(REFEREED RESEARCH)

A STUDY ABOUT THE EFFECTS OF INTERLININGS TO SEWABILITY PROPERTIES OF THE WOVEN FABRICS

TELANIN DOKUMA KUMAŞLARIN DİKİLEBİLİRLİK ÖZELLİKLERİNE ETKİSİ ÜZERİNE BİR ÇALIŞMA

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ABSTRACT

Interlining is a layer of knitted, woven or non-woven fabric placed between the garment fabrics and facing to reinforce, to give form and to prevent stretching. They are usually used for collars, cuffs, waistbands, pocket flaps and plackets. In this study, the woven fabrics and the woven interlinings that are usually used for shirts manufacturing were examined. 4 woven interlinings and 3 woven fabrics, that have same constructions but different weights were determined. The aim of this paper is to research sewability properties of different woven fabrics fused with different woven interlinings by using the L&M Sewability Tester. The findings were associated with the penetration force, fabric unit weight and fabric thickness. It was found that when the weight and thickness level of fabrics increase, the resistance to sewability increases, too.

Key Words: Interlining, Woven Fabric, Sewability, Needle Penetration Force, Fabric Thickness.

ÖZET

Tela, dayanımı desteklemek, form kazandırmak ve esnekliği önlemek amacıyla, giysi kumaşı ile astar arasında yer alan, örme, dokuma veya dokusuz yüzey kumaşlardan elde edilen bir ara katmandır. Genellikle patlarda, yakalarda, manşetlerde, kemerlerde ve cep kapaklarında kullanılmaktadır. Bu çalışmada, gömlek üretiminde yaygın olarak kullanılan kumaşlar ve telalar araştırılmıştır. Aynı konstrüksiyona fakat farklı gramajlara sahip 3 dokuma kumaş ile 4 dokuma tela belirlenmiştir. L&M Dikilebilirlik Test Cihazı kullanılarak farklı dokuma telalar ile işlem gören farklı dokuma kumaşların dikilebilirlik özelliklerinin incelenmesi amaçlanmıştır. Elde edilen bulgular iğne batış kuvveti, kumaş birim ağırlığı ve kumaş kalınlık değerleriyle ilişkilendirilmiştir. Kumaş birim ağırlığı ve kalınlığı arttıkça, kumaşın dikilebilirliğe karşı gösterdiği direncin arttığı ortaya konmuştur.

Anahtar Kelimeler: Tela, Dokuma Kumaş, Dikilebilirlik, İğne Batış Kuvveti, Kumaş Kalınlığı.

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1. INTRODUCTION

Interlinings play an important role in building shape into the detail areas of clothes, such as the fronts of coats, collars, lapels, cuffs, and pocket flaps. Also, they stabilize and reinforce areas subject to extra wearing stress, such as necklines, facings, patch pockets, waistbands, plackets, and button holes. Apart from these things, interlinings have also been used for many other purposes, so it is important to choose a proper interlining when designing a garment of high quality with good handle and function (1).

Interlinings can be divided into two major categories, sew-in and the type most often used is known as fusible. Sew-in interlinings are held in place by stitching, whereas fusible interlinings are bonded to the fabric using a thermally activated adhessive (2).

The fusible interlinings consists of the base fabric and its coating which heat-sets the interlining to the garment (3). They are divided into three groups; woven, knitted and non-woven according to the material surface's structure. Woven interlinings have the advantage of strength, stability, good drape and hand. Resiliency is the prime advantage of a woven interlining. The type of fiber used in a woven helps to determine its performance characteristics (2). Knitted interlinings are suited to the top dress fabric system easily. The biggest advantage of these interlinings is the elasticity in the warp direction. In addition to this, they have a natural handle. Non-woven interlinings can be produced from natural, synthetic or blended fibers. Natural fibers are more expensive than synthetic fibers, cause of this most non-woven surfaces are produced from synthetic fibers. Viscose, polyester, acrylic, polyamide and nylon fibers are commonly used in non-woven interlinings (4).

