	62.5	40.5	10 R	150+40 Dly W	72	111.5	53	62	6.84	11.08	-15%	-35%
F	53.5	45.8	10 R	150+40 Dly W	84.5	98.5	59	59.5	8.9	9.67	-1%	-14.50%

Dint W/B= Denier Intermengle White/Black; Pcs= Polyester cotton slub; K= Kut; Dly= Denier Lycra; OE= Opening; R= Ring

Table 3.3: Effect of wash on finished fabric Width

Width (Inches)		Count		EPI		PPI		Weight (Oz / yd)		Shrinkage%	
B/W	A/W	Warp	Weft	B/W	A/W	B/W	A/W	B/W	A/W	Warp	Weft
65	61.8	30/2	450 Dint W+12 PCS	103	104.5	71	72.5	10.32	10.26	-2%	-1.50%
62.5	61.4	14K*	450 Dint B+450 Dint W	103	104.5	62	64.5	11.23	11.2	-4%	-2%
57	49.8	14 OE	150+40 Dly White*	113	130	69.5	73	8.58	9.93	-5%	-13%
53.7	45.5	10 R	150+40 Dly White	84	99.5	59	59.5	8.9	10.02	-1.00%	-15.50%
53.9	48.0	14 OE	150+40 Dly White	120	135	65	68	8.93	10.23	-5%	-11.50%
53.5	46.0	10 R	150+40 Dly White	84.5	98	59.5	59.5	8.99	9.79	0%	-14%
56.1	49.2	14 OE	150+40 Dly White	115.5	131.5	70	73.5	8.67	9.96	-4.50%	-12.50%
62.9	62	9 OE	9 OE	70	71	52.5	52.5	11.61	11.32	-0.50%	-1.50%
54.1	46.6	10 R	150+40 Dly White	83.5	97	59.5	59.5	8.69	9.49	-0.50%	-14%
55.5	49.2	14 OE	150+40 Dly White	116.5	131.5	65.5	68.5	8.78	10.08	-5%	-11.50%
54.7	47.8	10 R	150+40 Dly White	82.5	94.5	59	59	8.81	9.7	-0.50%	-12.50%

*Dint W/B= Denier intermingle White/Black; Dly= Denier Lycra; PCS= Polyester Cotton Slub; B= Black; W= White: OE= Opening; R= Ring, K= Kut

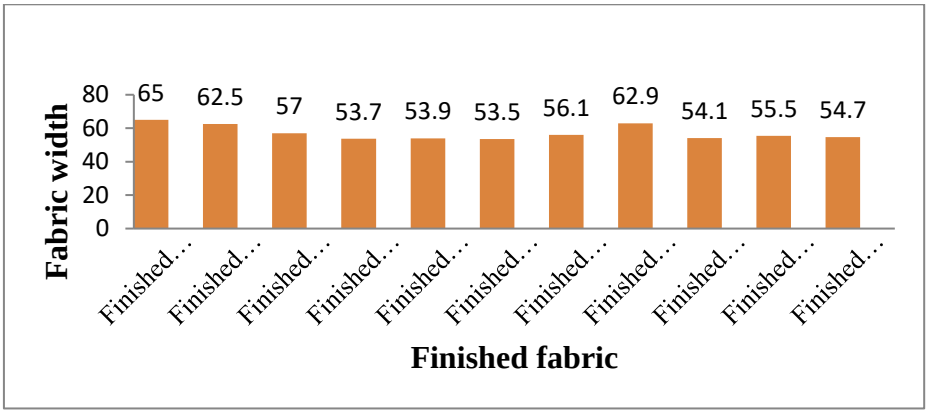


Chart 1: Effect of finished fabric

Table 3.4: Effect of weave on Grey & Finished fabric wash

Fabric type	Width (Inches)		Weave	Count		EPI		PPI		Shrinkage%	
	B/W	A/W		Warp	Weft	B/W	A/W	B/W	A/W	Warp	Weft
G	64.7	61.4	4/1 Rsat	30/2	450 Dint W+12 Pcs	100	105.5	66	73	-9.5%	-5.5%
F	62.8	61.8	4/1 Rsat	30/2	450 Dint W+12 Pcs	103	104.5	71	72.5	-2%	-1.5%
G	63.2	43.5	3/1RHT	10 R	150+40 Dly White	72	104	52	60	-14%	-32.5%
F	53.7	45.5	3/1RHT	10 R	150+40 Dly White	84	99.5	59	59.5	-1%	-15.5%
G	60.2	42.5	3/1 LHT	10 oe	150+40 Dly White	78.5	111	53	61.5	-14%	-30%
F	52.5	45.2	3/1 LHT	10 oe	150+40 Dly White	90	104.5	59	60	-2%	-14%
G	62.9	50.2	2/1 RHT	30 comb	30 comb	104	110.5	57	63	-9.5%	-6%
F	59.1	59.1	2/1 RHT	30 comb	30 comb	110.5	110.5	61.5	62.5	-1.5%	-0.5%

RHT= Right Hand Twill; LHT= Left Hand Twill; Dint W= Denier intermingle White; PCS= Polyester cotton slub; Dly= Denier Lycra; comb= combed

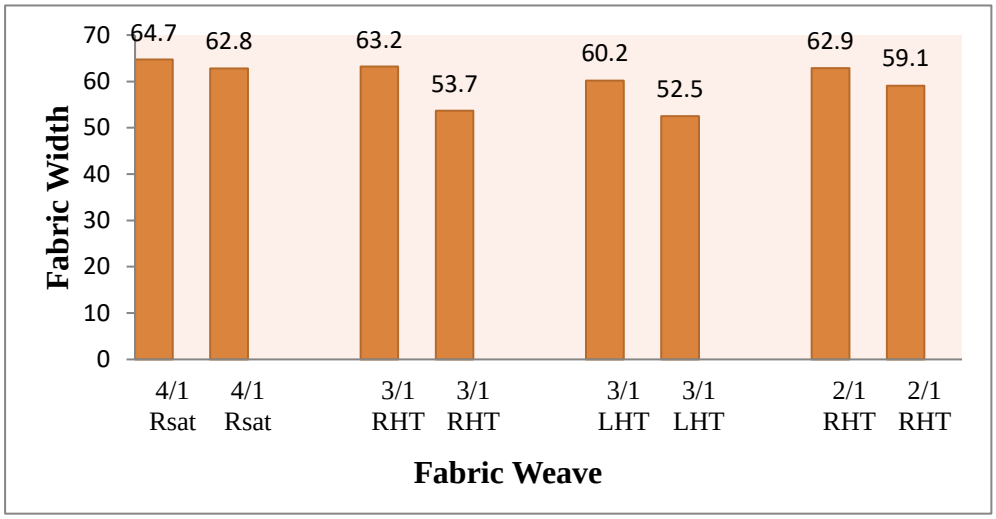


Chart 2: Effect of weave

Table 3.5: Effect of color on Grey and Finished fabric wash

Fabric type	Width (Inches)		Color	Count		EPI		PPI		Shrinkage%	
	B/W	A/W		Warp	Weft	B/W	A/W	B/W	A/W	Warp	Weft
G	64.9	60.6	SBIT	14 K	450 Dint B+450 Dint W	99	106	61	68.5	-11%	-7%
F	62.5	61.4	SBIT	14 K	450 Dint B+450 Dint W	103	104.5	62	64.5	-4%	-2%
G	63.2	43.5	IBST	10 R	150+40 Dly White	72	104	52	60	-14%	-32.5%
F	53.7	45.5	IBST	10 R	150+40 Dly White	84	99.5	59	59.5	-1%	-15.5%
G	62.5	40.5	Indigo	10 R	150+40 Dly White	72	112	53	62	-15%	-35%
F	53.5	45.8	indigo	10 R	150+40 Dly White	84.5	94.5	59	59.5	-1%	-14.5%
G	62.9	43.5	B.Black	10 R	150+40 Dly White	71.5	104	53	62	-14.5%	-31.5%
F	54.1	47.2	B.Black	10 R	150+40 Dly White	83.5	95.5	59	59.5	-0.5%	-13%

