Project Report

On

COMPARISION ON TUBE FINISHED AND OPEN FINISHED KNITTED FABRIC PARAMETER

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DECLARATION

We hereby declare that, this project has been done by us under the supervision of Md. Azharul Islam, Senior Lecturer, Department of Textile Engineering, Faculty of Engineering, and Daffodil International University. We also declare that, neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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ABSTRACT

This thesis presents an analysis and comparative study between open finish and tube finish on the properties of knitted fabrics . For this project work two types of yarn count (28 s/l Comb yarn for single jersey with m/c 36x24 and 38x24 and 40 s/l comb yarn for double jersey with m/c 36x18) were used. In this project the sample were produced from same lot 337. Two types of fabric which were knitted (single jersey and rib) from combed yarn. Then the various quality parameters such as CPI, WPI, stitch density, GSM, shrinkage, width, and Spirality were tested after finish the sample in open and tube format finishing. After testing, the overall results showed that the knitted fabrics finished from open form given lower less thick thin, less width variation or exact width, lower spirality, lower shrinkage , higher bursting strength , desired GSM , higher CPI, higher WPI, consistency compare with knitted fabric finished from tube format and these are the key achievement of this project work. Finally, after completing the project it can be said that the result of S/J-140 GSM, S/J-150GSM, Rib (1x1)-160 GSM samples are showing overall good properties like shrinkage, GSM, spirality, exact width when the sample finished in the open format and the result always reach towards standard format.

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Chapter 01

Introduction

1.1 INTRODUCTION

The use of knitted fabric has been rapidly increasing in world wide. . Now-a-day it's demand also highly. Both men & women feel comfortable wearing knitted fabric for their shape fitting properties, softer handle, less cost, easy wearing properties, bulkier nature and high extension at low tension compared to woven fabric.

Tube finished is mainly used now piping, decorative purposes, special items. This type of special purposes Tube finished is mainly used now. Otherwise Open finished is used vastly in kitted garment like as; T-shirt, Polo shirt, Tank top, Hosiery, Trouser, Ladies wear, Baby wear, women suits etc.

In a comparison between two types of finished, we are easily got that which is mostly effectiveness, good properties and economical for us. In knitted fabric, Tube finished and Open finished is widely used in knitted garment. But some of special advantages Open finished are more popular than Tube finished. In a example Spirality, shrinkage are good in Open finished, otherwise more impurities, uneven Dyeing, variation of shade percentages, trash content, fabric become compacted in Tube finished.

Knitted fabrics or finished articles made from such fabric, composed of a series of interloopings of one or more yarns and produced on aknitting machine. In contrast to other textiles, knit goods have the ability to stretch in all directions because the loops are able to change theirshape and size. The loose, looped structure gives knit goods softness and wrinkle res istance. Knitted fabrics are used in the manufacture ofclothing, artificial fur, lace, fishing nets, an d industrial and medical products.

1.2 OBJECTS OF THESIS

The fabric properties after tube finish and open finish are not same. Tube finish and open finish conveys different properties to the knit fabrics. From this interest this topic was selected to observe the fabric properties after tube finish and open finish. Further objectives of the thesis are given below:

- To know the variation of WPI, CPI and stitch density after tube finish and open finish.
- To know about measure Shrinkage test
- To know about measurement of GSM test.
- To know about measurement of Spirality test.

Chapter 02

Literature Review

2.1 Literature Review

Review of recent research work

Generally Open finished and Tube finished are used in knitted finishing. Four different fabric are manufactured in approximately same machine around 10 kg. Divided into two group open finished and tube finished are applying. Mainly follow up GSM, WPI, CPI, Stitch Density, Sprirality, Shrinkage.

M.A. Shahid [1] et al. produced Single jerseys knitted fabrics were produced from different yarn count (26s/1, 28s/1,and 30s/1)using different stitch length(2.58mm,2.63mm, 2.68mm, 2.70mm and 2.73mm) with positive feed device in Jiunn long knitting machine. The fabrics were dyed in light shade bya winch dyeing machine, dried with Unitech Stenter machine and compacted by Ferraro compactor using selected parameters. The results showed that spirality% were lowest for 26/1 Ne, 28/1 Ne and 30/1 Ne knitted fabrics at stitch length 4.58mm,2.70mm & 2.73mmbefore compacting and at stitch length 2.68mm,2.68mm & 2.73mmaftercompacting respectively.

K. Hasan et al. [2] predicted the yarn count, stitch length and appropriate machine gauge in order to produce fabric of certain GSM is of great importance in this regard. They aimed at emphasizing the importance of the linear relationship among those quality parameters and implementing statistical methods and techniques in order to develop a linear relationship among different quality parameters in making different weft knitted fabrics.

Murugesh Babu. K * and Selvadass. M [11] The results show that the properties of the fabric changes to a considerable extent after each stage of wet processing. It is observed that the pretreatment of the greige fabric has greater influence on the fabric properties primarily due to shrinkage of material.

Dr. Subrata Das [3] Compaction reduces the length of the fabric based on its elongation during processing which,
in turn, reduces the width. It helps in controlling the shrinkage of the fabric. There are two types of
compactors - open and tubular. In tubular compactor, the squeezing line gets on the sides in this process
and is done on natural movement thus controlling spirality. If the wales are straightened manually then it
results in spirality.

CHAPTER 03

THEORETICAL BACKGROUND

3.1 THEORIES BEHIND THE THESIS

3.1.1 Knitting:

Knitting is a method of converting yarn into fabric by intermeshing loops, which are formed with the help of needles. In other word, the process in which fabrics are produces by set of connected loops from a series of yarns in weft or warp direction is called knitting. Knitting may be done by hand or by machine. There exist numerous styles and methods of hand knitting. Different yarns and knitting needles may be used to achieve different end products by giving the final piece a different color, texture, weight, and/or integrity. Using needles of varying shape and thickness as well as different varieties of yarn can also change the effect.

