

Effect of Finishes of Polyester Thread on Seam Performance

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Abstract

Seam performance of the fabric depends on different parameters such as seam strength, seam slippage, seam thickness and seam pucker. Hence, in this study, polyester thread is treated with silicone finish and evaluated for its influence on the seam performance properties. It is observed that with the silicone finishing, seam strength, seam slippage, seam pucker index shows better result. It is also observed from the microscopic study, the unevenness of the yarn structure reduced and thereby the smoothness of the yarn increases.

Index Terms—seam slippage, seam strength, seam pucker, smoothness.

I. INTRODUCTION

THE quality of the apparel is determined by its major components of stitches and seams. The component used to join the fabric samples to form stitch and seam is constituted with the use of sewing threads [1]. The quality of the garments is determined not only by the fabric quality but also by the seam quality of the garment. The seam quality of the garment is highly influenced by the factors such as seam strength, seam slippage, seam appearance, seam pucker and so on [2]. The relationship between the seam strength and the fabric strength determines the quality of the fabric. The functional and decorative aspects of the garment are highly influenced by the seam strength that affects the reliability and durability of the garment [3]. Seam slippage is given as a defect caused by the separation of yarns through pulling the sewn fabrics apart at the seams [4]. This seam slippage with load application is highly varied with the fabric construction and finish applied on to the thread [5]. Seam puckering of the apparel is expressed as the waviness nature of the seam used in the fabric. It is obtained as the resultant aspect influenced by different fabric mechanical properties and parameters of the sewing machine [6]. Hence, in this work, polyester sewing thread is finished with silicone and its effect on the different

sewing parameters of seam strength, seam slippage, seam pucker and seam thickness are evaluated.

II. MATERIALS

The polyester thread of count 40/2 procured from Pranav mills, Madurai and cotton and polyester fabrics having the specification of ends per inch and picks per inch of 100 and 80 respectively were used for this work. The softener used in this work is a hydrophillic silicone softener sourced from Padma Traders, Coimbatore.

III. METHODOLOGY

A. Thread Finishing

For this work, the polyester thread is finished with silicone at varying concentration of 10, 20 and 30gpl with acetic acid of 5gpl for 10 minutes at room temperature. The finished thread is further cured at a temperature of 160°C for 5 minutes.

B. Testing Methods

The polyester thread was measured for its unevenness using the ISO 16594 standard of measurement. The seam strength and seam slippage of the samples were measured as per ISO 13935-1 standard. The seam thickness and seam pucker index were measured using ISO 5084 and ISO 13936-3 standards respectively.

C. Seam

The type of seam used for the study is the superimposed seam with lockstitch method. The superimposed is the category of seam achieved by sewing two or more layers of fabric together. This is obtained by stacking the plies of fabric one over another and lock stitching can be done by passing through all the plies of fabric (Fig. 1).

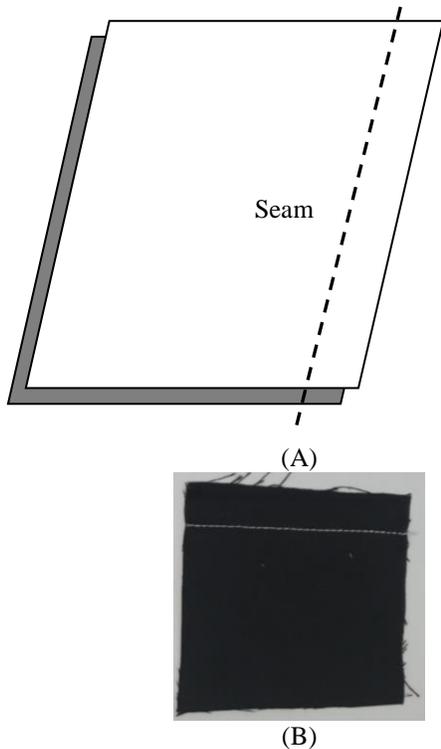


FIG. I (A & B) PLAIN SEAM

V. RESULTS AND DISCUSSION

A. Yarn Unevenness

From the Fig. 2, it is observed that with the increase in silicone concentration of finish application, the unevenness percentage of the thread decreases. This is mainly because the interfibre friction gets reduced with the increase in silicone concentration. This decreased friction is due to the binding of the fibres together as the finish acts as a lubricant and thereby the unevenness percentage of the thread gets reduced [7].