SBIT= Sulphur Bottoming Indigo Toppoing; IBST= Indigo Bottoming Sulphur Topping; B.Black= Blue Black

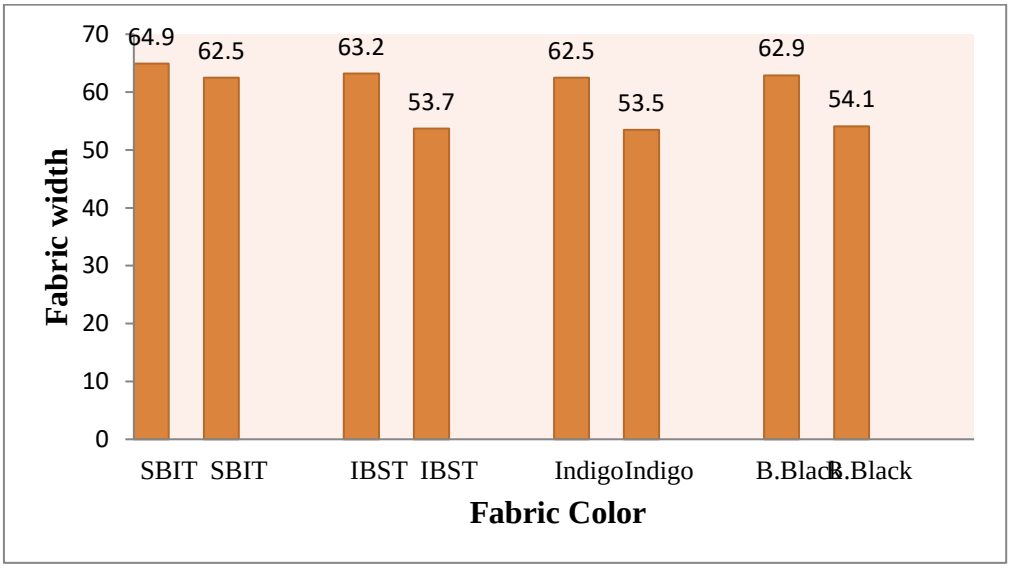


Chart 3: Effect of color

Table 3.6: Effects of warp and weft count on the properties of Grey & Finished fabric wash

Fabric type	Width (Inches)		Count		EPI		PPI		Shrinkage%	
	B/W	A/W	Warp	Weft	B/W	A/W	B/W	A/W	Warp	Weft
G	64.7	61.4	30/2	450 Dint W+12 PCS	100	105.5	66	73	-9.5%	-5.5%
F	62.2	61.8	30/2	450 Dint W+12 PCS	103	104.5	71	72.5	-2%	-1.5%
G	64.9	60.6	14 K	450 Dint B+450 Dint W	99	106	61	68.5	-11%	-7%
F	62.5	61.4	14 K	450 Dint B+450 Dint W	103	104.5	62	64.5	-4%	-2%
G	66.1	45.0	14 oe	150+40 Dly White	98	144	61	70	-12.5%	-32%
F	55.5	49.2	14 oe	150+40 Dly White	116.5	131.5	65.5	68.5	-5%	-11.5%
G	65.9	61.6	9 oe	9 oe	68	73	47	54	-13%	-7%
F	62.9	62	9 oe	9oe	70	71	52.5	52.5	-0.5%	-1.5%
G	60.2	42.5	10 oe	150+40 Dly White	78.5	111	53	61.5	-14%	-30%
F	52.5	45.2	10 oe	150+40 Dly White	90	104.5	59	60	-2%	-14%
G	63.2	43.5	10 R	150+40 Dly White	72	104	52	60	-14%	-32.5%
F	53.7	45.5	10 R	150+40 Dly White	84	99.5	59	59.5	-1%	-15.5%

K= Kut; OE= Opening; R= Ring

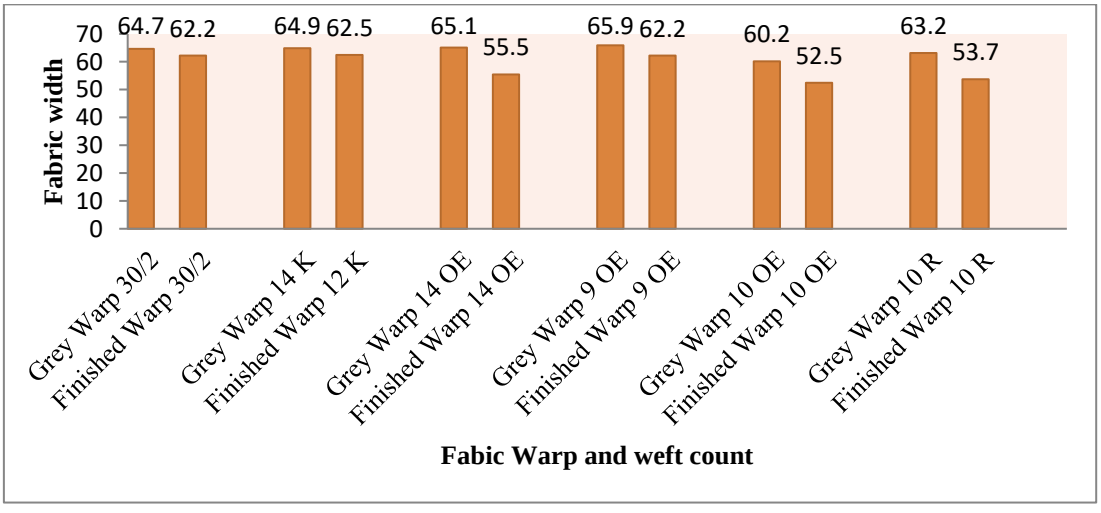


Chart 4: Effect of warp and weft count

Table 3.7: Effect of wash on EPI & PPI of Grey & Finished fabric

Fabric type	Width (Inches)		EPI		PPI		Weight (Oz / yd)		Shrinkage%	
	B/W	A/W	B/W	A/W	B/W	A/W	B/W	A/W	Warp	Weft
G	64.7	61.4	100	105.5	66	73	9.55	10.46	-9.5%	-5.5%
F	62.8	61.8	103	104.5	71	72.5	10.32	10.36	-2%	-1.5%
G	65.0	62.3	100	104.5	66.5	71.5	9.87	10.55	-8.5%	-10.5%
F	62.5	61.5	103	104.5	66.5	69.5	10.38	10.20	-4.5%	-1.5%
G	66.5	47.5	98	137	65	73.5	7.07	10.35	-12%	-28.5%
F	57.0	49.8	113	130	69.5	73	8.58	9.93	-5%	-13%
G	64.9	45.0	99.5	144	61	69	6.95	10.97	-12%	-31%
F	53.9	48.0	120	135	65	68	8.93	10.23	-5%	-11.5%
G	63.2	43.5	72	104	52	60	6.78	10.55	-14%	-32.5%
F	53.7	45.5	84	99.5	59	59.5	8.9	10.02	-1%	-15.5%
G	62.4	41.1	72.5	110	53	62	6.90	11.14	-14%	-34%
F	54.1	46.6	83.5	97	59.5	59.5	8.84	9.76	0%	-14%