3.1.2 Types of Knitting:

Knitting is done by set of connected loops from a series of yarn in warp or weft direction. Knitted fabrics are divided into two main types; they are

i. Warp knitting

ii. Weft knitting

3.1.3 Warp Knitting:

In a warp knitted structure each loop in the horizontal direction is made from different thread. Sweater is made by this warp knitting techniques.

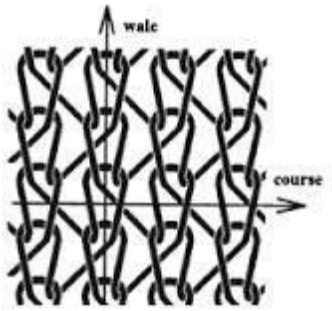


Fig: Warp knitting

3.1.4 Weft Knitting:

In a weft knitted structure a horizontal row of loops can be made using one thread and the thread runs in the horizontal direction. Most of the knitted fabrics are produced by weft knittin

3.1.5 Terms of weft knit:

3.1.5.1 Loop:

The needle loop is the basic unit of knitted structure. When tension in the fabric is balanced and there is sufficient take-away tension during knitting, it is an upright noose formed in the needle hook. It consists of a head and two side limbs or legs .

At the base of each leg is a foot (F), which meshes through the head of the loop formed at the previous knitting cycle, usually by that needle. The yarn passes from the foot of one loop into the foot and leg of the next loop formed by it. (NB: If the loop is the first loop knitted on that needle, its feet and legs will not be restricted and it will open out to give the appearance of a tuck loop. If the loops are knitted on a flat machine with a pressing down device and no take-down tension, the loops will be more rounded and will tend to incline due to the traversing movement of the presser.) In warp knitting the feet may be open or closed at the base of the loop. In the latter case, the yarn guide has passed across the back of the needle across whose hook it has previously formed a loop

3.1.5.2 Course and wales: In weft knits the interloop links two consecutive loops placed horizontally; when one loop breaks, the entire fabric can be undone simply by pulling the free end of the yarn. From a physical point of view, a fabric can be described as a flexible structure, made up by the vertical and horizontal repetition of two elements: the course and the wale. The word “course” defines a row of horizontal loops, belonging or not to the same yarn; “wale” means a row of loops laid vertically one upon the other. (Saville, 1998) In other word, course is discussed as A course is a

predominantly horizontal row of loops (in an upright fabric) produced by adjacent needles during the same knitting cycle. In weft knitted fabrics a course is composed of yarn from a single supply termed a course length. A pattern raw is horizontal row of cleared loops produced by one bed of adjacent needles

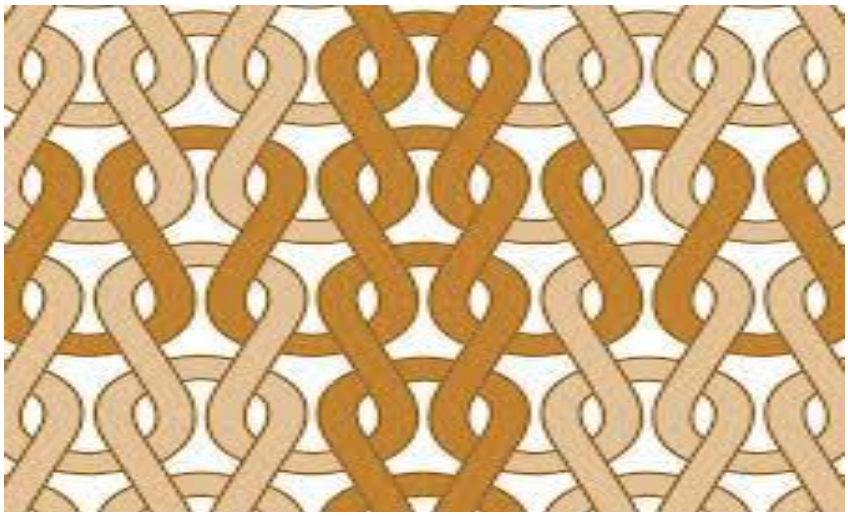


Fig: A courses and a wale.

In a plain weft knitted fabric this is identical to a course but in more complex fabrics a pattern row may be composed of two or more course lengths. In warp knitting each loop in a course is normally composed of a separate yarn.

A wale is a predominantly vertical column of needle loops produced by the same needle knitting at successive knitting cycles and this intermeshing each new loop through the previous loop. In warp knitting a wale can be produced from the same yarn if a warp guide laps around the same needle at successive knitting cycles this are making a pillar or chain stitch lapping movement. Wales are joined to each other by the sinker loops or under laps .

3.1.6 Process flow chart of weft knitting

Yarn

↓

Set

↓

Knitting

↓

Withdraw

↓

Weighting

↓

Inspection

↓

Grading

Figure: 3.1.6: Flow chart of knitting fabric production

3.1.7 Types of Weft Knitting:

i) Single Jersey

ii) Double Jersey

3.1.7.1 Single jersey:

The simplest and the most widely used weft-knit fabric is „jersey" or „plain" knit fabric. It consist of face loop stitches only on one side and back loop on another side. Single jersey produces by one set of needles. Single jersey is such as plain jersey. Polo pique, single lacoste etc.

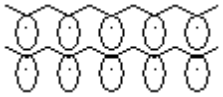


Fig : Notation diagram of single jersey.

Double Jersey:

3.2.1 Rib:

A double-knit fabric in which the rib wales or vertical rows of stitches intermesh alternatively on the face and the back of the fabric. Rib knit fabrics have good elasticity and shape retention, especially in the width.

A fabric with vertical rows of loops on both sides of the fabric and produces more stretch in the fabric.

