EFFECT OF WALE WISE INCREASING OF TUCK AND MISS LOOPS ON BURSTING STRENGTH OF SINGLE JERSEY FABRIC AT GREY AND FINISH STATE

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Abstract

Strength is a very important criterion for any material especially for fabric. To increase the durability and dimensional stability-strength plays a vital role. Of all types of weft knit fabrics single jersey fabric is very popular. This paper focused on the bursting strength of various derivatives of single jersey knit fabric in both grey and finished state. Derivatives of single jersey knit fabrics are found by using tuck and miss loops in corporate with knit loops in wales direction. Higher presence of tuck and miss loops in wales direction affect the bursting strength. From the total analysis it was observed that bursting strength decreases with the increasing of tuck (single pique, double pique, single lacoste, double lacoste) and miss loops (Single cross miss, double cross miss) than all knit loop containing fabric (plain single jersey). It is also observed that the bursting strength decrement of tuck loop containing fabric is higher than miss loop containing fabric as well as the lacoste & locknit fabrics have higher bursting strength than the pique & cross miss fabric.

Keywords: *Single jersey fabric, Tuck loop, miss loop, bursting strength, derivatives of single jersey fabrics.*

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1. INTRODUCTION

Of all knit fabrics knit fabrics are very popular for its feeling and extensibility. Weft fabrics are vastly used for daily uses. For the production perspectives, it is easy to produce knit fabric than woven fabric. As it is known that yarn used for knit fabric needs no preparations like warping and sizing, yarn can directly feed on machine after receiving from spinning mills. Feeling of knit fabrics can be modified by introducing miss and tuck loops on its structures where the basic knit structures contains knit loops only. These loops directly affect the bursting strength of knit fabrics. The aim of this paper is to observe the bursting strength variation occurs due to tuck and miss loops increment in wales direction.

A few studies have conducted to predict the bursting strength of knit fabrics. Unal P. G et al. [1] studied effects of yarn parameters, on the bursting strength of the plain knitted fabrics were examined with the help of artificial neural networks. It has been observed that the technique of neural networks showed better agreement with the prediction of the fabric bursting strength. The developed neural network revealed a good coincidence with the results of bursting strength. Therefore it can be stated that the neural network approach provides an effective skill for the prediction of bursting strength of the plain knitted fabrics only with a deviation of 3.75-8.75 %.

Ertugrul and Ucar [2] predicted the bursting strength of cotton plain knitted fabrics before manufacturing via using intelligent techniques of neural network and neuro-fuzzy approaches.

Akaydin M. [3] worked with the bursting strength of knit fabrics produced from combed ring and compact yarn. It was found that the bursting strength value of the compact yarn fabrics is higher than that of the combed yarn fabrics.

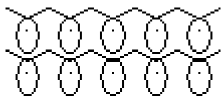
De Araújo and other authors have investigated mechanical behavior of weft-knitted fabrics for technical applications [4 – 7]. It has been established that knitted fabrics with longer miss loops were distinguished for improved extensibility. Thus, combining the stitches and misses of different length can be obtained the rigid or flexible structure.

Onofrei E. et al. [8] observed the thermal and moisture management properties for the changes of knitted fabric structures. Single jersey, cross miss, locknit and more few designs were selected to perform the study. It presented a quantitative study of various comfort related properties (thermal and moisture management properties) carried out on different knitted fabric structures containing Outlast® and Coolmax® yarns, and aiming at the selection the most adequate fabric for sportswear applications.

2. MATERIALS AND METHODS

Use of tuck and miss cams help to produce the derivatives of single jersey. Tuck and miss loops can be used in both wale wise and course wise. It is very popular to use tuck and miss loops in wales wise and known as different names as pique, lacoste, locknit and cross miss designs. Nine samples were knitted for this experiment and they are shown here with their cam arrangement and needle arrangement (Figure 1-9).

2.1 Single Jersey:



Needle arrangement: 1,2,1,2,1,2

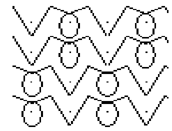
Fig 1: Notation diagram , needle arrangement and Cam arrangement of Single Jersey

2.2 Single Pique:

Needle arrangement: 1,2,1,2,1,2

Fig 2: Notation diagram , needle arrangement and Cam arrangement of Single pique

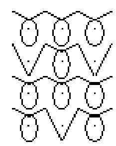
2.3 Double Pique



Needle arrangement: 1,2,1,2,1,2

Fig 3: Notation diagram , needle arrangement and Cam arrangement of double pique

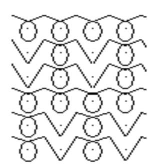
2.4 Single Lacoste



Needle arrangement: 1,2,1,2,1,2

Fig 4: Notation diagram , needle arrangement and Cam arrangement of Single lacoste