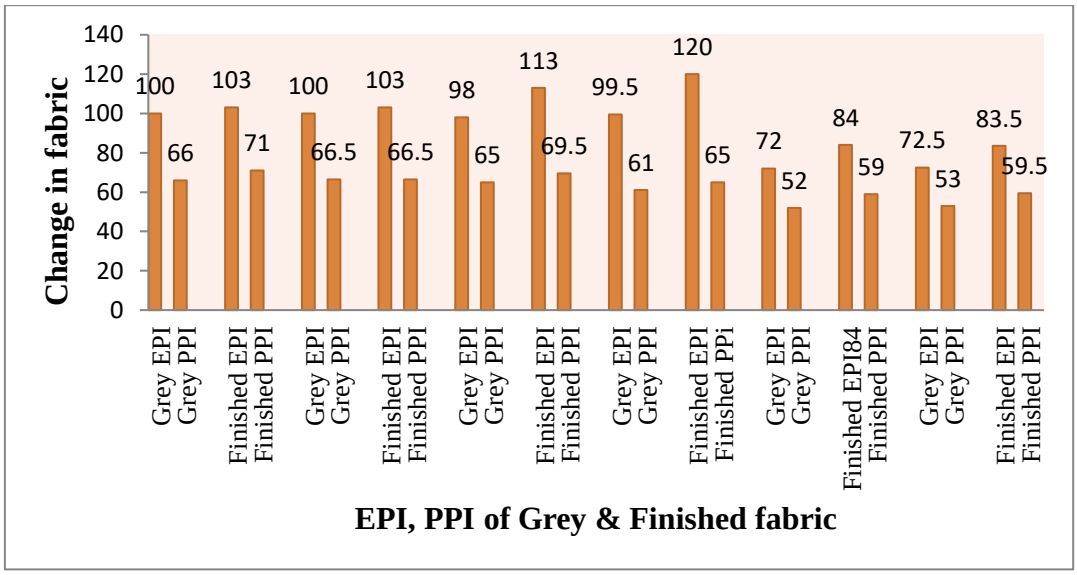


Chart 5: Effect of EPI & PPI Grey & Finish fabric

Table 3.8: Effect of wash on fabric weight of Grey & Finished fabric

Fabric type	Width (Inches)		Count	EPI		PPI		Weight (Oz / yd)		Shrinkage%	
	B/W	A/W	Warp	B/W	A/W	B/W	A/W	B/W	A/W	Warp	Weft
G	64.7	61.4	30/2	100	105.5	66	73	9.55	10.46	-9.5%	-5.5%
F	62.8	61.8	30/2	103	104.5	71	72.5	10.32	10.36	-2%	-1.5%
G	65.0	62.3	14 K	100	104.5	66.5	71.5	9.87	10.55	-8.5%	-10.5%
F	62.5	61.5	14 K	103	104.5	66.5	69.5	10.38	10.20	-4.5%	-1.5%
G	66.5	47.5	14 OE	98	137	65	73.5	7.07	10.35	-12%	-28.5%
F	57.0	49.8	14 OE	113	130	69.5	73	8.58	9.93	-5%	-13%
G	64.9	45.0	14 OE	99.5	144	61	69	6.95	10.97	-12%	-31%
F	53.9	48.0	14 OE	120	135	65	68	8.93	10.23	-5%	-11.5%
G	63.2	43.5	10 R	72	104	52	60	6.78	10.55	-14%	-32.5%
F	53.7	45.5	10 R	84	99.5	59	59.5	8.9	10.02	-1%	-15.5%
G	62.4	41.1	10 R	72.5	110	53	62	6.90	11.14	-14%	-34%
F	54.1	46.6	10 R	83.5	97	59.5	59.5	8.84	9.76	0%	-14%

K= Kut; OE= Opening; R= Ring

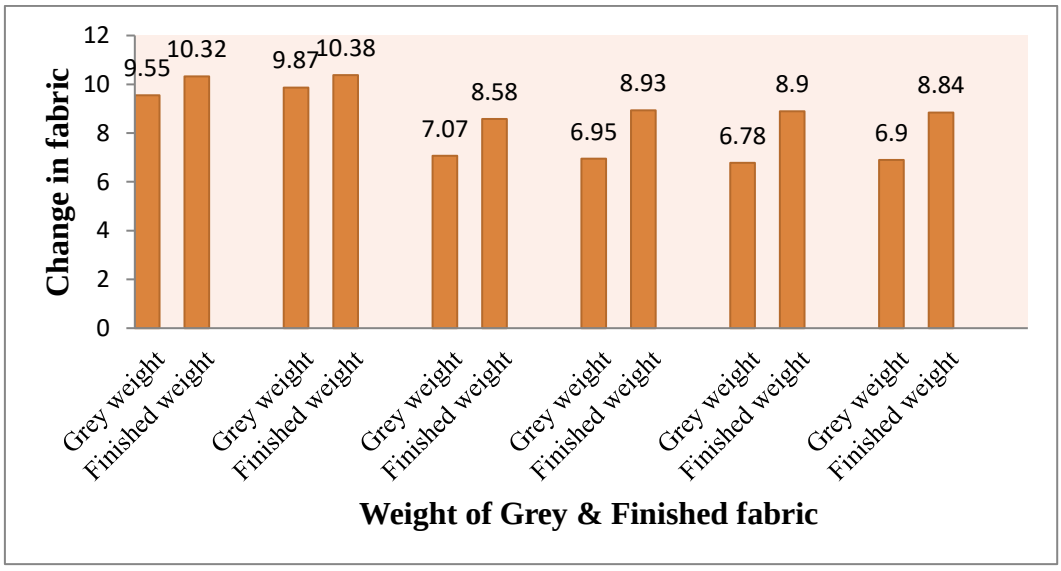


Chart 6: Effect of Fabric weight of Grey & Finish fabric

Table 3.9: Effect of wash on Shrinkage, bowing, Skew & Movement of Grey & Finished fabric

Fabric type	Width (Inches)		Count	Shrinkage%		Bowing %	Skew %		Movement %
	B/W	A/W	Warp	Warp	Weft		B/W	A/W	
G	70.2	46.7	14 K	-13%	-34%			2.30%	
F	60.6	53.1	14 K	-3.5%	-12.5%	0.40%	1.70%	1.50%	0.20%
G	68.8	49.4	14 OE	-12.5%	-29%				
F	58.6	51.9	14 OE	-5%	-12%	0.70%	2.30%	1.80%	0.50%
G	69.2	50.4	12 k	-13%	-27.50%			1.0%	
F	60.6	53.9	12 k	-4%	-11%	0.60%	2.0%	1.8%	0.2%
G	70.2	49.2	14 k	-13.5%	-30%			1.2%	
F	58.8	51.3	14 k	-3.50%	-13%	0.70%	1.70%	1.60%	0.1%
G	66.5	47.5	14 OE	-12%	-28.50%			4.80%	
F	57.0	49.8	14 OE	-5%	-13%	0.50%	4.40%	3.60%	0.80%
G	64.9	45.0	14 OE	-12%	-31%			5.80%	
F	53.9	48.0	14 OE	-5%	-11.5%	0.50 %	4.10%	3.70%	0.40%

K=Kut; OE= Opening

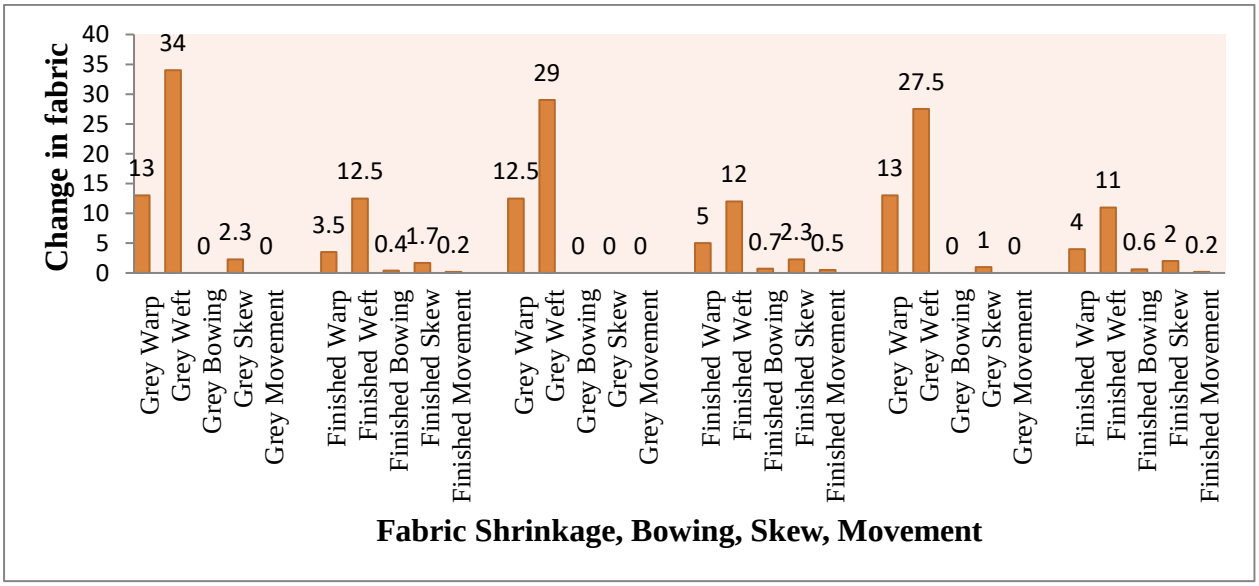


Chart 7: Effect of Shrinkage, bowing, Skew & Movement Grey & Finish fabric

Table 3.10: Effect of wash on different and percentage of Grey and Finished fabric