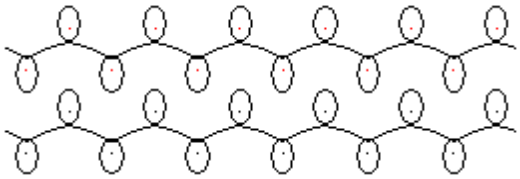


Fig: Notation diagram of rib.

A basic stitch used in weft knitting in which the knitting machines require two sets of needles operating at right angles to each other. Rib knits have a very high degree of elasticity in the crosswise direction. This knitted fabric is used for complete garments and for such specialized uses as sleeve banks, neck bands, sweater waistbands, and special types of trims for use with other knit or woven fabrics. Light weight sweaters in rib knit provide a close body hugging fit.

3.2.2 Fabric GSM: It stands for fabric weight in grams per square meter. One can determine GSM for woven and knitted fabric using following methods.

By means of instruments:

Apparatus required

i) Round GSM cutter and
ii) Weighing Balance.

The GSM of fabric is much more required for a fabric fineness or thickness. The GSM of fabric can measured byusing following formula.

$$\text{Weight per square meter (in gram)} = \frac{\text{Weight of the sample in gram X 10,000}}{\text{Area of sample in cm}^2}$$

3.2.3 Shrinkage:

Shrinkage is the process in which a fabric becomes smaller than its original size, usually through the process of laundry. Cotton fabric suffers from two main disadvantages of shrinking and creasing during subsequent washing. There are two types of shrinkage occurs during washing 1) Length wise 2) Width wise Shrinkage

 Cause: Due to high tension during preparation of fabric which result in excess stretch in yarn. This type of shrinkage is known as London shrinkage. Due to swelling of fibers for fiber structure. Glass plate Shrinkage

 Illustration of Shrinkage on Woven Fabric Caused by Fiber and Yarn Swelling.

 There are Two Kinds of Fabric Shrinkage: 1. Relaxation Shrinkage 2. Progressive Shrinkage Relaxation Shrinkage This occurs because the fibers and yarns are under tension when the fabrics are made. Later when the fabric is wet in a tensionless condition, relaxation occurs. Progressive Shrinkage This occurs each time a fabric is laundered. Unlike relaxation shrinkage which occurs only once, progressive shrinkage continues and the fabric shrinks a bit more with each laundering. Of the major fibers, only wool and viscose rayon are subject to progressive shrinkage. Shrinkage : Types

 Relaxation shrinkage: During manufactures fabrics and their component yarns are subjeceted to tension under varying conditions of temperature and moisture content, after manufacturing when the fabric is taken from the machine and keep on floor or store room, then the fabric tends to shrink, this type shrinkage is called relaxation shrinkage. Felting shrinkage: In case of wool fibers dimensional changes can be magnified by felting shrinkage. When untreated wool fibers are subjected to mechanical action in the presence of moisture. Compressive shrinkage: A process in which fabric is caused to shrink in length by compression. The process often referred to as controlled compressive shrinkage. Residual shrinkage: after washing the fabric is shrunk. This type of shrinkage is called residual shrinkage. Residual shrinkage is the main factor of garments industry.

 Causes: Shrinkage is mainly due to yarn swelling and the resulting crimp increase during washing in case of cotton fabrics. Yarn swelling percentage is more in polyester cotton blending yarn. Influencing factors: Twist factor: twist factor increases so that shrinkage will be increases. Stitch length: stitch length increases so that shrinkage will be increases. GSM: GSM increases so that shrinkage will be decreases.

 FOR 100% Cotton Plain Single jersey and Rib effect of GSM on Shrinkage (Tumble Dry): Sample No. Shrinkage 120 GSM 130 GSM 140 GSM 160 GSM 180 GSM Length wise Width wise Length wise Width wise Length wise Width wise Length wise Width wise Length wise Width wise 01 -6.5% -5% -4.4% -5% -3.62 -1.96 -3.32 -2.18 -2.18 -2.08 02 -4.51% -4.16% -3.74 -2.09 -3.7 -0.96 -3.17 -2.5 -2.72 -2.13 03 -5.74 -2.41 -4.15 -4.9 -3.43 -6.06 -3.37 -2.33 -2.74 -2.17 04 -4.44 -3.92 -4.22 -3.37 -3.18 -4.12 -2.94 -2.29 -1.17 -2.19 05 -4.7 -6.12 -3.75 -0.99 -3.56 -4 -3.15 -2.2 -0.72 -2.03 etc.

3.2.4 Spirality:

Spirality is a dimensional distortion in circular plain knitted fabrics. The lengthwise rows of stitches, called wales or needle lines, should occupy a truly vertical line in the fabric and should always be at right angles to the cross wise courses of stitches. This perpendicularity of wales to the courses is frequently, not the case and many times the wales may skew to the right or left forming an angle, which appears in the form of a twilled surface. This geometrical defect has been termed spirality of knitting in circular fabrics. The following figure shows the fabric with normal loop position and with spirality having wale skewness. Spirality has definite influence on both the functional and aesthetic performance of knitted fabrics and their garments.
Displacement or shifting of seams during the garment make-up mismatched patterns due to wale skewness, sewing difficulties etc. are some important practical difficulties due to spirality. As the dimensional properties of the fabrics are affected by spirality it is very essential to minimize or eliminate it altogether. This spirality problem is often corrected in finishing treatments by imposing distortion to fabrics so that the wales straighten out and subsequently set in new form. Though the setting by finishing treatments are normally achieved by using resins, heat, steam, mercerization etc, it is not permanent and after repeated washing, the wale skewness takes place.