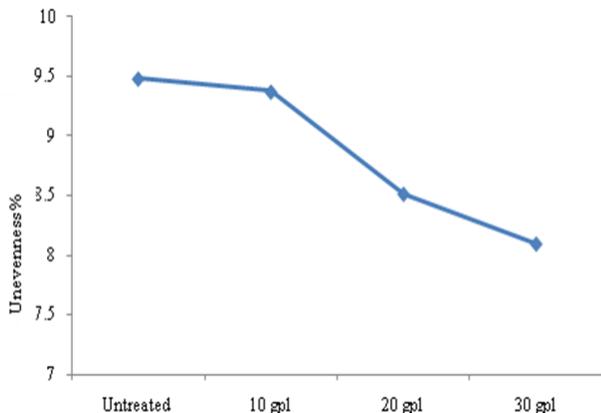


FIG. II YARN UNEVENNESS PERCENTAGE VARIATION WITH THE INCREASE IN CONCENTRATION OF SILICONE

B. Microscopic Analysis of Threads

Fig. 3 shows the microscopic structure of untreated and silicone treated polyester thread. The silicone softeners acts as a coating on to the thread surface as a thin film and thereby lubricate it. Hence it is obtained that the hairiness gets reduced and leads to smoothing effect on to the surface.

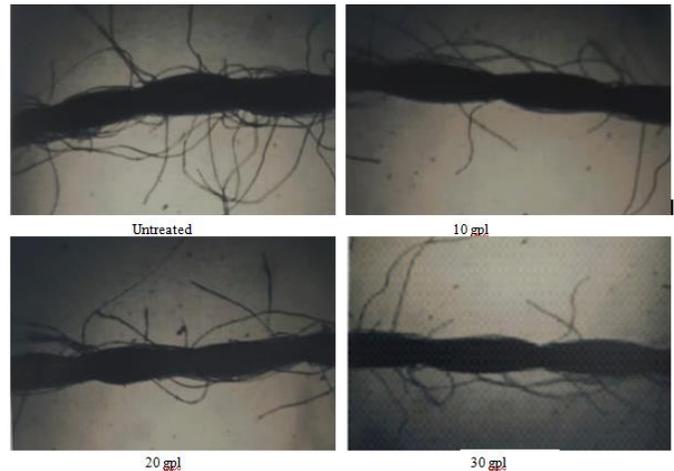


FIG. 3. MICROSCOPIC ANALYSIS OF UNTREATED AND SILICONE TREATED THREAD

C. Seam Strength

From the Table I, it is observed the seam strength of the fabric with the silicone treated thread increases with the increase in the concentration of silicone. This is because with the increase in concentration of softener, fibres binding to the yarn structure increases. This in turn leads to the higher amount of fibre contribution towards the load bearing capacity and thereby the seam strength increases. It is also obtained that the seam strength of the same thread on the polyester fabric is more than on the cotton fabric. This is because of the inherent stretchable character of polyester which makes the fabric to withstand more load in comparison to the cotton fabric.

TABLE I SEAM STRENGTH OF THE FABRIC

Treatment Condition	Cotton Fabric (N)	Polyester Fabric (N)
Untreated	114.5	137
10 gpl	117.2	162.2
20 gpl	125	265.3
30 gpl	140.5	290.6

D. Seam Slippage

From the Table II, it is observed that the amount of load required for the seam slippage for the finished polyester thread is more than the untreated thread. This also indicates that more load is required for the slippage of the seam in the polyester fabric than the cotton fabric [8]. In the case of polyester fabrics, seam slippage is higher due to the smooth and slippery characteristics of the polyester fabric. This leads to the load

required for slippage is lesser when compared to cotton for the slippage of thread in the fabric.

TABLE II SEAM SLIPPAGE OF THE FABRIC

Treatment Condition	Cotton Fabric(N)	Polyester Fabric(N)
Untreated	118.7	101.9
10 gpl	137	117.2
20 gpl	162.2	125
30 gpl	204.2	140.1

E. Seam Puckering

Sewing threads generally experience stretching, flexing, and deformation with the sewing operation. After sewing, the sewing threads tend to shrink due to relaxation process which in turn leads to seam pucker formation. From the Table III, it is observed that with the increase in the silicone concentration, the seam pucker index of the sewing thread on both cotton and polyester fabrics gets reduced. The thread elongation was restricted due to the surface coating as the thread gets stiffer with the silicone treatment. This causes the reduction in seam pucker index of the treated sewing thread on cotton and polyester fabrics. It is also observed that the seam puckering on polyester fabric is more when compared to that on the cotton fabric. This is mainly because the polyester fabrics have higher extensibility which leads to increased seam pucker index. In turn, the cotton fabric shows increased stiffness than polyester which leads to reduced seam pucker index [9].