The term sewability can be defined as the ability and the ease with which the 2-D fabric components can be qualitatively and quantitatively be seamed together to 3-D garment.

The quality and performance of a sewn garment depends on various factors such as seam strength, slippage, puckering, appearance and yarn

severance. All these factors combined together contribute to sewability of the fabric which is considered to be one of the most important aspects of clothing science (5).

During the sewing of woven fabric, good sewability implies that warp and weft yarns are separated by the needle going through them without producing fabric damage. When warp and weft densities are high, yarns are either broken or separated by the needle as a result of the pressure against the neighboring yarns (6).

The seam efficiency of a garment is affected by the needle penetration forces. The sewing needle penetration force is the quantitative measure of the damage which appears in a garment as the result of the sewing process. A high penetration force means a high resistance of the fabric and thus a high risk of damage (7).

The sewing needle penetration force is affected by various factors such as type and amount of layers of the sewing material, needle size, shape of needle point, stitch speed of the sewing machine, and treatment of the sewing material, among others (8).

2. MATERIAL AND METHOD

In this study, the woven interlinings and the woven fabrics which are usually used for shirts manufacturing were examined. Experiments were carried out on 3 different woven fabrics with same densities in both directions and 4 different woven interlinings. Each interlining was fused to the fabrics at the same pressure, temperature and time. Therefore, 12 different samples that have different specifications were obtained.

These samples were analyzed for the following basic structural parameters: weave type, fabric unit weight, fabric thickness and density. Thickness values of the fabrics were determined according to the TS (Turkish Standard) 7128 EN ISO (International Organization for Standardization) 5084 (ASTM American Society for Testing and Materials) D 1777. All the measurements managed after conditioning of the fabrics for 24 hours under the standard atmosphere conditions (20ºC±2 temperature, 65±2 % relative humidity). The characteristics of the fabrics (Table 1), interlinings (Table 2) and fabrics fused with interlinings (Table 3) are given below.

For the purpose of this study, sewability properties of fabrics had been tested by using L&M Sewability Tester.

The L&M Sewability Tester has been developed as a result of research carried out in the Clothing Section of the Textile Department at the University of Leeds (9). Figure 1 shows the L&M Sewability Tester.

Table 1. The characteristics of the fabrics.

No.	Composition (%)	Construction	Density (thread/cm)		Number (Ne)		Weight (g/m^2)	Thickness (mm)
			Warp	Weft	Warp	Weft		
1	100 cotton	Plain	56	36	40\1	40\1	147	0,25
2	100 cotton	Plain	56	36	50\1	50\1	112	0,19
3	100 cotton	Plain	56	36	60\1	60\1	78	0,14

Table 2. The characteristics of the interlinings.

No	Composition	Type	Weight (g/m^2)
1	% 100 cotton	Woven	137±2
2	% 100 cotton	Woven	151±2
3	% 100 cotton	Woven	81±2
4	% 100 cotton	Woven	97±2

Table 3. The characteristics of the fabrics fused with interlinings.

Interlinings/ Fabrics	Fabric 1		Fabric 2		Fabric 3	
	Weight (g/m^2)	Thickness (mm)	Weight (g/m^2)	Thickness (mm)	Weight (g/m^2)	Thickness (mm)
Interlining 1	283	0,55	255	0,48	218	0,46
Interlining 2	308	0,53	286	0,50	253	0,45
Interlining 3	227	0,48	198	0,41	165	0,39
Interlining 4	238	0,50	208	0,45	176	0,40

Fig. 1. The L&M Sewability Tester

The L&M Sewability Tester is used to test fabric sewability (6). It enables consecutive readings of force for penetration of the fabric by a selected needle to be measured on a small sample of fabric at a rate of 100 penetrations/min (9).

This device measures the penetration force exerted by a sewing needle on the fabric. A strip of fabric passes through a zone in which a sewing needle operates. The fabric specimens are 30-40 mm wide and a minimum of 100 perforations must be carried out. The specimen length is thus about 350 mm (6).