Fabric type	Width (Inches)		Count	Grey & Finish Different	Grey & Finish Different %
	B/W	A/W	Warp		
G	65.0	62.3	14 K		
F	62.5	61.5	14 K	-2.5	3.84%
G	65.5	63.3	14 K		
F	62.5	61.2	14 K	-3	4.58%
G	64.9	61.4	14 K		
F	61.2	60.4	14 K	-3.7	5.70%
G	66.5	47.5	14 OE		
F	57.0	49.8	14 OE	-9.5	14.28%
G	64.9	45.0	14 OE		
F	53.9	48.0	14 OE	-11	16.94%
G	66.6	45.6	14 OE		
F	56.1	49.2	14 OE	-10.50	15.88%

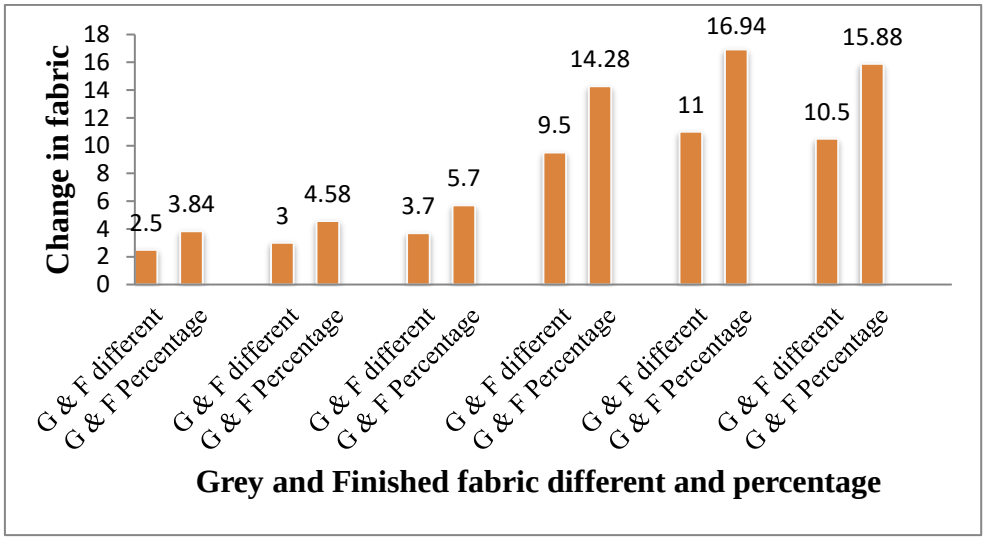


Chart 8: Grey & Finish fabric Different and percentage

3.16 Fabric Inspection and fabric defect

Figure 31: Fabric inspection

Here, this is inspection & packing section. Here, the fabric after inspection Grade A, Grade B, Grade C and cut pices. If we inspection has not fabric fault then the fabric is Grade A and if we inspection has fabric fault then the fabric roll is GradFie b or C. Every fabric rolls packing this machine, then the fabric roll inventory in floor and delivered of buyer.

3.16.1 Fabric fault

1. Double Pick: Two or More Pick inserted in the same shed where only one is desired.

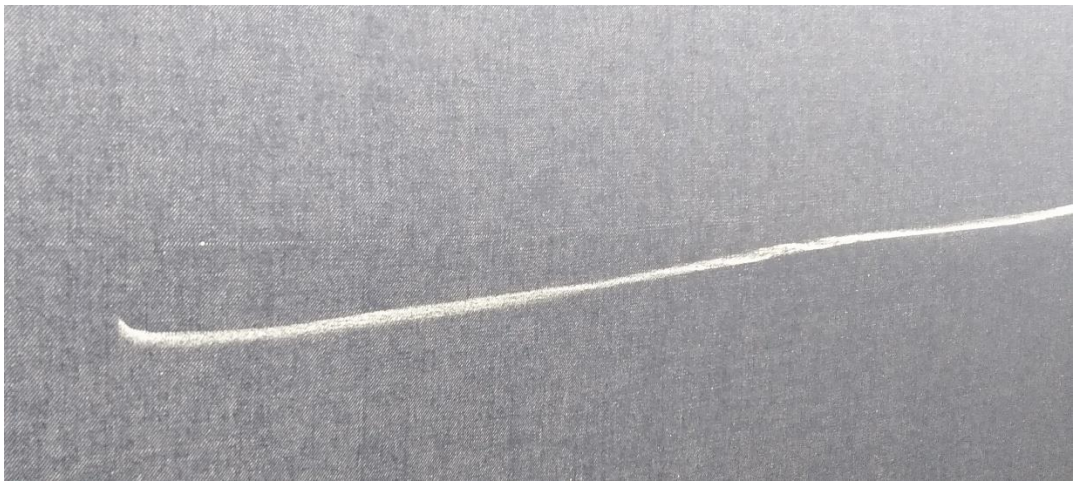


Fig 32 : Double Pick

Causes: Cutting Problem of cutter. Faulty setting of air pressure.
Remedy: cutter position is to be set correctly.

2. Miss Pick: This kind of defect is produced in woven fabric when operator starts a stopped machine without picking the Broken weft from the shede.

Fig 33: Miss Pick

Causes: Excess Air Pressure of Main Nozzle.
Remedy: Main Nozzle Air Pressure Should be reduced.

3.Broken Pick: A Filling earn that is Broken in the weaving of fabric.

Fig 34: Broken pick

Causes: Weft Break on Ordinary Looms
Remedy: Improper Function of weft work.

4.Smash: A Damage spot in the fabric with Many Broken Ends and Flooting Picks due to shuttle being trapped in the shed.
Causes: Incorrect Timing of shedding and Picking Improper Starting Loom.
Improper working of loose reed & Machines.
Remedy: Tune the loom Properly.
Tune the checleing Machine Properly.

5. Starting Mark: A Thick or thin place is produced in the fabric due to variation in the pick density white starting in the loom.

Fig 35: Starting Mark

Causes: Main causes is loom stoppage
Remedy: This cannot be avoided but can be controlled by starting mark setting.

7.End Out: When the yarn breaking and loom continuing to run with Missing End.

Fig 36: End Out

Causes: The yarn breaking and loom continuing.
Remedy: Control yarn breaking and loom Continuing.

9. Loose Ends: This type of fault is produced in woven fabrics when the tension of warp yarn is slow.

Fig 37: Loose Ends

Causes: When breaks yarn as a result loose ends occurs.
Remedy: Control yarn breaks & yarn tension.

10. Tight Ends: If the tension of warp yarn is more than other ends present in the loom than the other ends present in the loom then this type of fault is produced in woven fabrics.
Causes: When breaks yarn the yarn tension does not match with other yarn as a result tight ends.
Remedy: control yarn breaks and yarn tension.

11. Knot: When tying spools the yarn together.

Fig 38: Knot

Causes: The yarn tying spools the yarn together.
Remedy: Control spools of yarn together.

17 & 18 Slub in weft & slub in warp: An abnormally thick place in the yarn finally appearing in the fabric.

Fig 39: Siub in Weft

Causes: Undrafted portion in the yarn.
Remedy: Minimize the incidence of slubs during spinning.
Clean the yarns effectively during winding.

19. Thick Warp: A warp end having diameter larger than normal.

Fig 40: Thick warp

Causes: Excessive count variation Accidental Mixed up of counts in winding of warping.
Remedy: Avoid & count variation Cheeks to avoid Mixup of counts.

3.16.2 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.

