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Research Article

Comparative Analysis of Seam Strength, Seam Slippage and Seam Efficiency of Lapped Seam and Edge Neatening Seam

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Abstract

Now a day's people are concern about their fashion, comfort and the longevity of the garment. This comfort and longevity mostly depend on seam properties like seam appearance and seam performance. Seam performance can be determined by seam strength and seam slippage. In the present study twill fabric of two different GSM and construction was collected and two types seam one is lapped seam (seam class 2) and another is edge neatening seam (seam class 6) has been made with particular count thread on them. Then seam strength and seam slippage was measured both in warp and weft direction. A comparison of seam strength, seam slippage and seam efficiency among the samples were analyzed systematically.

Introduction

The appearance and longevity of a garment largely depends on the appearance and performance of seam. A join can be done using different seam, but the strength and the appearance are not same for all seam. The quality of seam is the main factor for the overall performance of the apparel in use [1]. Overall seam quality is defined with various functional and aesthetic performances desired for the apparel product during their end use in apparel industry. Most preceding studies examined the functional performance of seam generally in terms of the seam strength and seam efficiency [2,3]. The seam performance denotes the strength, efficiency, elasticity, elongation, flexibility, stiffness, abrasion resistance, washing resistance and dry-cleaning resistance of the seam under conditions of mechanical stress for a reasonable period of time [4-6]. The selection of appropriate seam is a vital issue for better performance of apparel. Seam types is one of the aspect of impelling the overall performance of the seam in terms of durability, comfort, potential for alteration [7]. The proper relationship among the size and type of thread, the stitch density and its types and the texture and weight of the fabric lead the total exterior of a seam [8]. Some researchers put emphasis on the fabric cover factor as a considerable effect on seam strength and seam efficiency. Their study discovered that high cover factor fabrics tend to break the fabric yarns during sewing [9]. The breakage of yarns in fabric is the ultimate cause of the lessening of the seam functional performance such as seam strength and seam efficiency [10]. Higher density fabric has better seam strength than that of lower density [11]. A good sewing thread must have necessary tensile strength, should be uniformly twisted throughout the length, smooth and elastic, and plied yarn treated by special finishes to increase its abrasion resistance during sewing and can be spun from staple yarn, filament or core spun yarns. The thread must have wash fastness for several wash and grip the seams together for the life span of the garment [12]. Side seam of a shirt and inseam of a pant can be done with both lapped seam and edge neatening seam. Moreover, three thread and four thread overlock stitch can be used for edge neatening seam. In this study, twill fabric of two different construction was used for examining the performance and appearance of those seams. and a comparative analysis was presented in terms of seam strength, slippage and seam efficiency.

Material and Methods

Material

100% cotton twill fabric of two different construction was collected from Evitex Apparel Limited. The specification of the fabrics is shown in the Table 1 below. GSM cutter and electronic weighing balance were used to measure fabric weight in terms of gram per square meter by ISO 1964 methodology. Fabric yarn count was determined by ISO 3442 methodology. Fabric density (EPI,PPI) was measured by ISO 1963 method.

Table 1: Fabric Specification.

Fabric Specification	Sample 1	Sample 2
Warp count	12	32
Weft Count	16	40
Ends per inch(EPI)	67	120
Picks per inch(PPI)	57	84
Fabric width	57”	56”
GSM	167	134

Methods

Seam preparation: As the project was on the comparison of lapped and edge neatening seam, we made lapped seam on the two-sample stated above by feed of the arm (model no. PA928) sewing machine with 40/2 count thread. Edge neatening seam was made with 4 thread and 5 thread overlock stitch with 40/2 count thread by overlock machine (model no. JUKI MO 6714S for 4 thread overlock and DT757F-516M2-35 for 5 thread overlock).

Seam strength measurement: Seam strength of the six samples (lapped seam, edge neatening with 4 thread, edge neatening with 5 thread on two types of twill fabric) were measured individually by using grab method (ISO 13935-2). Here pull to load cell maximum speed was 50mm/min and break detection at 20%. A comparison among the measurements were presented graphically in result section.

Seam slippage measurement: Seam slippage of each sample was measured through fixed load method by ISO 13936-2. Here fixed load (maximum force) was used 60N, Speed was 50mm/min and measurement time was 30 seconds.