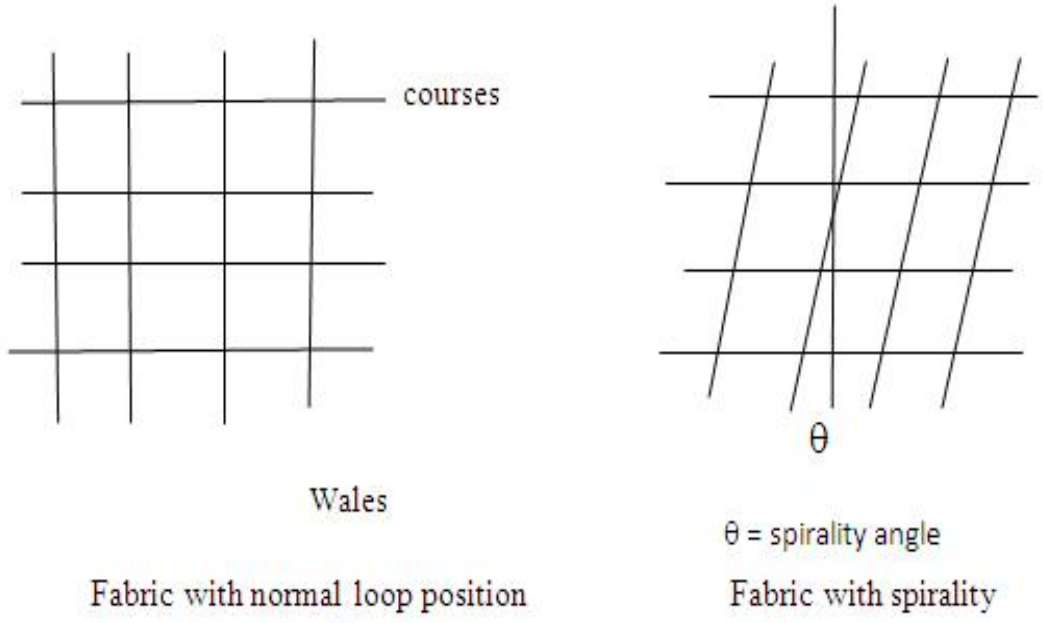


Fig: Measuring the spirality

CHAPTER FOUR

MATERIALS AND METHODS

4.1 Materials

The total thesis was conducted in Comfit Composite Textiles Ltd. In this time several tasks had been conducted according to this thesis topic. At first the fabrics were knitted from yarn by a circular knitting machine. After that it was dyed by dyeing machine then finished by finishing machine. With these processes all data was collected with the individual interval of each process.

4.1.1 Circular Knitting Machine:

Most of the high speed single jersey knitting machines is circular type. It is very popular for its higher production rate and easy operating system and maintenance. Because of the structure of this machine it needs limited space and have more scopes to involve the auto motions like stop motions, sensors, detectors, cleaning and auto lubrication systems.

Figure: Circular Knitting Machine

4.1.2 Machine Specification(Jersey):

Machine Name : Jiunnlong
Needle : 1884 & 2260
Feeder : 78 & 90
Dia : 36” & 38”
Gauge : 24G
Origin : Made in Taiwan.

4.1.3 Machine Specification(Rib):

Machine Specification:
Machine Name: Fukuhara
Needle: 1696x2
Feeder: 60
Dia: 30”
Gauge: 18G
Origin: Made in Japan.

Fig : Rib circular knitting machine.

4.2 Dyeing machine specification:

Machine Name: DILMENLER.

Origin: Turkey

Machine Type: DMS-12 HT ECOFLOW

Nozzle: 01.

Capacity; 100kg

Maximum Working Teperature: 135’c

Maximum Working Pressure: 3.5Bar

Fig: Dyeing machine

4.3 Finishing:

After dyeing, knit fabric requires to finish. During dyeing some knit fabrics are dyed in tubular form . According to the fabric types it needs to be tubular or open form in dyeing time. Normally the Lycra fabrics which are required to heat setting, these types of fabrics are open form. **.** To conduct this thesis, tube finishing is performed.