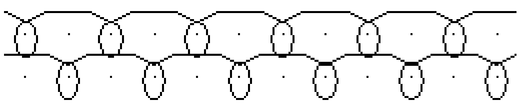
2.5 Double Lacoste:



Needle arrangement: 1,2,1,2,1,2

Fig 5: Notation diagram , needle arrangement and Cam arrangement of double lacoste

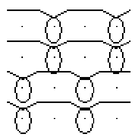
2.6 Single Cross Miss



Needle arrangement: 1,2,1,2,1,2

Fig 6: Notation diagram , needle arrangement and Cam arrangement of Single cross miss

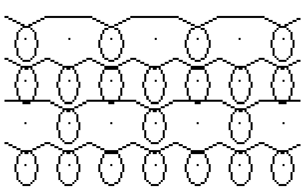
2.7 Double Cross Miss



Needle arrangement: 1,2,1,2,1,2

Fig 7: Notation diagram , needle arrangement and Cam arrangement of double cross miss

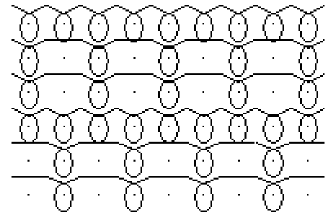
2.8 Single Locknit



Needle arrangement: 1,2,1,2,1,2

Fig 8: Notation diagram , needle arrangement and Cam arrangement of Single locknit

2.9 Double Locknit



Needle arrangement: 1,2,1,2,1,2

Fig 9: Notation diagram , needle arrangement and Cam arrangement of double locknit

All the samples were knitted with 30 Ne comb yarn in a 24 gauge circular knit machine having 21 inch diameter and stitch length of 2.60 mm.

After knitting, all the samples were then dyed on a dyeing machine & finished on tube dryer and tube stenter by maintaining standard procedures.Samples were prepared for bursting strength on laboratory and was tested on Autoburst machine(SDL Atlas, England) upholding ISO 13038-1 method.

Fig 10: Auto burst machine

2.10 Working Method of Bursting Strength Tester:

• A specimen was placed under the bell ensuring that it is flat and free from creases and distortions. Then the two clamp buttons was pressed.
• The standard flow rate was selected; this determines the speed at which the bell will inflate. The flow rate is often defined in the test method or standard being tested to.

• Clicked on "start".
• The diaphragm was automatically inflated until the specimen bursts.
• After burst occurrence the diaphragm returned to the zero position and the bell was unclamped.
• This procedure was followed for next 5 tests.
• After the required 5 tests the fabric was removed from the clamping area and the bell clamped over the diaphragm only.
• "start" button was pressed; the diaphragm automatically inflated to the mean distension reached on the series of tests. The diaphragm was deflated and the bell was unclamped. The results were then being shown on the screen; this result was collected and enlisted on table.

This procedure was followed for both grey and finished fabrics of all the nine samples and the tested values of pique are illustrated in Table 1 and Fig 11. The tested values of lacoste are illustrated in Table 2 and Fig 12, tested values of cross miss are illustrated in Table 3 and Fig 13 and tested values of lock knits are illustrated in Table 4 and Fig 14.

2.11 For Pique:

Table 1: Bursting strength of pique fabrics

Fabric Type	Bursting Strength(PSI)	
	Grey	Finish
Single Jersey	90	77
Single Pique	72	61
Double Pique	61	49

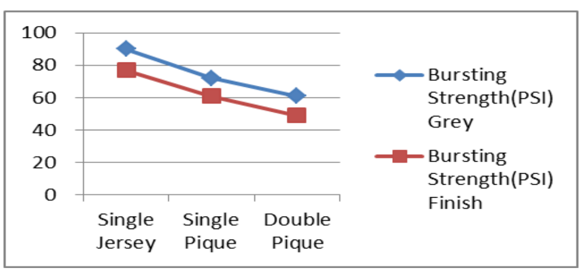


Fig 11: Bursting strength of pique fabrics

2.12 For Lacoste:

Table 2: Bursting strength of lacoste fabrics

Fabric Type	Bursting Strength(PSI)	
	Grey	Finish
Single Jersey	90	77
Single Lacoste	77	60
Double Lacoste	71	56

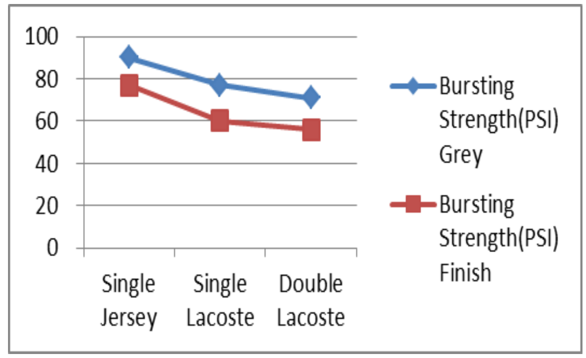


Fig 12: Bursting strength of lacoste fabrics

2.13 For Cross Miss:

Table 3: Bursting strength of lacoste fabrics

Fabric Type	Bursting Strength(PSI)	
	Grey	Finish
Single Jersey	90	77
Single cross miss	73	63
Double cross miss	66	55

