IJISET - International Journal of Innovative Science, Engineering & Technology, Vol. 09 Issue 05, May 2022
ISSN (Online) 2348 – 7968 | Impact Factor – 6.72
www.ijiset.com

The possessions of various fabric type and seam schemes on the seams proficiency

Mst. Khodeza Akhter

Lecturer, Department of Fashion Design & Technology, Shanto-Mariam University of Creative Technology, House #1, Road#14, Sector#13, Uttara, Dhaka, Bangladesh.

Abstract

Seam plays vital roles for the apparel. It is the integral parts of an apparel or garments. The efficiency of seam deign depends on the various types of fibers of fabric like cotton or others. Fabricated clothing requires joining fabric together by some resources. A variety of methods include: sewing, pasting, thermally bonding, etc. This joined fabric is required to have similar strength at the point of joining as the original fabric. This method of joining is commonly called seaming. Seams are the basic element of structure of any apparel, home furnishing product and industrial textiles. The main focus of this investigation is to study the joining parameters of fabric using a standard sewing machine. Two different seam designs will be investigated on three woven fabrics made from cotton, wool and silk. Textile products are produced from various fibers and different fabric construction, hence finding a specific seam that will best suit each individual product. Fabric seams are the most significant parameter to maintain apparel or garments integrity.

Keywords: *Seam strength, Seam design, Cotton fiber, Wool fiber, Silk fiber, Seam scheme*

1. Introduction

There are so many fibers in the fiber world. For instance, cotton, silk, wool, polyester, nylon, acrylic, viscous, acetate, ploynosic, modal, tensile, lyocell etc. different fibers have different mechanical, chemical and thermal properties, that will directly affect the seam design as well as efficiency." Cotton is a natural fiber that grows within a pod from developing seeds. Cotton is also referred to as a seed fiber or cellulosic fiber. Cellulose is defined as a polymer of glucose found in all plant fibers. Once the seed is removed from the plant the initial step is to remove the fiber from the seed. Cotton is known as the most prominent seed fiber. Cotton grows in climates where the weather is above 70°F and is sufficiently irrigated. Cotton grows on. Wool is a natural fiber produced from animal hair. Wool was widely used before the Industrial Revolution. The most valuable wool comes from Merino sheep. Merino wool is three to five inches long and has a soft hand and luster. Different breeds of sheep vary in the type of wool they produce. Sheep are sheared once a year in the spring time. The fleece is removed in one continuous piece and the process begins at the legs and belly. Silk is a natural protein fiber produced from the larvae of a moth. The production of cultivated silk begins when moths lay eggs. Once the eggs hatch the caterpillars are fed fresh mulberry leaves. After about thirty-five days the caterpillars are ready to spin a cocoon. The silkworm begins moving its head in a figure eight motion on the straw frame that is placed specifically for this purpose. Seaming is the most common of fabric joining done today. Seams are constructed when two or more pieces of fabric are sewn together. The row of stitching joining the two or more pieces of fabric is known as the seam line.

2.0 PURPOSE OF STUDY

This research will lead to the optimization of seam designs for cotton, wool and silk fabrics that are used in home furnishing and apparel manufacturing. From this purpose of study, the following specific objectives will be addressed:

- Regulate the effect of two different seam designs on fabrics produced from cotton, wool and silk yarns.
- Define the range of seam efficiency within the same fabric utilizing a specific seam.
- To find out which seam design produces the highest seam strength for each of the three fabrics

3.0 LITERATURE REVEIW

This thesis will examine the features of the fabric and how they are comprised. It is essential to have a background of the processing of fiber to the finish product, fabric. Once the construction of the fabric is complete various parts of a fabric must be joined utilizing a sewing needle. The component of the sewing machine that initiates control is the sewing needle, but what is a sewing needle without thread. Thread is precisely placed on the sewing machine to guarantee ideal stitches. Threads are made of various fibers and finally twisted into a thin continuous strand of yarn. The selection of the sewing thread is crucial to the process of seaming. Seaming is the final step in the process to manufacture the product and obtaining strength and quality.