A nominal value (threshold) of penetration force is determined based on the fabric mass per unit area according to the fabric type, and then the number of times this value is exceeded is recorded. Fabric sewability corresponds to the number of points that exceed the threshold previously set, related to the over-all tested points and expressed as a percentage. The sewing operation will be more difficult as the sewability parameter increases.

When sewability values ranged between 0 and 10%, the fabric sewability was considered good; between 10 and 20% sewability was considered to be only fair even though no great difficulties arose during sewing (10).

In this study the device setting was maintained constant for all the tests; the total count per fabric was 100; the force range chosen was 500gf, and the threshold value for sewability determination was 125gf. If the penetration force did not exceed the set level 125gf, then the sewability value was zero and the sewability was good.

3. FINDINGS

In this study, as shown in Table 5, without interlinings, sewability values for each fabric in the warp and weft directions were 0. It means that sewability of the fabrics was considered good. The values of the needle penetration forces were between 19 gf and 80 gf and the sewability values were 0%. When the penetration force values of three fabric samples were compared, it has seen that the 40/1 plain fabric had the highest value in both directions.

Sewability values of 40/1 plain fabric fused with four interlinings was given in Table 6. As shown in table, sewability values in the warp and weft direction exceeded 50 except third sample. So the sewability of samples 1, 2 and 4 were considered poor.

Although the weight of sample 1 is less than sample 2, the needle penetration force is higher in sample 1 in warp direction. This can be explained by the difference in thickness.

Sewability of 50/1 and 60/1 plain fabrics fused with different interlinings are given in Tables 7 and 8.

Table 5. The sewability values of fabrics (threshold value is 125 gf).

No	Warp Direction		Weft Direction	
	Needle Penetration Force (gf)	Sewability Value (%)	Needle Penetration Force (gf)	Sewability Value (%)
1	80	0	69	0
2	41	0	41	0
3	19	0	19	0

Table 6. The sewability values of 40/1 plain fabric with different interlinings (threshold value is 125 gf).

No	Warp Direction		Weft Direction	
	Needle Penetration Force (gf)	Sewability Value (%)	Needle Penetration Force (gf)	Sewability Value (%)
1	159	69	142	81
2	148	70	167	88
3	104	10	76	4
4	127	50	118	35

Table 7. The sewability values of 50/1 plain fabric with different interlinings (threshold value is 125 gf).

No	Warp Direction		Weft Direction	
	Needle Penetration Force (gf)	Sewability Value (%)	Needle Penetration Force (gf)	Sewability Value (%)
1	81	7	108	20
2	121	44	129	58
3	81	2	71	11
4	91	4	95	1

Table 8. The sewability values of 60/1 plain fabric with different interlinings (threshold value is 125 gf).

No	Warp Direction		Weft Direction	
	Needle Penetration Force (gf)	Sewability Value (%)	Needle Penetration Force (gf)	Sewability Value (%)
1	89	3	90	2
2	114	33	147	82
3	68	0	60	0
4	51	0	53	1

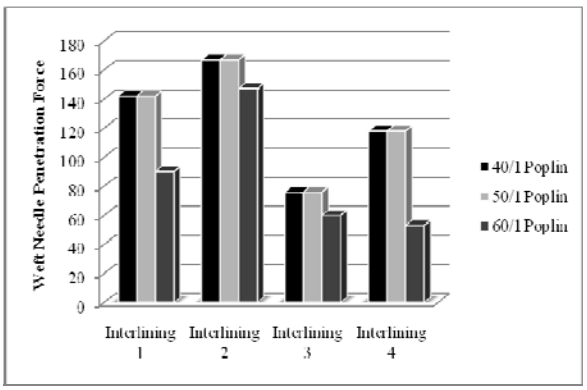

Figure 2. The variation of needle penetration forces in weft direction for all fabrics.

