

Comparative Analysis on Physical Effects for using Elastane on Cotton and CVC Single Jersey Fabric

Faisal Bin Alam

Assistant Professor, Department of Textile Engineering, BGMEA University of Fashion & Technology, Dhaka, Bangladesh.

Abstract: Application of elastane with base yarn has become a common phenomenon in fabric manufacturing now a days and the demand is on ever increase from buyer side due the additional flexibility, elasticity and comfort ability of the clothing. This paper puts an attempt to present a comparative analysis on some physical properties of Cotton and CVC single jersey fabrics before and after using elastane.

Keywords : Elastane / Spandex, Cotton, CVC, Plain Single Jersey, Physical Properties.

Introduction

Weft knitted fabric is characterized by its extensibility and elasticity due to construction. Elastane (also known as Spandex) is used to add more stretch ability and functions to garments. Today use of elastane blended fabrics are not limited to sportswear or underwear [1], rather are being used in all forms of outer wear. Elastane has its massive use in circular knitting [8] and maintaining the dimensional stability of the fabrics is a constant concern there. As the application of elastane in knitting has been increasing, it's important to carefully analyze the physical and dimensional properties of fabrics for the purpose of estimating the properties of finished fabrics well ahead [2]. Elastanes are always processed with one or more natural or manmade fibres assuming the risk that it may break when stretched too far if done individually [1].

This study investigates on some physical properties like GSM, Shrinkage, Spirality, Bursting strength and Pilling for plain Cotton and CVC fabrics and

then shows a comparative analysis of those effects after using elastane.

Materials & Methods:

Materials:

Experiments were done on single jersey knit fabric samples produced in Jiunn long brand Single Jersey Circular Knitting Machine of 26 diameter & 24 gauge. Four types of fabric samples were used for the experiments-

- (a) Plain S/J fabric produced from 30^s/1, 100% Cotton
- (b) Plain S/J fabric produced from 30^s/1, 100% CVC
- (c) Plain S/J fabric produced from 30^s/1, Cotton with 20D Elastane
- (d) Plain S/J fabric produced from 30^s/1, CVC with 20D Elastane

Methods:

Samples from single jersey basic fabric for both 100% Cotton and 100% CVC of same count (30 single) were taken from same machine parameters and physical properties like GSM, Shrinkage, Spirality, Bursting and Pilling were determined. Then single jersey basic samples were taken for both 30^s/1 Cotton and 30^s/1 CVC with 20D elastane with each. Then same experiments were repeated to reveal the physical difference that happened due to the use of elastane to Cotton & CVC fabric. Five samples for each type of fabric were taken and AATCC standards were followed for each testing procedure.

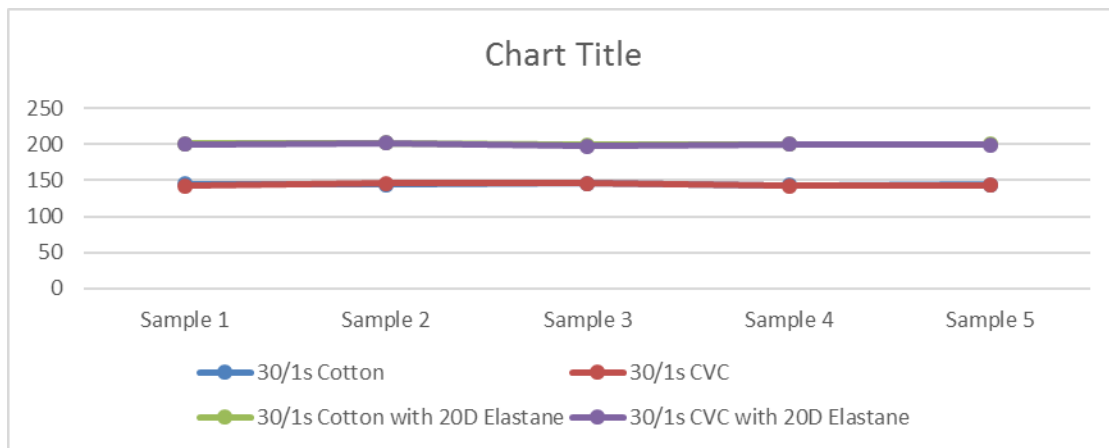
Result & Discussion:

Effect on fabric weight (GSM):