3.1 COTTON FIBERS

Cotton is picked by machine and another mechanical device known as a gin, which separates the fibers from the seeds. Cotton is than pressed into bales and sold to a spinning mill. Cotton is white in appearance and produces a staple fiber. A staple fiber is made from the natural surroundings and is short in fiber length. The length of the fiber affects many aspects of the fabric's construction. Characteristics of cotton include: comfortable hand, good absorbency, color retention, machine washable, good strength, and drapes well and importantly easy to handle and to sew.

3.2 WOOL FIBER

The chemical feed addictive makes the wool brittle and many weeks later the fleece can be pulled. off from the sheep. The injection can cause the sheep to shed fleece about a week later (Kadolph et al. 50-52). The physical structure of wool depends on the animal and the length of time between shearing. Like cotton, wool is also a staple fiber and it affects many aspects of the fabric's construction. Main characteristics of wool include: resist wrinkles, resists soiling, is durable, repels moisture, resiliency, retains shape and resists flames (American Wool). Distinctive characteristics may separate wool fibers from others because of the different breeds of sheep.

3.3 SILK FIBER

Silk is produced in two glands within the silkworm and the silk that is in the form of a liquid comes through the spinnerets, which are the openings found on the silkworm's head. The silk solidifies once it is forced out the spinnerets into air. After two to three days the silkworm has spun approximately one mile of filament. Many silkworms do not live after these few days, but the silkworms that do live are used to breed more silkworms. Silk is considered a luxury fiber and it takes quite a

bit of silkworms to produce enough silk. Silk is also the only natural. fiber that is produced in filament form. Cotton and wool are natural fibers, but they are produced in staple form. Once the silk is produced it is sorted by fiber size, quality and defects. Filaments are then gathered and wound onto reels. It takes several filaments to form a yarn. It is essential that when the filaments are combined that they remain similar in size, this is the most valuable silk. Wild silk does not follow the same process. Wild silk produces silk, but it is not as uniform because it lacks the nutrition that the previous silkworms receive. The most common form of wild silk is Tussah. This silk does not resemble the beauty and hand of the controlled production silk.

4.0 SEWING THREAD

Thread is a foremost factor in the overall production of a garment. Thread is consisting of of yarn, which determines the effectiveness of that thread. Textile fibers are the main component of yarns, which create sewing thread. The more common sewing threads are cotton, polyester, nylon and rayon. The thread chosen for a particular garment does not only affect the life expectancy of that garment, but the overall design. Sewing thread is chosen according to the sewing needle and fabric structure. The sewing thread must conform with the garment, making it pleasing to the eye, but the product must also be of quality. The sewing thread is a huge indicator of style as well as the durability of the product. The strength of sewing thread is critical to the performance of stitches and seams. The sewing thread should be comparable to the wear and care of the garment. It is important to compare the strength of the fabric with the strength of the sewing thread. The sewing thread should never be stronger than the fabric. Besides being compatible in strength, the sewing thread should be extensible against the stress of the garment.

5.0 SEAMS

Two different seam designs were utilized in the investigation of this study. The first seam was the SSa seam. This seam is the most common form of superimposed seams. This plain seam is the most common for joining garment pieces. The SSn seam is a more complex seam and its complexity is indicated by the lower case n. Two seams are illustrated in Figure 2 (Brown et al. 263- 264)

Figure 2 Types of Seam

5.1 SEAM STRENGTH

Strength is known as one of the tensile properties of textile materials. The stitches used to make seams help determine the functional and aesthetic performance of the garment. Strong stitches directly affect the durability of seam strength. The strength of the seam can be found within the seam type and seam width. The location and type of seam must be suitable for the overall construction of the garment. The quality of manufactured products can be determined by the tensile testing machine (Brown et al 238-239).