Fabric strength measurement: Tensile strength of both the fabric (red and green) were measured by ISO 13934-2 method. Here pull to load cell maximum speed was 50mm/min and break detection at 20%.

Seam efficiency measurement: After measuring fabric strength and seam strength, seam efficiency was measured by the following equation

$$\text{Seam efficiency} = \frac{\text{Seam strength}}{\text{Fabric strength}} \text{X100\%}$$

Warp way: Thus seam efficiency for sample 1 lapped seam = $\frac{281.1}{271.97}$X100%=109% sample 1 edge neatening seam(4 thread) $\frac{163.2}{271.97}$X100%=60%

And sample 1 edge neatening seam (5 thread) = $\frac{184.5}{271.97}$X100%=68%.

Weft way: Thus, seam efficiency for sample 1 lapped seam = $\frac{269}{201.06}$X100=133% sample 1 edge neatening seam(4 thread) = $\frac{193.7}{201.06}$X100=96%

And sample 1 edge neatening seam(5 thread) = $\frac{241.5}{201.06}$X100=120%.

Warp way: Thus seam efficiency for sample 2 lapped seam = $\frac{184}{229.53}$X100=80% sample 2 edge neatening seam(4 thread) = $\frac{158}{229.53}$X100=69%

And sample 2 edge neatening seam(5 thread) = $\frac{173}{229.53}$X100=75% .

Weft way: Thus seam efficiency for sample 2 lapped seam = $\frac{238.5}{155.76}$X100=153% sample 2 edge neatening seam(4 thread) = $\frac{160.6}{155.76}$X100=103%

And sample 2 edge neatening seam(5 thread) = $\frac{188}{155.76}$X100=120%.

Result and Discussion

Seam Strength

Figure 1: Seam Strength (warp way).

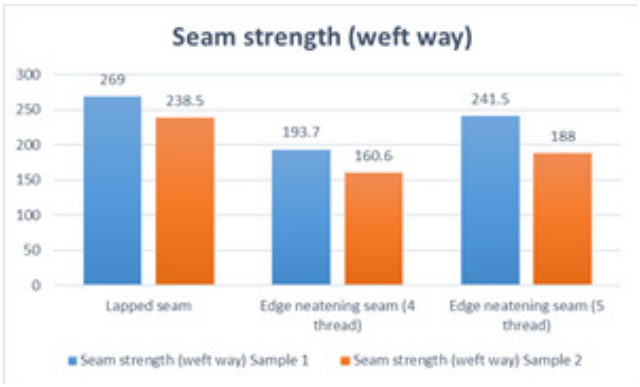

Figure 2: Seam Strength (weft way).

Here seam strength was measured with maximum speed 50mm/min. We can see the variation of the seam strength of different seam from the graphical representation figure 1. From the graph, It has been shown that sample 1 with lapped seam has the highest seam strength 281.1N. Then the strength is good for 5 thread overlock and last one is 4 thread overlock. Moreover, as the sample 1 has more GSM and strength in warp direction , it has

more seam strength than the sample 2 figure 2. From the above graph, it has been shown that sample 1 with lapped seam has the highest seam strength 269N. Then the strength is good for 5 thread overlock and last one is 4 thread overlock. Similar to the warp way, sample 1 has more seam strength in weft way because of high GSM and fabric strength.

Seam Slippage

Seam slippage was measured by fixed loaded method. We can see the variation of the seam slippage of different seam from the graphical representation. It is clear from the Figure 3 that seam slippage i.e. seam opening at maximum force 60N was greater for the sample 1 with 4 thread edge neatening seam, then higher for 5 thread edge neatening seam as it has less ends per inch. Both sample with lapped seam show good performance and less seam slippage. It has been seen from the Figure 4 that seam slippage i.e. seam opening at maximum force 60N was greater for the sample 1 with 4 thread edge neatening seam, then higher for 5 thread edge neatening seam as yarn density was low than sample 2. Both sample with lapped seam show good performance and less seam slippage.