Four (4) Point System

This is sued 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)**
- **3 inches or less**
- **Over 3 inches but less than 6 inches**
- **Over 6 inches but less than 9 inches**
- **Over 9 inches**

Machinery Description

Name : Inspection Table
Brand : STT Machinery

Model : Amoeba
Speed :0 - 80yds/min
M/C dimension :2580 mm x 2920 mm x 2310mm(L×W×H
spection m/c :860mm (height)
size of inspection board : 72 inch
Fabric roll diameter: 450mm

Name Wrapping m/c

Brand : STT Machinery

Model: Amoeba
Speed: 5 - 6 packages/min
M/C dimension: 970×2700×1300mm (L×W×H)
spection m/c 860mm (height)
size of inspection board : 72 inch
Fabric roll diameter: 450mm
Air consumption: 850L/min

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.

Major Fabric Faults

Starting mark:

- Causes: Main cause is loom stoppage.
- Remedy: This cannot 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.

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 breaks yarn, 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

    1. If weft is too long & reach FD2

- Remedy: 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.

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:

Point Range	**Grade Name**
Up to 20 points/100m	Grade A
Up to 20-30 points/100m	Grade B
Up to 30-40 points/100m	Grade C
More than 40 points/100m	Rejected

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

Inspection Calculation Formula

= 20÷39.37×63"÷100×80 Meter

=25.60 point

Here, 20 is a constant value. 63 is a finished fabric width, 100 is a unique and 80 is a fabric inspection meter. If 100 yards length total 20 point is acceptable of inspection section.

Table 3.11: Fabric Inspection Report of lot no. WDL 19-4180
One Denim Mills Limited

Section: **Inspection**

Fabric Roll Inspection Sheet

Quality…cotton Lycra **Weave**…3/1RhT… **Colo**r…Indigo **Construction**……

Lot No WDL 19-4180 **S.S**…… **Beam**….. **Loom**…….. **Code**…….

Operator Name…Al amin…… **Shift**……A…… **Date**……09/11/19……

1	Double Pick	8	Wrong Denting	15	Oil Spot	22	Hole Tears
2	Miss Pick	9	Loose Ends	16	Weaving Crease	23	Yarn Patta
3	Broken Pick	10	Tight Ends	17	Slub in Weft	24	Lycra Missing
4	Smatch	11	Knot	18	Slub in Warp	25	Weft loose
5	Starting Mark	12	Snarl	19	Thick warp	26	Singeing Mark
6	End Out	13	White Mark	20	Thick weft	27	Finishing Crease
7	Double End	14	Ballformation	21	Yarn Contamination	28	Cone change

Loom-98, Beam-256, ss- 1 Loom-90, Beam-251, ss-12 Loom-82 Beam217,ss-11

Yds	Defect Code	Point	Grade
5	9	4	
37	13	4	
45	13	4	
31	5	4	
51	2	4	
Roll 183	117 yards	20 point	A
17	9	4	
23	13	4	
35	1	4	
57	1	4	
Roll 184	110 yards	16 point	A
9	5	4	
12	9	4	
24	6	4	
37	17	2	
Roll 185	53 yards	14 point	A

Yds	Defect Code	Point	Grade
79	5	4	
83	17	4	
94	17	4	
Roll 188	120 yards	12 point	A
30	17	4	
45	9	4	
104	17	2	
Roll 189	120 yards	10 point	A
87	17	4	
92	5	4	
Roll 190	101 yards	8 points	A

Yds	Defect Code	Point	Grade
29	11	2	
43	17	4	
62	17	2	
83	17	4	
Roll 191	106 yards	12 point	A
49	17	4	
53	17	2	
64	3	4	
87	4	4	
Roll 192	102 yards	14	A
18	5	4	
49	17	4	
Roll 193	101 yards	8 points	A

Total A Grade= 1001 yards Total C Grade= Total Cut Pcs=

Table 3.12: Fabric inspection Report of lot no. SL 19-4421
One Denim Mills Limited

Section: **Inspection**

Fabric Roll Inspection Sheet

Quality… **Weave**…3/1RhT… **Colo**r…Indigo **Construction**……

Lot No SL 19-4421 PB/PA **S.S**…06…… **Beam**…82.. **Loom** …63…….. **Code**……

Operator Name…Mokbul Ali…… **Shift**……B…… **Date**……25/12/19……

1	Double Pick	8	Wrong Denting	15	Oil Spot	22	Hole Tears
2	Miss Pick	9	Loose Ends	16	Weaving Crease	23	Yarn Patta
3	Broken Pick	10	Tight Ends	17	Slub in Weft	24	Lycra Missing
4	Smatch	11	Knot	18	Slub in Warp	25	Weft loose
5	Starting Mark	12	Snarl	19	Thick warp	26	Singeing Mark
6	End Out	13	White Mark	20	Thick weft	27	Finishing Crease
7	Double End	14	Ballformation	21	Yarn Contamination	28	Cone change

Loom-06, Beam-82, ss- 06

Yds	Defect Code	Point	Grade
20	18	3	
86	3	3	
87	3	4	
Roll 116	95 yards	10 point	A
20	18	3	
33	3	3	
63	3	4	
82	3	4	
Roll 117	95 yards	14 point	A
18	18	3	
36	3	4	
42	3	4	
56	3	4	
73	3	4	
Roll 118	73 yards	19 points	A

Loom-42, Beam-93, ss-01

Yds	Defect Code	Point	Grade
20	18	3	
33	18	3	
57	3	3	
63	9	3	
Roll 16	93 yards	12 points	A
20	18	3	
56	9	3	
69	9	4	
76	9	4	
Roll 17	91 yards	14 points	A
20	18	2	
24	9	4	
60	10	4	
76	10	4	
Roll 18	86 yards	14 points	A

Loom-51 Beam-23, ss-10

Yds	Defect Code	Point	Grade
28	2	4	
58	9	4	
Roll 19	100 yards	8 points	A
14	9	4	
29	4	2	
76	2	4	
Roll 20	100 yards	10 points	A
38	2	4	
64	4	2	
88	9	4	
92	2	4	
Roll 21	117 yards	14 points	A

Total A Grade= 850 yards

Table 3.13: Fabric Inspection Report of Lot no. SL 19-4421
One Denim Mills Limited

Section: **Inspection**

Fabric Roll Inspection Sheet

Quality… **Weave**…4/1RhT… **Colo**r…Indigo **Construction**……

Lot No SL 19-4421 PG **S.S**…03…… **Beam**…07.. **Loom**…33…….. **Code**…….

Operator Name…Mokbul Ali…… **Shift**……B…… **Date**……16/12/19……

1	Double Pick	8	Wrong Denting	15	Oil Spot	22	Hole Tears
2	Miss Pick	9	Loose Ends	16	Weaving Crease	23	Yarn Patta
3	Broken Pick	10	Tight Ends	17	Slub in Weft	24	Lycra Missing
4	Smatch	11	Knot	18	Slub in Warp	25	Weft loose
5	Starting Mark	12	Snarl	19	Thick warp	26	Singeing Mark
6	End Out	13	White Mark	20	Thick weft	27	Finishing Crease
7	Double End	14	Ballformation	21	Yarn Contamination	28	Cone change

Loom-33, Beam-07, ss-03

Yds	Defect Code	Point	Grade
32	4	4	
56	18	3	
83	3	3	
Roll 58	100 yards	10 points	A
20	18	3	
56	18	3	
Roll 59	100 yards	06 points	A
15	18	2	
32	18	2	
86	9	3	
Roll 60	99 yards	07 points	A

Loom-21, Beam-115, ss-04

Yds	Defect Code	Point	Grade
20	18	3	
56	18	3	
86	9	4	
Roll 75	100 yards	10 points	A
15	18	2	
35	10	4	
75	18	2	
Roll 76	101 yards	08 points	A
20	18	3	
56	3	3	
76	4	3	
Roll 77	93 yards	09 points	A

Loom- Beam ,ss-

Yds	Defect Code	Point	Grade

Total A Grade= 593 yards

Table 3.14: Fabric Inspection Report Lot no. SL 342 GB

One Denim Mills Limited

Section: **Inspection**

Fabric Roll Inspection Sheet

Quality… **Weave**…4/1RhT… **Colo**r…Indigo **Construction**……

Lot No…SL 342 GB **S.S**…07…… **Beam**…30.. **Loom**…11…….. **Code**…….