Following m/c Used

□□De-watering

□□Dryer

□□Open compactor

4.3.1. Dewatering machine:

4.3.1.1 Specification of Dewatering Machine:

Machine Name: Bianco

Origin: Italy

Construction year: 2012

Velocity max: 90 m/min

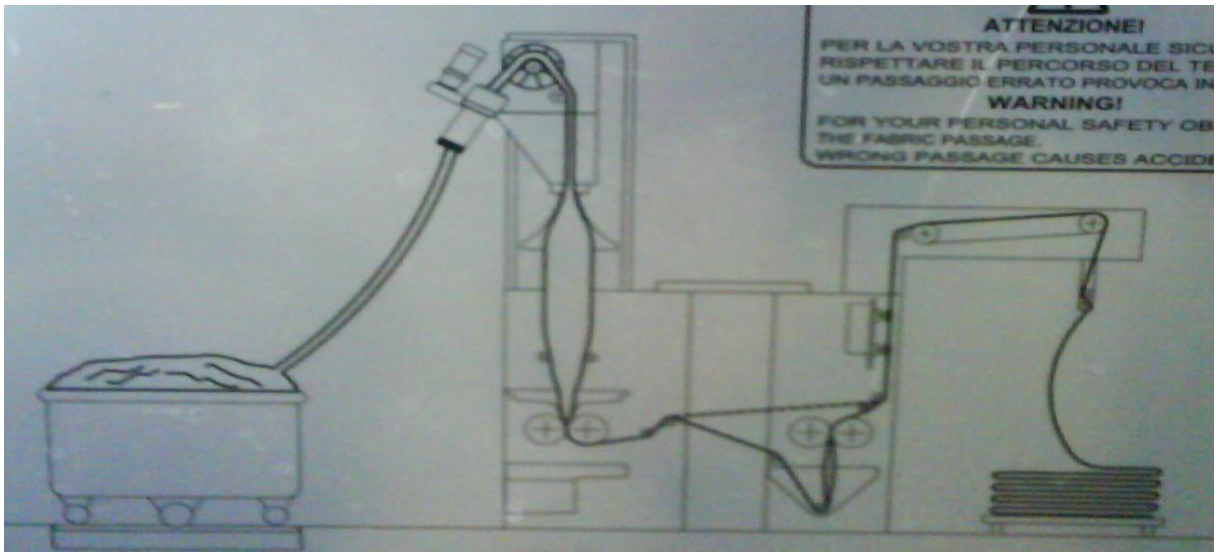


Fig: Dewatering machine

4.3.1.2. Dryer m/c &Specification:

Brand Name: LK

Year of Manufacture: 2006-03

Company: LK & LH

Type: CF42800NG

Origin : Taiwan

Max. Working Speed: 30 m/min

Min. working Speed : 5~15 m/min

Overfeed Range : 0% to 40%

Max Temperature : 2500C

Min Temp: 100

No of Blower: 4

No of Chamber: 4

No of Burner: 4

Fig: Dryer machine

4.3.1.3 Tube Compactor Machine:

Specification:

Brand Name: FAB-CON

Company: Machinery Development Corporation.

Origin : USA

Serial no. : 06483

Fig: Tube compactor machine.

Important parts:-

i. Over feed roller.
ii. Steam sprayers.
iii. Expander.
iv. Cylinder (2)
v. Blanket (2)
vi. Teflon covers.

Operational parameter:-

- Set the temperature at 110-139^{0}C (as required)
- Set the speed as much as possible (15-25m/min). GSM, m/c speed
- Set the over feed %as required; to increase GSM, overfeed need to increase to a certain limit.

4.1.3.4 Stenter machine:

Brand Name: LK

Year of Manufacture: 2006-03

Company: LK & LH Company LTD

Max capacity: 8 ton/day

Origin : Taiwan

Normal Working capacity: 6 ~7 ton /Day

No of Chamber: 8

No of Burner: 8

No of Blowers: 16

MFG No: S01643

Type : SE82800NGPL

W/W: 2650

Fig: Stenter machine.

4.2 Testing materials:

4.2.1 CPI, WPI Measuring material:

4.2.1.1 Counting glass:

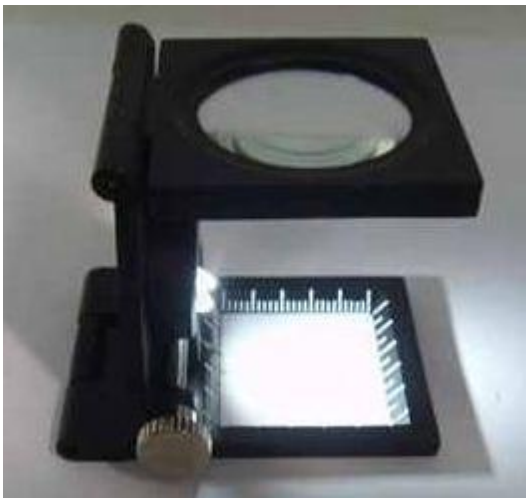


Fig: Counting glass.

For close observations of knit fabrics in one inch square area, counting glass is used. With the help of counting needle CPI, WPI and stitch density can be measured physically. This equipment contains a magnifying glass for larger view of small stitches of fabrics.

4.2.1.2 Stitch length counting materials:

Scale and pen: Pen is used to count the wales (it may be 50 or 100) with the help of counting glass and scale is used to measure the length of the course length contains those wales.

4.3 GSM checking material:

4.3.1 GSM cutter and digital balance:

GSM is the short term of Gram per Square meter which expresses the weight of fabrics. To test the GSM of a fabric a round cutter is used known as GSM cutter.

Fig: GSM cutter& weight balance.

4.3.2 Shrinkage and spirality test:

Shrinkage and spirality are very important properties of single jersey weft knit fabrics which is measured after washing. Because, this properties of knit fabrics are observed after wetting and drying consecutively

4.3.3 Washing machine specifications:

Brand name: LG
Capacity: 6 kg
Standard method: ISO 6330
Company and origin: LG, China.

Fig: Washing machine.

4.4 Methods

Both 28/1 for single jersey & 40/1 for rib have been used to knit total two different samples; single Jersey, 1x1 Rib fabrics. All machine parameters of knitting machine like stitch length, take down tension, sinker timing, yarn feeder position, spreader width- were fixed for same construction fabric in order to observe the variations. All these knitted samples were dyed on dyeing machine on a single batch with a fixed recipe. After that samples were dried on stenter and compacted of compactor. The same and compactor machine setting was same for all the samples. The required tests were performed by collecting necessary samples from all these finished same.
Knitting, dyeing, finishing and testing methods are discussed below:

4.4.1 Knitting method:

As all the machine parameters were same for same fabrication, only needle arrangement and cam arrangement was done and installed on the machine. The machine parameters were kept like follows according to fabric type:

M/c specification	Yarn type	Yarn count	Fabric type	M/c rpm
36x24	combed	28s/1	single jersey()	20
38x24	combed	28s/1	single jersey()	22
36x18	combed	40s/1	rib()	22
36x18	combed	40s/1	rib()	25

4.4.2 Dyeing method:

The total knit fabrics were stitched together for dyeing. Total 10 kg knit fabrics were dyed with the following parameters:

Fabric Type	Shade%	M:L	Temp
Single jersey	1%	1:6	90
Rib	2%	1:6	90

Table: 4.4.2 Dyeing Method

4.4.3 Finishing method:

After dyeing it is necessary to dry the fabric before compacting. Stenter was implemented to dry the samples by maintaining same parameters.
Compactor was implemented after drying for the final GSM and fabric width. In this case, compacting parameters also were same.

