

Influence of Needle Thread Tension on Different Types of Fabrics and Sewing Threads

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Abstract- The needle thread tension is one of the important parameters which influence the quality of seam in the garment construction. Variation in needle thread tension leads to seam puckering and various other sewing defects in the garments. Presently, the tension adjustment is carried out manually by trial and errors method by the sewing operators. The research work focuses on development of a needle thread tension measuring device for Single Needle Lock Stitch Sewing Machine. The tension variation measuring device uses Pressure sensor, which is connected to the tension disc in the SNLS sewing machine, to sense and measure the needle thread tension. It measures the amount of pressure developed in the tension disc and the sensor output is fed to the control cabinet which houses electronic circuits and LED display. The maximum and minimum values of the needle thread tension for a particular sewing thread and fabric can be preselected and LED glows whenever the tension values exceeds these upper and lower control limits. Needle thread tension is varied by increasing and decreasing the stitches per inch (SPI) for the fabric selected. The work analyses influence of tension variation on different types of woven fabrics – light, medium and heavy weight fabrics. The correlation between SPI, and hence needle thread tension and fabric type is established.

Keywords- Seam performance, sewing thread tension, SPI, needle thread tension, Pressure sensor

1. Introduction

The needle thread tension is one of the important parameters which influence the quality of seam in the garment construction [1, 2]. Setting of bobbin thread tension was made at the beginning of the stitch cycle. Unbalanced or excess thread tension leads to seam puckering and various sewing defects in the garments [1, 2]. Presently, the tension adjustment is carried out manually by trial and errors method by the sewing operators [9]. There is no proper device to measure the tension of the needle thread [4]. The thread tension at the beginning of seaming operation is manually adjusted and this tension is not quantified [5]. In the present work, a needle thread tension measuring device has been designed to measure the needle thread tension in Single Needle Lock Stitch sewing machine.

The device measures the tension of sewing threads in a suitable unit. By increasing or decreasing the tension of the spring provided on the tension discs, needle thread tension is increased or decreased. The usual practice of adjusting the needle thread tension by trial and error method can be avoided and the exact tension can be set for the needle thread while sewing to avoid seam defects. The single needle lock stitch sewing machine with drop feed mechanism is used in this work.

Table-1 Fabric Details

FABRIC	Type		Br.Force (kgf)	Elongation (mm)	T.Break (Kgf)	GSM g/sq.m	Thickness mm
cotton	Light weight	Warp	28.52	11.4	2.12	49	0.16
		Weft	19.45	15.5	3.1		
cotton	Medium weight	warp	53.48	49.36	9.88	85	0.20
		Weft	27	23.97	4.76		
cotton	Heavy weight	Warp	34	21	4.17	126	0.24
		Weft	31.5	26.27	5.25		

2. Research Methodology

2.1 Materials Used

The fabric and sewing thread used for this study are given in the table below

Sewing Thread Details

Table 2-Sewing Thread Details

	Count	TN	Elongation (mm)	Max.Load (gf)	Tenacity (Kgf)
cotton	18s	18	14.75	464.65	14.16
Cotton polyester	2/56s	32	39.25	792.77	37.59
Polyester	150 denier	15	70.55	583.35	24.7

2.2 Principle:

The tension measuring device uses pressure sensor sensing the thread. Printed Circuit Board which consists analog to digital converter and programmable micro chip performs the communication and computation is connected with the pressure sensor. PCB also has a LED display unit which displays output i.e., needle thread tension in centi Newton.

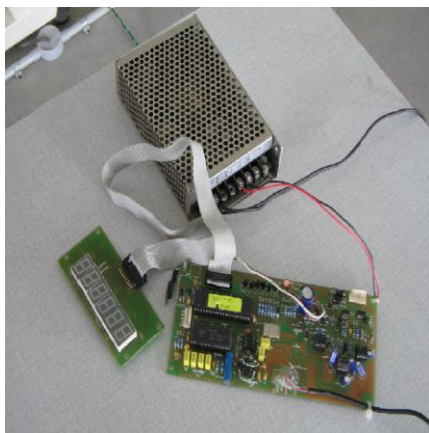


Fig: 1 Circuit Pack

2.3 Placement of Sensor:

The sensor is placed after the tension disc. It also serve as a thread guide.

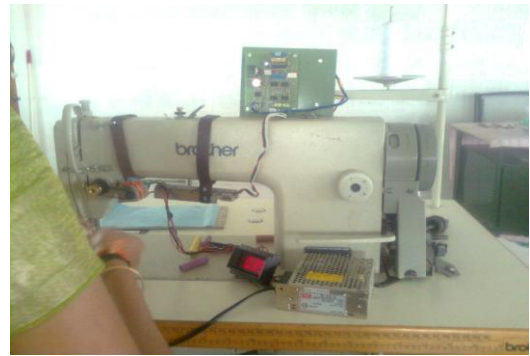
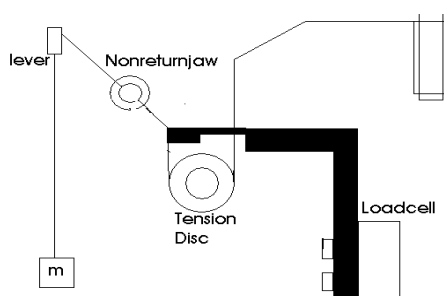


Fig 3 - Placement of Sensor

The thread is allowed to pass through the sensor guide present after the tension disc and tension applied on the needle thread is measured. Lower and upper limit values of needle thread tension can be set for each type of sewing thread and type of fabric. Beyond these limit values sewing defects are found to be occurring. Once the needle thread tension crosses either lower limit or upper limit, light signal is emitted to warn the operator.