Operator Name…Ismail… **Shift**……A…… **Date**……16/12/19……

1	Double Pick	8	Wrong Denting	15	Oil Spot	22	Hole Tears
2	Miss Pick	9	Loose Ends	16	Weaving Crease	23	Yarn Patta
3	Broken Pick	10	Tight Ends	17	Slub in Weft	24	Lycra Missing
4	Smatch	11	Knot	18	Slub in Warp	25	Weft loose
5	Starting Mark	12	Snarl	19	Thick warp	26	Singeing Mark
6	End Out	13	White Mark	20	Thick weft	27	Finishing Crease
7	Double End	14	Ballformation	21	Yarn Contamination	28	Cone change

Loom-11, Beam-30, ss-07

Yds	Defect Code	Point	Grade
18	18	3	
56	3	3	
96	10	3	
Roll 176	100 yards	09 points	A
23	18	3	
32	4	3	
56	3	3	
86	3	4	
Roll 177	101 yards	13 points	A
20	18	2	
86	4	3	
97	13	3	
Roll 178	84 yards	08 points	A

Loom-61, Beam-04, ss-10

Yds	Defect Code	Point	Grade
15	18	3	
39	3	3	
26	3	3	
Roll 195	110 yards	09 points	A
20	18	2	
56	18	2	
73	9	2	
87	10	3	
Roll 196	99 yards	09 points	A
20	18	2	
56	18	2	
76	9	3	
83	10	2	
Roll 197	101 yards	09	A

Loom- Beam-, ss-

Yds	Defect Code	Point	Grade

Total A Grade= 595 yards

Table 3.15: Fabric Inspection Report of Lot no. SL 342 GC

One Denim Mills Limited

Section: **Inspection**

Fabric Roll Inspection Sheet

Quality… **Weave**…4/1RhT… **Colo**r…Indigo **Construction**……

Lot No…342 GC **S.S**…04…… **Beam**…71.. **Loom**…05…….. **Code**…….

Operator Name…Ismail…… **Shift**……B…… **Date**……25/12/19……

1	Double Pick	8	Wrong Denting	15	Oil Spot	22	Hole Tears
2	Miss Pick	9	Loose Ends	16	Weaving Crease	23	Yarn Patta
3	Broken Pick	10	Tight Ends	17	Slub in Weft	24	Lycra Missing
4	Smatch	11	Knot	18	Slub in Warp	25	Weft loose
5	Starting Mark	12	Snarl	19	Thick warp	26	Singeing Mark
6	End Out	13	White Mark	20	Thick weft	27	Finishing Crease
7	Double End	14	Ballformation	21	Yarn Contamination	28	Cone change

Loom-05, Beam-71, ss-05

Yds	Defect Code	Point	Grade
38	2	4	
71	9	4	
96	4	4	
Roll 79	120 yards	12 points	A
44	9	4	
88	3	4	
Roll 80	120 yards	8 points	A
31	2	4	
56	9	4	
76	9	4	
96	4	2	
Roll 81	127 yards	14 points	A

1 Loom-13, Beam-64, ss-09

Yds	Defect Code	Point	Grade
20	18	3	
56	3	3	
Roll 82	120 yards	6 points	A
38	9	4	
56	2	4	
79	3	2	
Roll 83	120 yards	10 points	A
23	4	4	
50	2	4	
93	9	4	
Roll 84	117 yards	12 points	A

Loom-43 Beam-38 ,ss-08

Yds	Defect Code	Point	Grade
28	2	4	
65	9	4	
88	2	4	
Roll 85	110 yards	12 points	A
37	2	4	
76	9	4	
Roll 86	100 yards	8 points	A
30	4	4	
56	9	4	
83	2	4	
Roll 87	101 yards	12 points	A
23	9	4	
56	2	4	
68	11	2	
Roll 88	88 yards	10 points	A

Total A Grade= 1123 yards

Table 3.16: Fabric Inspection Report of Lot no.AN 19- 4428 GB
One Denim Mills Limited

Section: **Inspection**

Fabric Roll Inspection Sheet

Quality… **Weave**…4/1RhT… **Colo**r…Indigo **Construction**……

Lot No AN 19-4428 GB **S.S**…… **Beam**….. **Loom**…….. **Code**…….

Operator Name…Ismail…… **Shift**……A…… **Date**……25/12/19……

1	Double Pick	8	Wrong Denting	15	Oil Spot	22	Hole Tears
2	Miss Pick	9	Loose Ends	16	Weaving Crease	23	Yarn Patta
3	Broken Pick	10	Tight Ends	17	Slub in Weft	24	Lycra Missing
4	Smatch	11	Knot	18	Slub in Warp	25	Weft loose
5	Starting Mark	12	Snarl	19	Thick warp	26	Singeing Mark
6	End Out	13	White Mark	20	Thick weft	27	Finishing Crease
7	Double End	14	Ballformation	21	Yarn Contamination	28	Cone change

Loom-18, Beam-17, ss-02

Yds	Defect Code	Point	Grade
10	9	4	
58	4	4	
60	9	4	
66	9	4	
70	9	4	
Roll 89	118 yards	20 points	A
28	9	4	
46	9	4	
56	2	4	
76	9	4	
80	4	4	
96	9	4	
Roll 90	130 yards	24 points	A

Loom-18, Beam-17, ss-02

Yds	Defect Code	Point	Grade
28	9	4	
63	2	4	
76	9	4	
91	4	4	
Roll 91	110 yards	16 points	A
36	2	4	
72	9	4	
Roll 92	95 yards	8 points	A

Loom- Beam-,ss-

Yds	Defect Code	Point	Grade

Total A Grade= 453 yards

Table 3.17: Fabric Inspection Report of Lot no. AN 19- 4414 GC
One Denim Mills Limited

Section: **Inspection**

Fabric Roll Inspection Sheet

Quality… **Weave**…4/1RhT… **Colo**r…Indigo **Construction**…

Lot No AN 19-4414 GC/ **S.S**…… **Beam**….. **Loom**…….. **Code**…….

Operator Name…Ismail…… **Shift**……A…… **Date**……09/11/19……

1	Double Pick	8	Wrong Denting	15	Oil Spot	22	Hole Tears
2	Miss Pick	9	Loose Ends	16	Weaving Crease	23	Yarn Patta
3	Broken Pick	10	Tight Ends	17	Slub in Weft	24	Lycra Missing
4	Smatch	11	Knot	18	Slub in Warp	25	Weft loose
5	Starting Mark	12	Snarl	19	Thick warp	26	Singeing Mark
6	End Out	13	White Mark	20	Thick weft	27	Finishing Crease
7	Double End	14	Ballformation	21	Yarn Contamination	28	Cone change

Loom-36, Beam-37, ss-04

Yds	Defect Code	Point	Grade
23	2	4	
47	9	4	
71	6	4	
83	4	4	
Roll 93	100 yards	16 points	A
14	9	4	
23	6	4	
27	2	4	
33	4	4	
36	2	4	
46	9	4	
56	10	4	
65	5	4	
70	4	4	
74	5	4	
77	2	4	
79	3	4	
82	2	4	
84	5	4	
Roll 94	110 yards	56 points	A

Total A Grade= 1001 yards

Loom-36, Beam-37, ss-04

Yds	Defect Code	Point	Grade
10	5	4	
21	5	4	
43	4	4	
Roll 95	64 yards	12 points	A

Loom-40 Beam-78,ss-10

Yds	Defect Code	Point	Grade
37	9	4	
59	2	4	
73	4	4	
Roll 96	110 yards	12 points	A
28	2	4	
43	5	4	
57	4	4	
85	9	4	
Roll 97	110 yards	16 points	A
21	2	4	
47	9	4	
69	2	4	
Roll 98	105 yards	12 points	

Table 3.18: Fabric Inspection Report of Lot no. AN 19- 4423 R
One Denim Mills Limited

Section: **Inspection**

Fabric Roll Inspection Sheet

Quality… **Weave**…4/1RhT… **Colo**r…Indigo **Construction**……

Lot No…19-4423 R **S.S**…05…… **Beam**…227.. **Loom**…89…….. **Code**…….