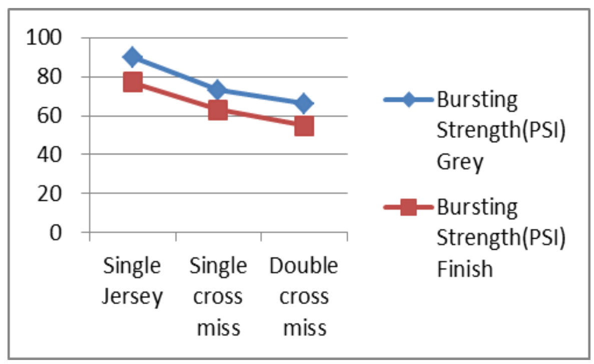


Fig 13: Bursting strength of lacoste fabrics

2.14 For Locknit:

Table 4: Bursting strength of locknit fabrics

Fabric Type	Bursting Strength(PSI)	
	Grey	Finish
Single Jersey	90	77
Single locknit	80	72
Double locknit	74	64

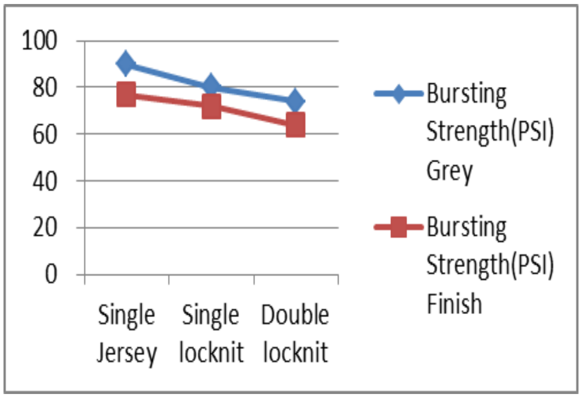


Fig 14: Bursting strength of locknit fabrics

3. RESULTS AND DISCUSSIONS:

3.1 Effect of Tuck Loops on Bursting Strength:

Table 1, table 2 and Fig 11, Fig 12 shows that bursting strength of pique design is lower than lacoste structure. In case of pique fabric [table 1 & Fig 11], it was observed that with the increasing of tuck loops bursting strength decreases. Grey and finish bursting strength of single pique (72 & 61 PSI) was found higher than double pique (61 & 49 PSI). Same result was found for lacoste fabrics; with the increasing of tuck loops bursting strength decreases where single lacoste grey and finish bursting strength (77 & 60 PSI) was higher than double lacoste (71 & 56 PSI) [table 2 & Fig 12]. On other hand, Grey and finish bursting strength of double pique was 61 and 49 in PSI whereas bursting strength of double lacoste design was 71 and 66 PSI. It means all knit course insertion on double pique design increases the bursting strength. For all structures finish bursting strength was lower than grey bursting strength. It was also observed that involvedness of tuck loops decreases the bursting strength.

3.2 Effect of Miss Loops on Bursting Strength:

Table 3, table 4 and Fig 13, Fig 14 indicates that after finishing bursting strength decreases for every observation. But the decrement of bursting strength in case of cross miss design is higher than locknit designs. Increasing of miss loops also reduces the bursting strength because single cross miss design shows the grey strength and finish strength as 73 and 63 PSI where double cross miss design shows 66 and 55 PSI [table 3 & Fig 13]. Same result found for locknit designs where single locknit designs shows 80 and 72 PSI in grey and finish state and double locknit shows 74 and 64 PSI [table 4 & Fig 14]. It can be also discussed that locknit designs have more bursting strength than cross miss designs. It means that all knit course insertion in cross miss designs increases the bursting strength of the fabrics.

4. CONCLUSIONS

For knit fabrics bursting strength is concerned whereas tensile strength is measured for woven fabrics. Knit, tuck and miss loops can be combined to produce different designed knit fabrics. After the experiment we can come to the following conclusion-

1. That higher tuck loop presence decreases the bursting strength; derivatives should be used made by concerning tuck loop's effect on bursting strength.
2. Miss loop also reduces the bursting strength but bursting strength of miss loop containing derivatives is higher than tuck loop containing derivatives.
3. Lacoste fabric shows more bursting strength than pique fabric at grey state. At finishing state, bursting strength of lacoste shows higher value than pique with the increment of tuck loops.
4. Bursting strength of locknit fabric is clearly higher than cross miss designs. It means, all knit course insertion on cross miss fabric increases the bursting strength.

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BIOGRAPHIE:

Md. Azharul Islam completed his graduation from College of Textile Technology, University of Dhaka. His interest area in textile is fabric manufacturing technology. He has teaching experience over 4 years and currently working at Daffodil International University.