Table no. 1.1

Experiment No	GSM without Elastane		GSM with Elastane	
	30 ^s /1 Cotton	30 ^s /1 CVC	30 ^s /1 Cotton with 20D Elastane	30 ^s /1 CVC with 20D Elastane
Sample 1	145	142	201	200
Sample 2	144	146	202	202
Sample 3	146	146	199	198

Sample 4	143	142	200	200
Sample 5	144	143	200	199



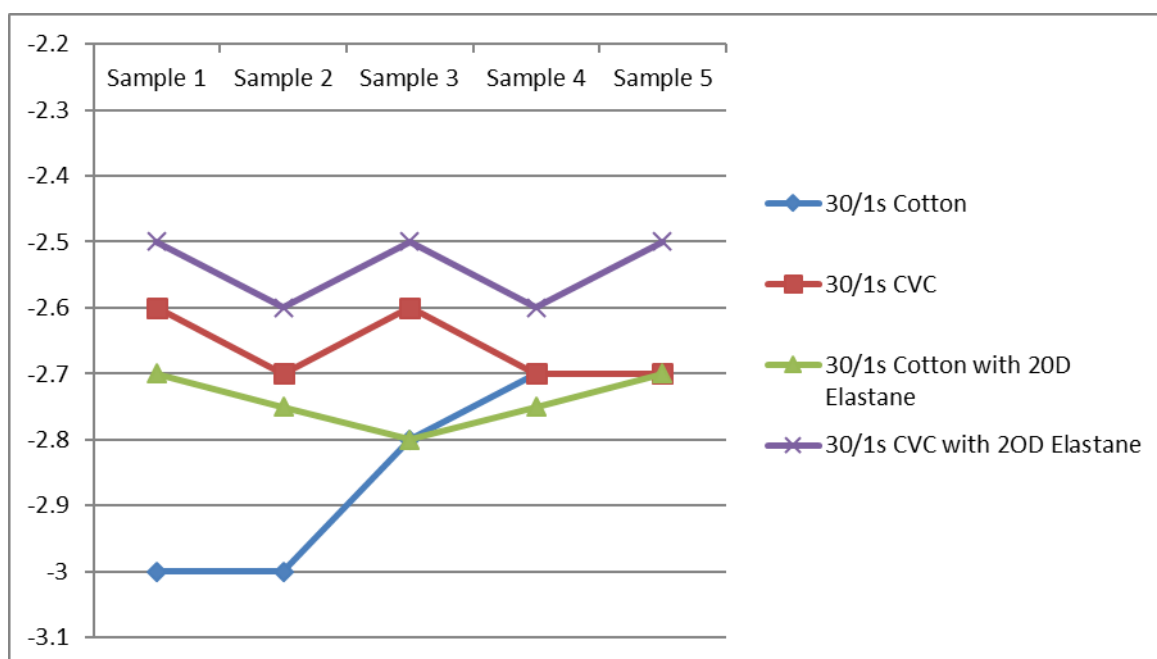
Graph No. 1: Effect on Grey Fabric GSM

Result: Naturally GSM is increased when elastane is added and difference in GSM increase for Cotton and CVC samples are almost same. The variation of GSM among the same type of fabric samples are also minimum.

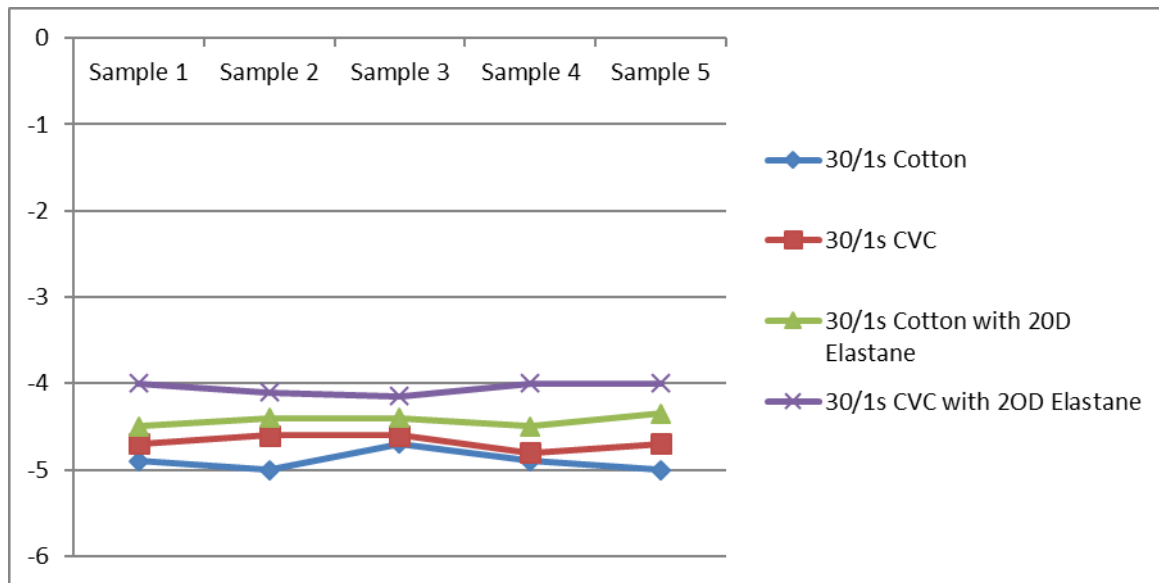
Effect on fabric shrinkage:

Table no. 2.1

Experiment No	30 ^s /1 Cotton fabric (%)		30 ^s /1 CVC fabric (%)		30 ^s /1 Cotton fabric with 20D Elastane (%)		30 ^s /1 CVC fabric with 20D Elastane (%)	
	Length	Width	Length	Width	Length	Width	Length	Width
Sample 1	-3	-4.9	-2.6	-4.7	-2.7	-4.5	-2.5	-4
Sample 2	-3	-5	-2.7	-4.6	-2.75	-4.4	-2.6	-4.1
Sample 3	-2.8	-4.7	-2.6	-4.6	-2.8	-4.4	-2.5	-4.15
Sample 4	-2.7	-4.9	-2.7	-4.8	-2.75	-4.5	-2.6	-4
Sample 5	-2.7	-5	-2.7	-4.7	-2.7	-4.35	-2.5	-4



Graph No 2.1: Effect on Fabric Shrinkage (lengthwise)



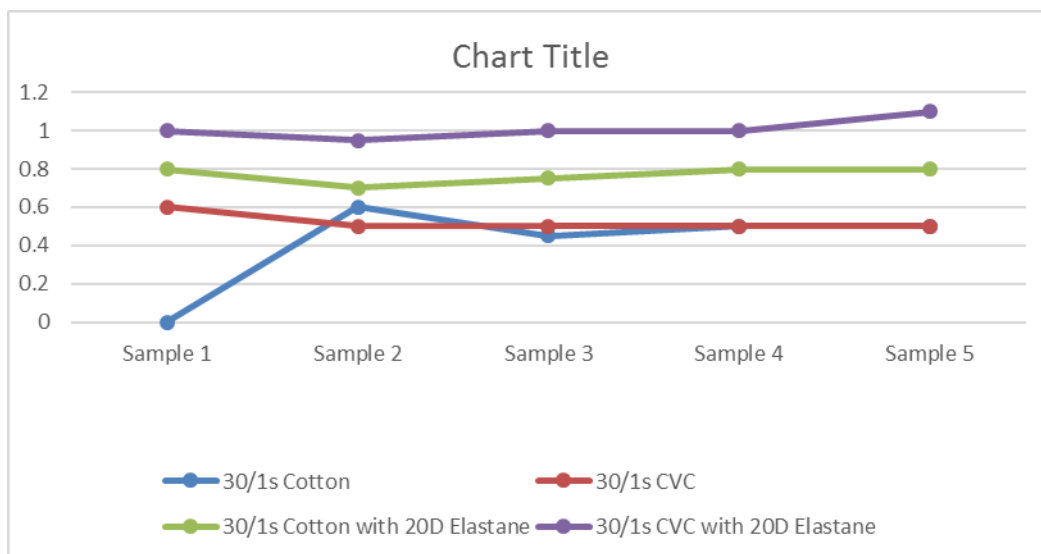
Graph No 2.2: Effect on Fabric Shrinkage (widthwise)

Result: Before using spandex, shrinkage was higher for Cotton & CVC. Shrinkage reduced after elastane is added with Cotton & CVC. Cotton shrinkage is higher than CVC in both cases.