Table 4.5 Finishing Parameters:

Machine name	Set dia	Overfeed	Speed	Temp
Lk stenter	52”	60%	20	140
Lafarz compactor	50”	60%	16	150

4.5.1 CPI & WPI Test:

By a counting glass and counting needle,the total number of courses and wales were calculated on 1 inch at every stages (Grey & Finished). The daviations of the values of Combed sample are calculated.

4.5.2 Stitch length:

Total n (100) numbers of wales were counted by a counting glass then they were measured by a millimeter scale. After measuring the scale measurement is divided by number of wales (100). Then we get the stitch length in millimeter.

4.5.3 Stitch density:

Stitch density is the number of total loops per square inch. There have an equation to calculate the stitch density.
Stitch density= WPI X CPI

This stitch density has a direct impact on the fabric properties like air permeability, water permeability, dimensional properties, thickness, aesthetic properties of fabrics etc. WPI and CPI don't have any direct effect on weft knit fabrics except the stripe effects like horizontal and vertical effects. WPI and CPI together affects the stitch density, it means the total number of loops on specific area. We got Stitch Density both Grey and Finish fabric from this method.

4.6 Shrinkage test of knitted fabrics:

Method: ISO 3759/6330/5077

The general procedures for preparing and marking out of samples are laid down in the British standard. Many shrinkage tests follow very similar lines differentiated only by the treatment given to the fabric, so that these procedures may be followed if no specific test method exists.
For critical work recommended sample size is 500mmX500mm and for routine work a minimum sample size for 300mX300mm is considered sufficient.350mmX350mm sample size was considered for this thesis work. Shrinkage can affect both Length wise and Width wise. That's why both the parameters were in observations.

Working Procedure:
The sample was spread on table. Then a glass template was placed on sample fabric which is square size. There has six marks on glass template and distance between two marks is 35 cm. A 35cmX35CM sample was marked by permanent marker. Then sample is sewn by hand sewing machine. Sample is ready for washing. Simple washed at 60˚c temp for 90 min at washing. after washing the fabric is taken out. Dry can be performed by any of the method, it can either Line Dry or Flat Dry or Tumble Dry. Line dryer was used for this thesis. After drying distance between the mark lines on both wale and course way were measured and by the following equation the shrinkage percentage was obtained.
Shrinkage % = (length of fabric before wash)-(length of fabric after wash))/ (length of fabric before wash) *100
Example, length of fabric before wash = 35 cm length of fabric after wash = 33 cm Now, Shrinkage % = {(35-33)/ 35} * 100 = 5.71% Here, Shrinkage is 5.71%. Normally shrinkage is acceptable less than 5%. But it can be change in case of buyer requirement.

4.7 Spirality Test of knitted fabrics:

Method: ISO 16322-2 Spirality or twisting in a garment is appeared after washing. As a result one of the side seams comes at front of the garment when wearer wears it. Spirality percentage depends on fabric torque and garment structure.

Procedure: By the following way we can test spirality.

Sample: Two piece of 50cm x 50cm fabric is taken for test.

i. Conditioning: put the sample in the table for 4 hours conditioning before starting test.

ii. Cut the sample 50cmx50cm and benchmark should be 35cmx35cm. stitch the sample (3 sides).by over lock sewing machine.

iii. Sample is washed in washing machine.

iv. All samples are driedon tumble dryer

.

4.7.1 Spirality test calculation:

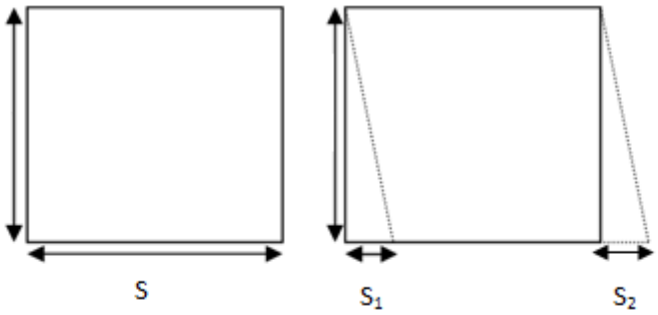


Fig: Spirality

Total length S= 47 cm

Twist in one end S_1= 2.3 cm

Twist in another end S_2= 2.2 cm

Average Spirality = (2.3+2.2)/2= 2.25 cm

So, Spirality= = 2.25/47*100=4.78%

Finishes Process of Knit:

After dyeing, knit fabric is required to finish. During dyeing all knit fabrics are dyed in tubular form. According to buyers requirement knit fabrics are finished in open form or tubular form. There are two flow chart of express to Open finished & Tube finished given below-

For Tubular Form Following M/Cs are Require:

Hydro-extractor

↓

De-watering

↓

Dryer

↓

Tubular compactor

For Open Form Following M/Cs are Require:

Hydro-extractor

↓

De-watering

↓

Dryer

↓

Slitter

↓

Stenter

↓

Open Compactor

To analysis this methods got following table which are given below-

4.8.1 Comparison between GSM of Grey, Open, & Tube Finished Fabric

Fabric Type	G. GSM	O. F. GSM	T. F GSM
S/J 36X24, 28 S	145	164	150
S/J 36X24, 28 S	148	170	153
Rib 36X18, 40 S	134	158	162
Rib 36X18, 40 S	122	150	154

4.8.2 Comparison between Stitch Density of Grey, Open & Tube Finished Fabric

Fabric Type	G. Stitch Density	O.F Stitch Density	T.F Stitch Density
S/J 36X24, 28 S	1404	1736	1814
S/J 36X24, 28 S	1540	2074	2232
Rib 36X18, 40 S	2450	2736	2920
Rib 36X18, 40 S	2112	2345	2448

4.8.3 Comparison between Spirality of Grey, Open & Tube Finished Fabric

Fabric Type	O.F Spirality	T.F Spirality
S/J 36X24, 28 S	3%	3.70%
S/J 36X24, 28 S	1%	2.60%
Rib 36X18, 40 S	2%	3.10%
Rib 36X18, 40 S	1%	2.10%