6.0 PROCEDURE

The three fabrics taken for this test included: cotton, wool and silk. Four samples were cut from each of the fabrics. Tensile tests on the sample fabrics were accomplished to find out seam efficiency using the ASTM D 5034-95 (grab) and the ASTM D 2261-96 (tear) methods. The twelve samples were cut exactly 4 inches wide and 8 inches long. After all, twelve samples were cut, according to the measurements, the middle of each sample was determined. The samples were measured individually, 1 ½ inches from the top left edge and 1 ½ inches from the bottom left edge, indicating a small dot at each point. The dots were connected by a straight line from top to bottom. This middle sector made it possible for the sample to be mounted correctly. Next, the clamps of the machine were placed 3 inches apart. The sample was then placed lengthwise in the top and bottom clamps of the tensile testing machine. The edge of each dot was aligned with the left sides of the top and bottom clamps. After the sample was securely mounted, the appropriate data was entered into the computer system. The next step required the computer settings to set channels to 0 (to align), 1-inch width, .125 thickness and 3 inches for length of clamps. The results were then recorded on the computer monitor. The remaining eleven samples followed the same procedure.

The second part of the process tangled determining the fabric weight of the cotton, wool and silk fabrics. To begin, the eight samples of cotton were cut into 2-11/16” circles. All eight samples were placed on the balance and weighed in grams. The weight of the eight samples in grams gives the weight of the fabric in ozs/yd². The same procedure was followed for the wool samples and then the silk samples. Fabrics are designed using different yarns to produce a light, medium or heavy weight fabric. A light weight fabric is a fabric that weighs less than 4.0 ozs/yd². A medium weight fabric ranges from 4-6 ozs/yd². Lastly, a heavy weight fabric weighs 6.0 ozs/yd² or more.

The third part of the procedure involved cutting eight samples from each of the fabrics. The twenty-four samples were cut exactly 4 inches wide and 8 inches long. Once the samples were cut, each sample was ironed to remove any creases that had formed on the fabric. Next, two cotton samples were sewn together using a 1985 Singer sewing machine with:

- 12 stitches per inch
- Size 80 sewing needle
- Sewing thread comprised of 100% polyester
- SSa seam

The samples were sewn in pairs with cotton and cotton, wool and wool and silk and silk. In the end, there were four samples of cotton, four samples of wool and four samples of silk, creating a total of twelve samples. Individually, the samples were

opened lengthwise and measured, 1 ½ inches from the top left edge and 1½ inches from the bottom left edge indicating a small dot at each point. The dots were connected by a straight line from top to bottom. This middle sector made it possible for the sample to be mounted correctly. Next, the clamps of the machine were placed 3 inches apart. The sample was then placed lengthwise in the top and bottom clamps of the tensile testing machine. The edge of each dot was aligned with the left sides of the top and bottom clamps. After the sample was securely mounted, the appropriate data was entered into the computer system. The next step required the computer settings to set channels to 0 (to align), 1-inch width, .125 thickness and 3 inches for length of clamps. The results were then recorded on the computer monitor. The remaining eleven samples followed the same procedure. The fourth part of the procedure involved cutting eight samples from each of the fabrics. The twenty-four samples were cut exactly 4 inches wide and 8 inches long. Once the samples were cut, each sample was ironed to remove any creases that had formed on the fabric. Next, two cotton samples were sewn composed using a 1985 Singer sewing machine with.

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Next, the clamps of the machine were placed 3 inches apart. The sample was then placed lengthwise in the top and bottom clamps of the tensile testing machine. The edge of each dot was aligned with the left sides of the top an bottom clamps. After the sample was securely mounted, the appropriate data was entered into the computer system. The next step required the computer settings to set channels to 0 (to align), 1 inch width, .125 thickness and 3 inches for length of clamps. The results were then recorded on the computer monitor. The remaining eleven samples followed the same procedure. This procedure verified valuable information that was essential in identifying the strength of a fabric. The main focus was to determine the peak load, mean, standard deviation and seam efficiency. The seam efficiency was only necessary when calculating the six experiments with seams involved. To calculate seam efficiency, the following equation was used:

Seam Efficiency (%) = (Fabric Strength with Seam ÷ Fabric Strength without Seam) x 100

The computer will provide the essential information after each sample has been tested. The peak load is the pound per force or can also be defined as the amount of force to cause a fabric to break. Different fabrics will have a different breaking strength than others. A fabric's properties and performance is due mainly to fiber structure and morphology. The molecular orientation and crystallinity of fibers will contribute to the fabric strength. The machine acts as a force and produces the breaking load of a fabric, the load at which the fabric disruptions.