3. Results and Discussions

Experimental study is conducted for the following fabrics.

1. Plain fabric
2. Compound weave fabric
3. Twill fabric
4. Huck a back fabric
5. Satin

Plain weave fabric

It is observed that for the plain weave fabric normal stitches are formed for the needle thread tension range of 16-23 centi newton. Above 23 centi newton needle thread breakage is observed.

Compound weave fabric

In case of compound weave fabrics normal stitches are formed for the needle thread tension in the range of 17-30 centi newton. Above the tension value of 30 centi newton needle thread breakage occurs.

Twill fabric

In the case of twill fabric normal stitches are formed in the value range of 17-22 centi newton. As needle thread tension increased beyond the value 24 centi newton occurrence of needle thread breakage is observed.

Huck A Back fabric

It is observed that normal stitches are formed for needle thread tension value in the range of 22-34. However above the tension value of 37 centi newton needle thread breakage occurs.

Satin fabric

For satin fabric normal stitches are formed for the needle thread tension value of 16 – 26 centi newton. Thread breakage occurs at the tension value of 30 centi newton.

1. Effect of SPI on seam strength and seam slippage for light weight fabrics and 100% Cotton, 100% Polyester, P/C sewing thread

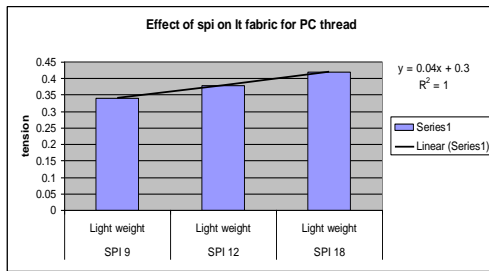


Fig-4 Effect of spi on light weight fabric for pc thread

If SPI increases it increases the seam strength and also the seam elasticity of the fabrics. The more number of stitches may damage the fabric. It is seen that increase in SPI has much influence on the seam quality for 3 threads.

2. Effect of SPI on Medium weight fabrics for 100% Cotton, 100% Polyester, P/C sewing thread

Generally, if SPI increases it increases the seam strength and also the seam elasticity of the fabrics. The more number of stitches sometimes may damage the fabric. It shows that increase in SPI has damaged the fabric and also SPI has significant influence on the seam quality.

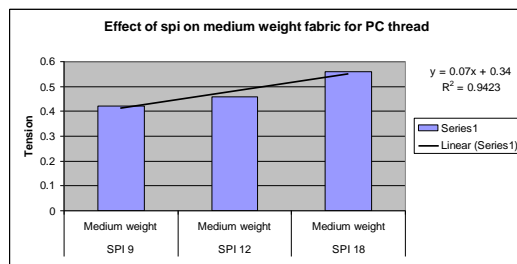


Fig-5 - Effect of spi on medium weight fabric for pc thread

3. Effect of SPI on Heavy weight fabrics for cotton, Polyester and Cotton polyester thread

As SPI increases it increases the seam strength and also the seam elasticity of the fabrics. The more number of stitches sometimes may damage the fabric. It is observed that increase in SPI increased the seam strength and also less no of SPI has given good seam quality and also the increase in the SPI has influence on the seam quality.

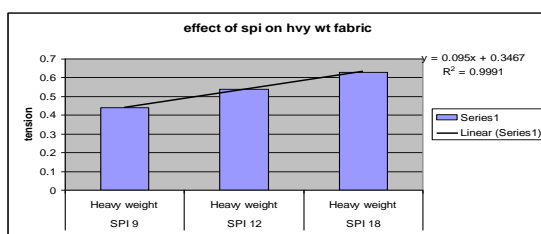


Fig-6 Effect of spi on heavy weight fabric for pc thread

The change in SPI, fabric and sewing threads has great influence in the seam quality. This is due to the impact of needle thread tension which affects the seam quality.

The needle thread measuring device is designed so that the operator can smoothly fix the tension for different types of fabrics, threads and SPI.

4. Conclusion

Online needle thread tension measuring device found to be useful in determining a range of needle thread tension for different types of fabrics in order to produce defect free normal stitches. And the device also facilitates to arrive at the maximum limit value of needle thread tension for a specific fabric, beyond which the quality of seam deteriorates and results in thread breakage. Both imperfect seam and the needle thread breakage affects the productivity of the sewing section. The defective garments or semi-finished panels require either rework or replacement. This will result in wastage of material, man power and effective machine utilization. Frequent thread breakage also affects productivity of the sewing line as broken thread needs to be replaced and hence more frequent stoppage of machines. This brings down significantly the operator and machine utilization.

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