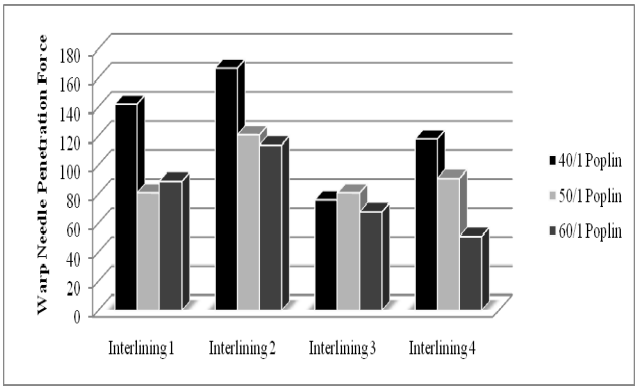

Figure 3. The variation of needle penetration forces in warp direction for all fabrics.

Except sample 2, the sewability was considered good for both 50/1 and 60/1 plain fabrics. Sample 2 shows poor sewability because of the high sewability values in both directions. This could be caused by the weight of the interlining.

As shown in Figures 2 and 3, fabrics fused with second interlinings have the highest needle penetration forces in both directions. Due to this fact, it was found that with increasing weight and thickness level in fabrics, the resistance to sewability increases as well. The high penetration force shows that the fabric has a high resistance. So it can be said that 40/1 plain fabric fused with 151±2 g/m^2 interlining has the highest resistance to sewing in both directions and 60/1 plain fabric fused with 81±2 g/m^2 interlining has the lowest resistance to sewing in both directions.

4. CONCLUSION

This paper presents a experimental study of the sewability of woven fabrics fused with different interlinings. In this study, 3 woven fabrics and 4 woven interlinings with same construction but different weight were used. Interlinings were fused these three fabrics at the same conditions. Therefore, 12 samples having different specifications were obtained. Weight, thickness and needle penetration force were determined for identifying sewability.

When we associated weight and thickness with penetration force, it has seen that sewing needle penetration forces increase proportionally with weight and thickness. The high penetration force shows that the fabric has a high resistance. Because of the high resistance, during the sewing process, the fabric will be damaged. As the same, the fabric with minimum weight and thickness has the minimum needle penetration force. So, it can be said that there is a significant effect of fabric weight and thickness in the needle penetration force.

REFERENCES / KAYNAKLAR

1. Jeong, S.H., Kim, J.H., Hong, C.J., 2000, "Selecting Optimal Interlinings with a Neural Network", *Textile Research Journal* 2000 70: 1005.
2. Harder, F., 2004, "*Fashion For Profit"*, Harder Publications.
3. Aldrich, W., 2007, Fabric, "*Form and Flat Pattern Cutting",* Second Edition, Blackwell Publishing.
4. İstanbul Tekstil ve Konfeksiyon İhracatçı Birlikleri (İTKİB), 2002, "*Teknik El Kitapları Serisi Hazırgiyim'de Tela seçme ve Kullanma"*, İstanbul, s. 24.
5. Behera, B.K., Rathee, P., 1997, "Sewability of Denim"*, International Journal of Clothing Science and Technology*, Vol. 9, No. 2, pp.128-140.
6. Manich, A.M., Domingues, J.P., Sauri, R.M., Barella, A., 1998, "Relationships between Fabric Sewability and Structural, Physical, and FAST Properties of Woven Wool and Wool-blend Fabrics", *Journal of the Textile Institute,* Vol. 89, Part 1, No. 3, pp.579-589.
7. Gurarda, A., Meric, B., 2007, "The Effects of Elastane Yarn Type and Fabric Density on Sewing Needle Penetration Forces and Seam Damage of PET/Elastane Woven Fabrics", *Fibres & Textiles in Eastern Europe,* Vol. 15, No. 4 (63).
8. Ujević D., Rogale D., Kartal M., Šajatović B. B., 2008, "Impact of Sewing Needle and Thread on the Technological Process of Sewing Knitwear", *FIBRES & TEXTILES in Eastern Europe*, Vol. 16, No. 4 (69) pp. 85-89.
9. The L&M Sewability Tester Catalogue.
10. Gurarda, A., Meric, B., 2005, Sewing Needle Penetration Forces and Elastane Fiber Damage During the Sewing of Cotton/Elastane Woven Fabrics, *Textile Research Journal,* Vol. 75, No. 8, pp.628-633.

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