Operator Name…Ismail…… **Shift**……B…… **Date**……24/12/19……

1	Double Pick	8	Wrong Denting	15	Oil Spot	22	Hole Tears
2	Miss Pick	9	Loose Ends	16	Weaving Crease	23	Yarn Patta
3	Broken Pick	10	Tight Ends	17	Slub in Weft	24	Lycra Missing
4	Smatch	11	Knot	18	Slub in Warp	25	Weft loose
5	Starting Mark	12	Snarl	19	Thick warp	26	Singeing Mark
6	End Out	13	White Mark	20	Thick weft	27	Finishing Crease
7	Double End	14	Ballformation	21	Yarn Contamination	28	Cone change

Loom-89, Beam-227, ss-05

Yds	Defect Code	Point	Grade
20	9	4	
30	9	4	
88	4	4	
Roll 99	125 yards	12 points	A
10	10	4	
20	9	4	
80	9	4	
90	9	4	
98	9	4	
118	19	4	
Roll 100	125 yards	24 points	A
40	10	4	
46	9	4	
96	9	4	
Roll 101	129 yards	12 points	A

Loom-88, Beam-210, ss-12

Yds	Defect Code	Point	Grade
40	9	4	
80	9	4	
94	9	4	
Roll 102	110 yards	12 points	A
16	9	4	
24	9	4	
58	9	4	
Roll 103	110 yards	12 points	A
40	9	4	
68	9	4	
80	9	4	
Roll 104	96 yards	12 points	A

Loom-100 Beam-268,ss-09

Yds	Defect Code	Point	Grade
31	9	4	
56	2	4	
73	9	4	
Roll 105	100 yards	12 points	A
21	9	4	
56	2	4	
76	10	4	
91	9	4	
Roll 106	110 yards	16 points	A
24	11	4	
44	2	4	
63	9	4	
Roll 107	77 yards	12 points	A

Total A Grade= 982 yards

Table 3.19: Fabric Inspection Report of Lot no. SL-4429 PA
One Denim Mills Limited

Section: **Inspection**

Fabric Roll Inspection Sheet

Quality… **Weave**…4/1RhT… **Colo**r…Indigo **Construction**…

Lot No SL-19-4429 PA/PBL **S.S**…06…… **Beam**…67.. **Loom**…68…….. **Code**…

Operator Name…Nayan+Ismail…… **Shift**……B…… **Date**……24/12/19

1	Double Pick	8	Wrong Denting	15	Oil Spot	22	Hole Tears
2	Miss Pick	9	Loose Ends	16	Weaving Crease	23	Yarn Patta
3	Broken Pick	10	Tight Ends	17	Slub in Weft	24	Lycra Missing
4	Smatch	11	Knot	18	Slub in Warp	25	Weft loose
5	Starting Mark	12	Snarl	19	Thick warp	26	Singeing Mark
6	End Out	13	White Mark	20	Thick weft	27	Finishing Crease
7	Double End	14	Ballformation	21	Yarn Contamination	28	Cone change

Loom-68, Beam-67, ss-06 Loom-54, Beam-66, ss-05 Loom-45 Beam-47,ss-07

Yds	Defect Code	Point	Grade
5	2	4	
10	9	4	
80	2	4	
Roll 108	110 yards	12 points	A
10	10	2	
18	9	4	
20	9	4	
40	10	2	
43	9	4	
24	4	4	
36	19	4	
Roll 109	104/2 yards	24 points	A
9	9	2	
20	9	2	
29	2	4	
36	9	4	
38	10	4	
56	2	4	
Roll 110	63 yards	20 points	A

Yds	Defect Code	Point	Grade
30	9	4	
60	2	4	
80	2	4	
Roll 111	115 yards	12 points	A
10	10	4	
71	9	4	
Roll 112	115 yards	8 points	A
30	2	4	
Roll 113	123 yards	4 ponts	A

Yds	Defect Code	Point	Gra de
10	2	4	
30	9	4	
90	4	4	
Roll 114	133 yards	12 points	A
40	2	4	
Roll 115	133 yards	4 points	A
11	2	4	
80	2	4	
Roll 116	130 yards	8 points	A

Total A Grade=1026 yards

Table 3.20: Fabric Inspection Report of Lot no. AN 19- 4428 GB
One Denim Mills Limited

Section: **Inspection**

Fabric Roll Inspection Sheet

Quality… **Weave**…4/1RhT… **Colo**r…Indigo **Construction**……

Lot No…AN 19-4428 GB **S.S**…09…… **Beam**…108.. **Loom**…57…….. **Code**……

Operator Name…Suja…… **Shift**……B…… **Date**……09/11/19……

1	Double Pick	8	Wrong Denting	15	Oil Spot	22	Hole Tears
2	Miss Pick	9	Loose Ends	16	Weaving Crease	23	Yarn Patta
3	Broken Pick	10	Tight Ends	17	Slub in Weft	24	Lycra Missing
4	Smatch	11	Knot	18	Slub in Warp	25	Weft loose
5	Starting Mark	12	Snarl	19	Thick warp	26	Singeing Mark
6	End Out	13	White Mark	20	Thick weft	27	Finishing Crease
7	Double End	14	Ballformation	21	Yarn Contamination	28	Cone change

Loom-57, Beam-108, ss-09

Yds	Defect Code	Point	Grade
40	5	4	
Roll 117	100 yards	4 points	A
50	9	4	
Roll 118	90 yards	4 points	A
50	2	4	
Roll 119	90 yards	4 points	A

Total A Grade= 583 yards

Lot AN-19-4414 GB Loom-60, Beam-92, ss-11

Yds	Defect Code	Point	Grade
30	9	4	
Roll 120	110 yards	4 points	A
40	2	4	
Roll 121	116 yards	4 points	A
50	9	4	A
Roll 122	77 yards	4 points	A

Yds	Defect Code	Point	Grade

Here, every fabric roll is a A grade Fabric. There is no C grade and cut pcs. Complete the fabric roll then the packing section, packing complete and store in the fioor.

Here, above the fabric roll inspection fabric defect code is maximum no. 2, 3, 5, 9, 10, 13 I saw that, every fabric inspection roll of fabric fault in 4 point system. Sometimes I get others fabric defect code but this fabric defect code is more. So, I can tell that, this inspection roll data is correct information.

3.16.3 Summary Total Percentage of Fabric Fault

Table 3.21

Sl No.	Fault Name	Fabric Roll	Quantity (Yards)	Total points	Percentage (%)
1.	Double Pick	2	110	8	1
2.	Miss Pick *	30	3137	152	17
3.	Broken Pick	9	997	68	11
4.	Smash*	19	2155	73	12
5.	Starting Mark	9	876	36	6
6.	End Out	2	163	8	1
9.	Loose Ends *	43	5061	298	25
10.	Tight Ends	9	974	30	7
11.	Knot	3	271	8	1
13.	White Mark	3	311	15	2
17.	Slub in Weft*	6	703	40	6
18.	Slub in Warp*	16	1841	68	10
19.	Thick Warp	1	125	4	1
	Total	**152**	**16724 yards**	**808**	**100**

Here is the above get total fabric fault according to percentage More Loose Ends, Then miss pick, Smash, Broken Pick, Slub in warp, Tight Ends, Starting Mark, Slub in weft, White Mark, Knot, End Out, Double Pick, Thick warp.

Here, I am stuy in the inspection fabric roll. Here this inspection fabric roll have 152. This inspection fabric in 152 roll I get more Table 4 fabric fault.Here this table fabric fault I get more defects Loose Ends total points 298. Then I get Miss pick total points 152.Then I get smash total points 73. Slub in warp total points 68. Broken pick total points 68.Slub in weft total points 40.Starting mark total points 36, Tight Ends total points 30, White mark total points 15, Double pick, End out, Knot I get total points 8 and more less total points I get Thick warp.