7.0 RESULTS

Test results of the investigational fabrics have been summarized and presented in tables I through II:

Table I Fabric Tensile Strength Values

Cotton Strength		Wool Strength		Silk Strength	
Samples	Peak Load (lb/f)	Samples	Peak Load (lb/f)	Samples	Peak Load (lb/f)
Sample A	69.077	Sample A	90.525	Sample A	51.117
Sample B	62.258	Sample B	90.158	Sample B	45.284
Sample C	65.609	Sample C	93.020	Sample C	56.793
Sample D	64.655	Sample D	94.557	Sample D	61.992
Mean	65.400	Mean	92.065	Mean	53.796
Standard Deviation	2.828	Standard Deviation	2.092	Standard Deviation	7.206
Fabric Strength in lbs/unit thickness	13.9	Fabric Strength in lbs/unit thickness	12.7	Fabric Strength in lbs/unit Thickness	16.8
Fabric Weight (ozs/yd²)	4.7	Fabric Weight (ozs/yd²)	7.2	Fabric Weight (ozs/yd²)	3.2
Fabric Classification	Medium Weight	Fabric Classification	Heavy Weight	Fabric Classification	Light Weight

Table II Fabric Seam Strength of Cotton

Cotton Samples SSa Seam		Cotton Samples SSn Seam	
Samples	Peak Load (lb/f)	Samples	Peak Load (lb/f)
Sample A	45.235	Sample A	55.670
Sample B	58.169	Sample B	57.000
Sample C	50.764	Sample C	56.242
Sample D	53.832	Sample D	45.700
Mean	52.000	Mean	53.653
Standard Deviation	5.438	Standard Deviation	5.330
Seam Efficiency, %	79.511	Seam Efficiency, %	82.038

8.0 DISCUSSION

8.1 Fabric Strength

Overall, fabric strength depends on the fiber type, fabric construction and thickness. The wool fabric having the highest weight exhibited the greatest strength (92 lbs) followed by cotton fabric (65 lbs) and silk (53 lbs). It is interesting to note that when the strength data was rationalized by the fabric weight, silk became the strongest fabric followed by cotton and wool, which follows the usual strength ranking of the fiber Seam Type Effects. Because of the high standard deviation values of the strength data, there was no clear superiority of one seam type over the other for seam efficiency. However, seam SSn appears to produce a stronger joint in the wool fabric, since it is a more complex stitch and provides a higher frictional resistance between the fabric panels.

8.2 Fabric Effects

Highest seam efficiency was obtained for the cotton fabric and the least efficiency was noted for wool fabric, which was the strongest fabric, but the weakest fiber. Although silk was the strongest fiber, it had the lowest coefficient of friction (much lower than cotton yarn) resulting in a lower seam efficiency than cotton. The investigation indicated that the seam efficiency was influenced by multiple factors, including fabric type, fabric effect and seam design.

9.0 CONCLUSION

The purpose of this study was to investigate the effects of different fabric types and seam design on the seam efficiency of the product. The following conclusions are made within the scope of the parameters of the study; although wool was the weakest fiber among the three used in the study, the wool fabric produced the highest breaking load because it was the heaviest fabric. Two types of seams were examined in this study, SSa and SSn. The seam efficiency of the wool fabric was slightly higher for the SSn seam than the SSa seam. This effect, however, was not clear for the other two fabrics. The highest seam efficiency was found in the cotton fabric for both seam types, which was followed by the silk and wool fabric. This may be attributed to the higher friction between the cotton yarn or fabric and the sewing thread than that of the other two fabrics.

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