TABLE III SEAM PUCKER INDEX OF THE FABRIC

Treatment Condition	Cotton Fabric	Polyester Fabric
Untreated	1.5	2.45
10 gpl	0.862	1.6
20 gpl	0.810	1.54
30 gpl	0.781	0.863

F. Seam Thickness

From the Table IV, it is obtained that the seam thickness on the fabric increases with the increase in the concentration of silicone. This is mainly due to the increased stiffness of the thread that makes it to have reduced conformability that in turn leads to increase in seam thickness.

TABLE IV SEAM THICKNESS OF THE FABRIC

Treatment Condition	Cotton Fabric (mm)	Polyester Fabric (mm)
Untreated	0.23	0.24
10 gpl	0.24	0.26
20 gpl	0.27	0.27
30 gpl	0.28	0.29

VI. CONCLUSION

In the current work, it is obtained that the surface finish of the polyester sewing thread influences the seam performance of the thread on different fabrics. It is observed that the thread evenness increases because of the reduced hairiness. The surface finish with silicone leads to increased seam strength of cotton and polyester fabrics due to its increased stiffness. Similarly it is also observed that the load required for the seam slippage on cotton and polyester fabrics also increases. With respect to seam puckering, the increased stiffness leads to reduced relaxation that causes reduced seam puckering on cotton and polyester fabrics. This also in turn leads to the increased seam thickness of the cotton and polyester fabrics.

REFERENCES

- [1] Bhavesh Rajput, Madhuri Kakde, Sujit Gulhane, Sudhir Mohite and Raichurkar PP, "Effect of Sewing Parameters on Seam Strength and Seam Efficiency", *Trends Textile Eng Fashion Technol*, vol. 4, no. 1, pp. 398-402. Aug. 2018.
- [2] M. Bharani, P.S.S.Shiyamaladevi and R.V.Mahendra Gowda, "Characterization of Seam Strength and Seam Slippage on Cotton fabric with woven Structures and Finish", *Research Journal of Engineering Sciences*, Vol. 1(2), 41-50, Aug. 2012.
- [3] Md. Rafiul Islam, A. K. M. Ayatullah Hosne Asif, Abdur Razzaque, Abdullah Al Mamun, Md. Maniruzzaman, "Analysis of Seam Strength and Efficiency for 100% Cotton Plain Woven Fabric", *International Journal of Textile Science*, vol. 9, no. 1, Aug. 2020.
- [4] Manal A. Seif, "Investigating the Seam Slippage of Satin Fabrics", *International Journal of Textile and Fashion Technology*, Vol. 4, no. 5, Oct. 2014
- [5] Daoling Chen and Pengpeng Cheng, "Investigation of factors affecting the seam slippage of garments", *Textile Research Journal*, Vol. 89, no. 21-22, Nov. 2019. pp.: 4756-4765
- [6] Ajay Shankar Joshi, T.K.Sinha and Tanveer Malik, "Behavior of Seam Puckering of Polyester, Cotton & blends fabric on High Sewing Thread Tension" *Ajay Shankar Joshi Journal of Engineering Research and Application*, Vol. 8, no. 6, June 2018, pp 01-04.
- [7] Tae Jin Kang and Min Sun Kim, "Effects of Silicone Treatments on the Dimensional Properties of Wool Fabric", *Textile Research Journal*, vol. 71, 2001, p. 295
- [8] Vildan Sülara , Cansu Meşegül , Hülya Kefsizc & Yasemin Sekia, "A comparative study on seam performance of cotton and polyester woven fabrics, *The Journal of The Textile Institute*, Vol. 106, no. 1, Jan. 2015, pp. 19-30
- [9] A. K. Choudhary and Amit Goel, "Effect of Some Fabric and Sewing Conditions on Apparel Seam Characteristics", *Journal of Textiles*, Vol. 2013, June 2013.