3.16.4 Fabric Inspection Report According to fabric defect

Table 3.22: For Example: Here the table Fabric defect code & point
***

Roll No.	Yards	Defect Code	Penalty point	Total points	Grade
20	100	9, 4, 2	4, 2, 4	10	A
21	117	2, 4, 9, 2	4, 2, 4, 4	14	A
108	110	2, 9, 2	4, 4, 4	12	A
109	104	10, 9, 9, 10, 9, 4, 19	2, 4, 4, 2, 4, 4, 4	24	A
110	63	9, 9, 2, 9, 10, 2	2, 2, 4, 4, 4, 4	20	A
111	115	9, 2, 2	4, 4, 4	12	A
112	115	10, 9	4, 4	8	A
113	123	2	4	4	A
114	133	2, 9, 4	4, 4, 4	12	A
115	133	2	4	4	A
116	130	2, 2	4, 4	8	A
117	100	5	4	4	A
118	90	9	4	4	A
119	90	2	4	4	A
120	110	9	4	4	A
183	117	9,13,13,5,2	4,4,4,4,4	20	A
185	53	5,9,6,17	4,4,4,2	14	A
188	120	5, 17, 17	4,4,4	12	A
189	120	17, 9, 17	4,4,2	10	A
190	101	17, 5	4,4	8	A
191	106	11, 17, 17, 17	2, 4, 2, 4	12	A
192	102	17, 17, 3, 4	4, 2, 4, 4	14	A
193	100	2, 9	4,4	8	A
197	101	18, 18, 9, 10	2, 2, 3, 2	9	A
176	100	18, 3, 10	3, 3, 3	9	A
177	101	18, 4, 3, 3	3, 3, 3, 4	13	A
178	84	18, 4, 13	2, 3, 3	8	A

Here above this table, According to Fabric inspection report I get more than fabric defect code. This fabric defect code is actual inspection data.Here this table every fabric roll is A grade, no C grade roll because if finished fabric is not problem.

3.17 Recent development of denim

Major focus areas of innovation and development are comfort, performance and environment friendliness. Use of special attachments on ring and rotor machines such as Amsler control to impart unique effects to the yarn. Use of multi-component in place of bi-component filament yarn is one such concept in the production of stretch denim yarns. Use of plied yarns on TFO to make denims. Use of slub yarns and multi-count yarns to impart fancy effects. Use of newly developed biochemical and cellulosic fibres such as Cupro, Modal, Promodal, Rayon and Tancel for softer blends of denim. Use of core spun with outstanding abrasion resistance and elasticity and etc. Blends of Bamboo and Hemp are under considerate experimentation for high end use denims. Use of engineered yarns has also found its way in the market because of the competition.

4 Discussion of Results

4.1: Effect of Finishing on Grey and Finished fabric properties

Table 3.2 1 show that after laboratory wash all the parameters e.g. width, EPI, PPI weight and shrinkage changed. It is seen that the change of shrinkage is more prominent in grey stage and very little in finished fabric. This has happened because after finishing the fabric becomes more compact so that it allowed less movement of the threads. Similarly it is seen that, after lab wash the EPI, PPI and weight increased but the increase was more prominent in grey stage than finished stage. This was because after finishing the fabric becomes more compact so that it allowed less movement of the threads. However samples 1, 2, 3 and 4 100% and have no lycra. Therefore width wise shrinkage is very little in these two fabrics. Sometimes this table I see that, weft shrinkage is high (-28.50%; 32.50%) because weft yarn is (150+40D) lycra so, weft shrinkage is more than less.

4.2: Effect of wash on finished fabric Width

Table 3.3 and chart 1 show the details of some finished fabric after. It shows that the shrinkage percentage is remarkably high for lycra based fabric. The table shows that though shrinkage in warp direction is relatively low but weft direction is remarkably high which was due to use of lycra yarns in weft direction. However samples 1, 2 and 8 100% and have no lycra. Therefore width wise shrinkage is very little in these two fabrics. Here this table, weft shrinkage is more than less is same of finished fabric width.

4.3: Effect of weave on Grey & Finished fabric wash

Table 3.4 and chart 2 shows the effect of weave structure on fabric properties before and after lab wash. Data of three different weaves were presented and found that weave does not have any significant effect on shrinkage. However samples 1 and 4 are 100% and have no lycra. Therefore width wise shrinkage is very little in these two fabrics.

4.4: Effect of color on Grey and Finished fabric wash

Table 3.5 and Chart 3 show the effect of color on fabric properties before and after lab wash. Data of four different colors were presented and found that a color does not have any significant effect on shrinkage. However samples 1 100% and have no lycra. Therefore widthwise shrinkage is very little in these two fabrics.

4.5: Effects of warp and weft count on the properties of Grey & Finished fabric wash

Table 3.6 and chart 4 shows the effect of warp and weft count on fabric properties before and after lab wash. Data of six different warp and weft count were presented and found that warp and weft count does not have any significant effect on shrinkage**.** However samples 1, 2, 3 and 4 are 100% and have no lycra. Therefore widthwise shrinkage is very little in these two fabrics.

4.6: Effect of wash on EPI & PPI of Grey & Finished fabric

Table 3.7 and chart 5 shows the effect of EPI and PPI on fabric properties before and after lab wash. Data of six fabrics having different EPI and PPI were presented and found that weave does not have any significant effect on shrinkage, however in case lycra as weft PPI increased due to greater shrinkage in the weft direction. However samples 1 and 2 are 100% and have no lycra. Therefore widthwise shrinkage is very little in these two fabrics.

4.7: Effect of wash on fabric weight of Grey & Finished fabric

Table 3.8 and chart 6 shows the change of fabric weight before and after lab wash. Data of 6 fabrics were given; it was found that fabric weight was not affected by lab wash. However samples 1, 2, 3 and 4 are 100% and have no lycra. Therefore widthwise shrinkage is very little in these two fabrics.

4.8 Effect of wash on Shrinkage, bowing, Skew & Movement of Grey & Finished fabric

Table 3.9 and chart 7 shows the change of fabric shrinkage, bowing, skew and movement before and after lab wash data of 6 fabrics were given; it was found that fabric shrinkage, bowing, skew and movement was not affected by lab wash. Different types of after wash movement. However samples 1, 2, 3 and 4 are 100% and have no lycra. Therefore widthwise shrinkage is very little in these two fabrics.

4.9: Effect of wash on different and percentage of Grey & Finished fabric

Table 3.10 and chart 8 shows the effect of grey and finished fabric different and percentage on fabric properties before and after lab wash. Data of six different grey and finished fabric different and percentage were presented and found that fabric different and percentage does not have any significant effect on shrinkage. However samples 1, 2 and 3 are 100% and have no lycra. Therefore widthwise shrinkage is very little in these two fabrics.

4.10 Fabric 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.

Here, I am stuy in the inspection fabric roll. Here this inspection fabric roll have 152. This inspection fabric in 152 roll I get more Table 4 fabric fault.Here this table fabric fault I get more defects Loose Ends total points 298. Then I get Miss pick total points 152.Then I get smash total points 73. Slub in warp total points 68. Broken pick total points 68.Slub in weft total points 40.Starting mark total points 36, Tight Ends total points 30, White mark total points 15, Double pick, End out, Knot I get total points 8 and more less total points I get Thick warp.

5 Conclusion

The work reported in this thesis is a detailed account of the effect of fnishing treatment on the residual change of the various properties of denim fabric. The residual change has been evaluated by washing the fabric samples. The properties that were considered were width, counts of warp and weft, EPI, PPI, weight in oz/sq.yd and shrinkage. It was observed that after finishing, residual change in all the properties decreased to the optimum level. Therefore the intened garment made from the fabric would be user-friendly. It was found that change in width was greater at the grey state then the finished state, however, the change was extremely high for fabrics having lycra in the weft direction. This was due to a construction in width, and the change was too high at both grey as well as the finished state. Like width, obviously, the EPI also changed in the same manner. The residual change of PPI is also significant and for lycra fabric, the change is more significant. The residual change of fabric weight is also in existence and the change is more prominent for lycra fabric. The change of shrinkage was the most significant, even after finishing the lycra fabrics show substantial residual shrinkage. Between warp and weft shrinkage, the change was more significant in the weft direction than warp direction.

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