4.8.4 Comparison between Shrinkage Lengthwise of Grey, Open & Tube Finished Fabric

Fabric Type	O.F Shrinkage (Lengthwise)	T.F Shrinkage
S/J 36X24, 28 S	-4.28	-5.3
S/J 36X24, 28 S	-2.66	-3.4
Rib 36X18, 40 S	-4.85	-5.2
Rib 36X18, 40 S	-4	-4.6

4.8.5 Comparison between Shrinkage Widthwise of Grey, Open & Tube Finished Fabric

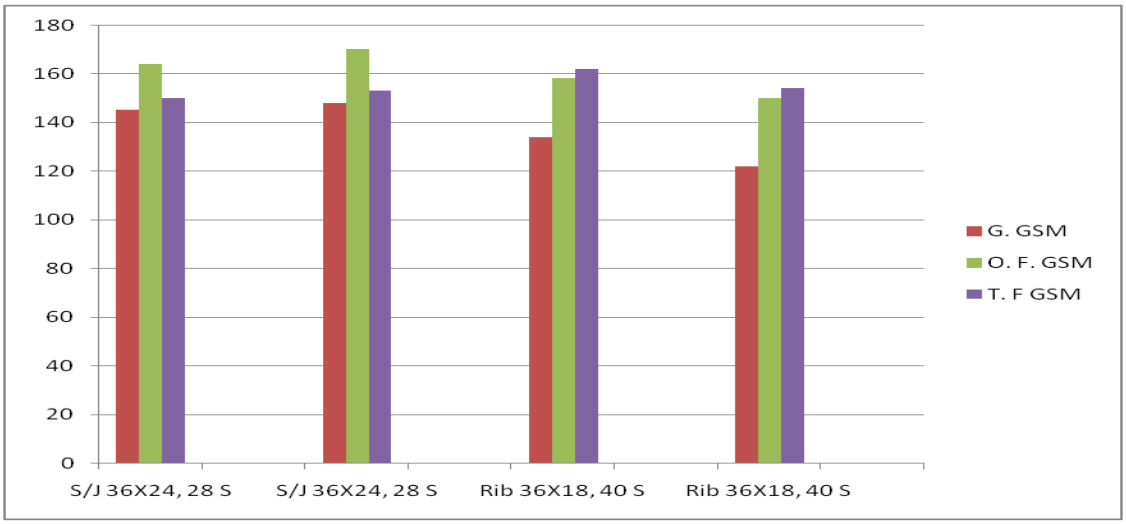
Fabric Type	O.F Shrinkage (Widthwise)	T.F Shrinkage
S/J 36X24, 28 S	-2.85	-3.5
S/J 36X24, 28 S	-2.66	-3.2
Rib 36X18, 40 S	-4.28	-4.65
Rib 36X18, 40 S	-3.33	-3.75

CHAPTER FIVE

Results and discussions

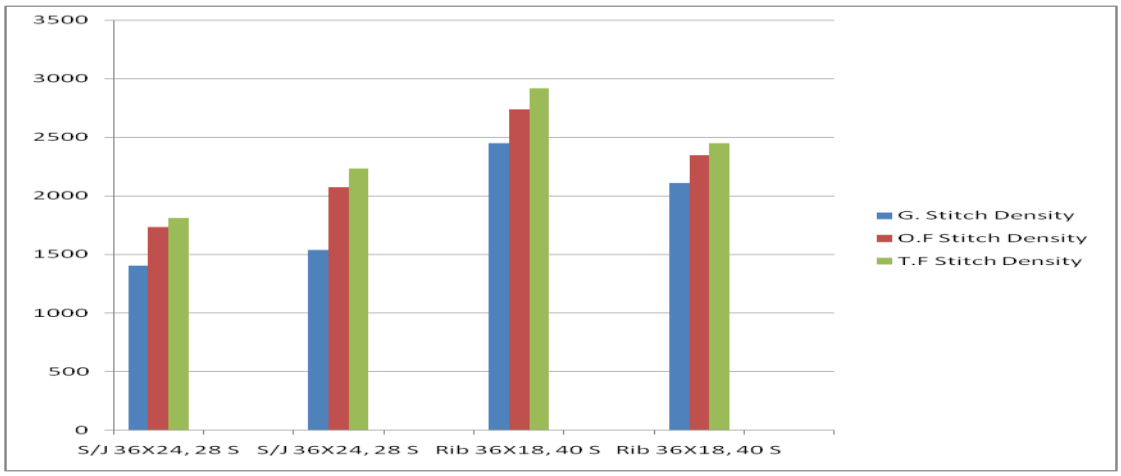
5.1 Results and discussions

To analysis two type of fabric got that, in case of Single Jersey fabric GSM are increased highly in Open finished fabric than Tube finished fabric. We got this from Table no 4.8.1.



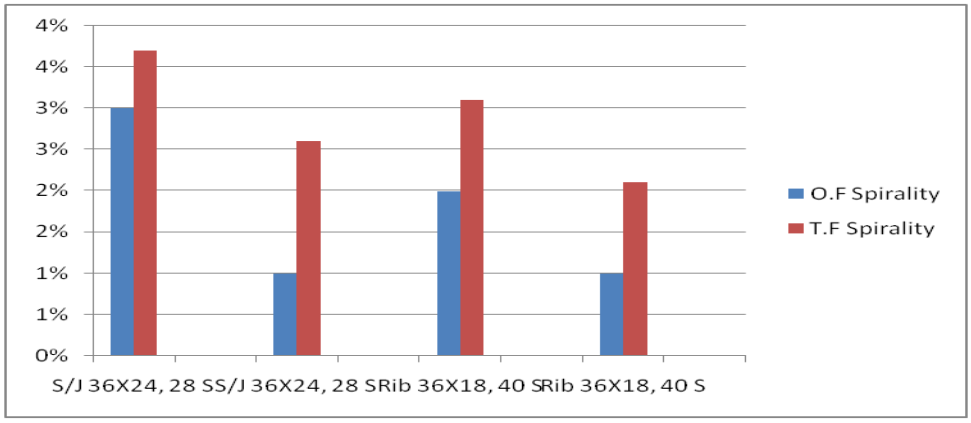
Graph: 01

To analysis two type of fabric got that, in case of Single Jersey and Rib fabric Stitch Density are increased highly in Tube finished fabric than Open finished fabric. We got this from Table no 4.8.2.