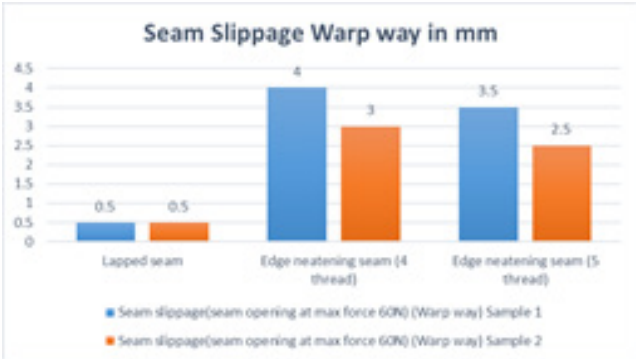

Figure 3: Seam slippage warp way.

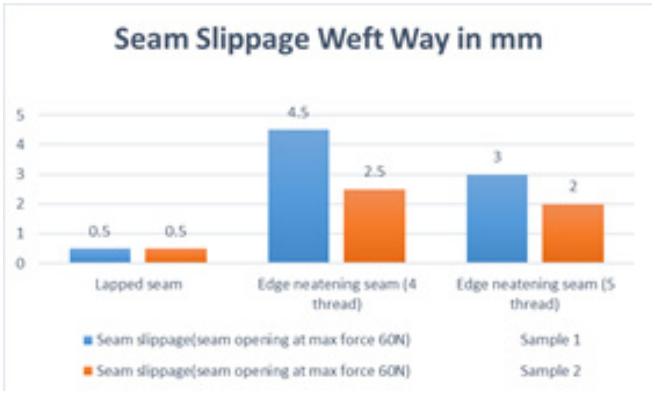

Figure 4: Seam slippage weft way.

Seam efficiency

Seam efficiency% was measured by divided seam strength by fabric strength. The values are presented graphically for each sample below From Figure 5 it is clear that seam efficiency was greater for sample 2 as seam strength was higher than the fabric strength and for lapped seam it has the highest value in warp way. From figure 6 it has been shown that seam efficiency is greater for all the variations of sample 2 as seam strength is higher than the fabric strength and for lapped seam it has the highest value i.e. 153% in weft way.

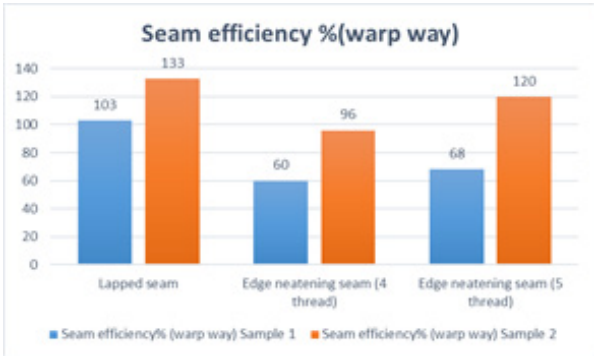

Figure 5: Seam efficiency% (warp way).

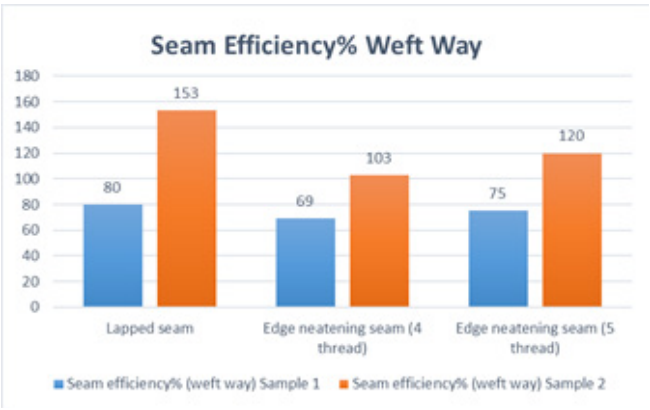

Figure 6: Seam efficiency% (weft way).

Conclusion

From the study it is clear that seam strength and seam slippage depends on the thread density and GSM of the fabric. In this study, we have found that lapped seam has the most seam strength then 5 thread overlock and then 4 thread overlock. Sample 1 has more seam strength as it's GSM and fabric strength are high . Moreover, it has less thread density, so its seam slippage is high. But sample 2 has more seam efficiency as its seam strength and fabric strength ratio is high than sample 1. From overall observation it can be concluded that lapped seam for both sample is the most effective in terms of seam strength seam slippage and seam efficiency.

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