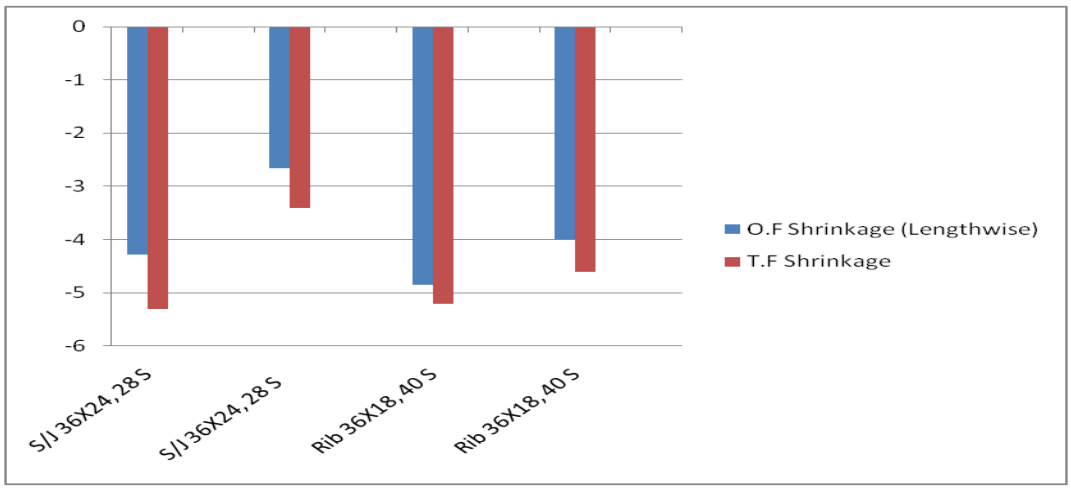
Graph: 02

To analysis two type of fabric got that, in case of Single Jersey and Rib fabric Spirality are increased highly in Tube finished fabric than Open finished fabric. We got this from Table no 4.8.3.



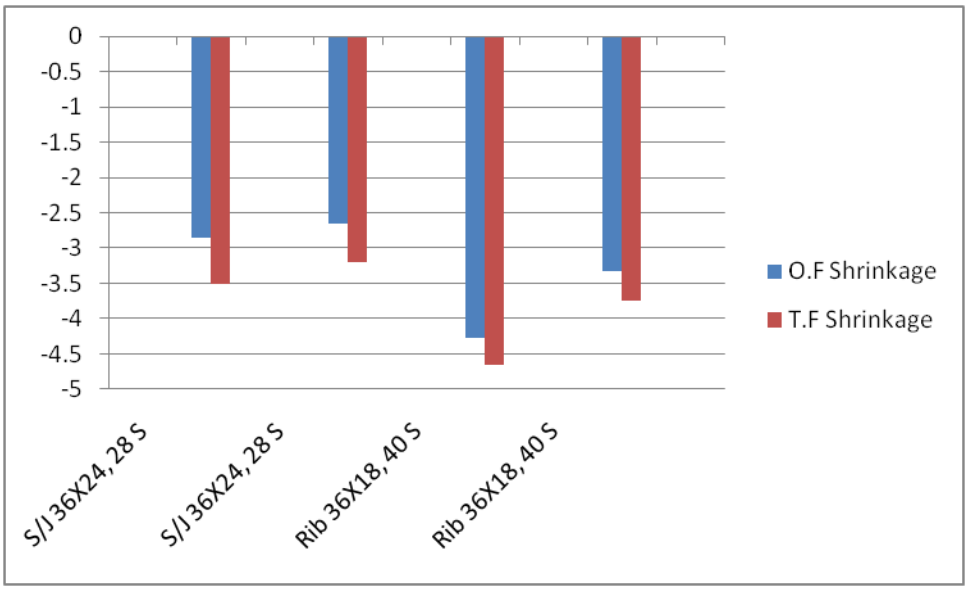
Graph: 03

To analysis two type of fabric got that, in case of Single Jersey and Rib fabric are increased highly in Shrinkage according to Lengthwise Tube finished fabric than Open finished fabric. We got this from Table no 4.8.4.



Graph: 04

To analysis two type of fabric got that, in case of Single Jersey and Rib fabric are increased highly in Shrinkage according to Widththwise Tube finished fabric than Open finished fabric. We got this from Table no 4.8.5.



Graph: 05

CHAPTER SIX

CONCLUSION

6.1 Conclusion:

6.1.1. Overall Discussion of Results:

 Usually tube finish fabric can give better GSM than open finish fabric.

 The tube finish fabric is not much better as open finish for spairality cause it has dust which can not fully removed cause its tube strutcure.

 Open finish fabric can give exact dia as required .

  Tube finish fabric is higher spairality than open finish fabric.

 Tube fish fabric has higher CPi&WPI than open finish fabric.

 Tube finish fabric has higher stitch dencity than open finish fabric,.

 In tube finish fabric the shrinkage% is not better as the open finish fabrics are.

 Tube finish knitted fabric width is lower than open finish knitted fabric.

6.1.2 Recommendations for future work:

I have done comparative study on only two types of knitted fabrics by open and tube finish format. May be this thesis expand to all kinds of knitted fabrics.

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