Effect of fabric Spirality:

Table no - 3

Experiment No	Spirality Test Rating (cm)				
	30 ^s /1 fabric	Cotton	30 ^s /1 CVC fabric	30 ^s /1 Cotton fabric with 20D Elastane	30 ^s /1 CVC fabric with 20D Elastane
Sample 1	0.5	0.6	0.8	0.8	1.0
Sample 2	0.6	0.5	0.7	0.7	0.95
Sample 3	0.45	0.5	0.75	0.75	1.0
Sample 4	0.5	0.5	0.8	0.8	1.0
Sample 5	0.5	0.5	0.8	0.8	1.1



Graph No 3. Effect on Fabric Spirality

Result: Spirality in elastane blended fabric found to be higher than 100% Cotton or CVC fabric and CVC spirality is higher than Cotton fabric in both situations.

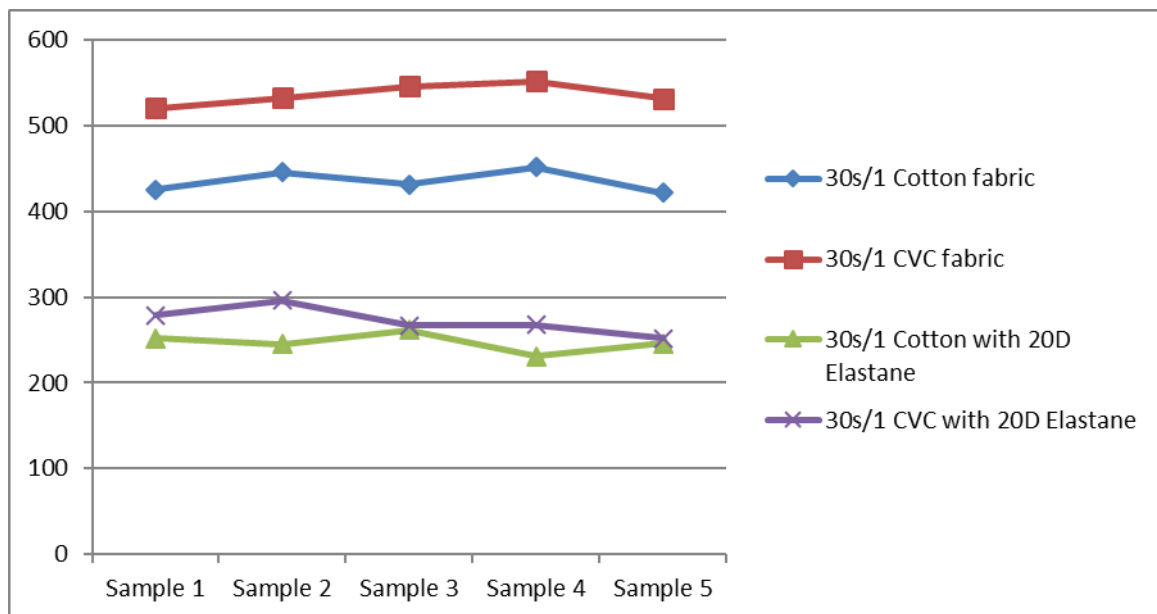
Effect on fabric bursting strength:

Table no.4.1

No.	30 ^s /1 Cotton fabric bursting strength			30 ^s /1 Cotton with 20D Elastane fabric bursting strength		
	KPA	Distension	Second	KPA	Distension	Second
Sample 1	425.4	12	18	251.6	19.6	17.5
Sample 2	445.6	12.8	21.2	245.4	20.2	18.1
Sample 3	431.6	13.4	20.5	261.4	20.6	18.6
Sample 4	451.6	14	22.1	230.6	17.3	16.2
Sample 5	421.5	11.9	17.8	245.8	17.9	16.9

Table no.4.2

No.	30 ^s /1 CVC fabric bursting strength			30 ^s /1 CVC with 20D Elastane fabric bursting strength		
	KPA	Distension	second	KPA	Distension	Second
Sample 1	520.4	12.1	18.6	278.5	21.9	18
Sample 2	532.6	12.9	20.2	295.6	23	19
Sample 3	545.6	13.4	20.5	266.6	22.2	17.5
Sample 4	551.6	14	23.1	267.6	20.6	17.8
Sample 5	531.5	12.4	21.8	251.7	19.4	17.4



Graph No 4: Effect on Fabric Bursting Strength

Result: Without elastane, distension of fabric was low but bursting strength was high. But after using elastane, distension of fabric was high but bursting strength was low. 100% Cotton fabric bursting

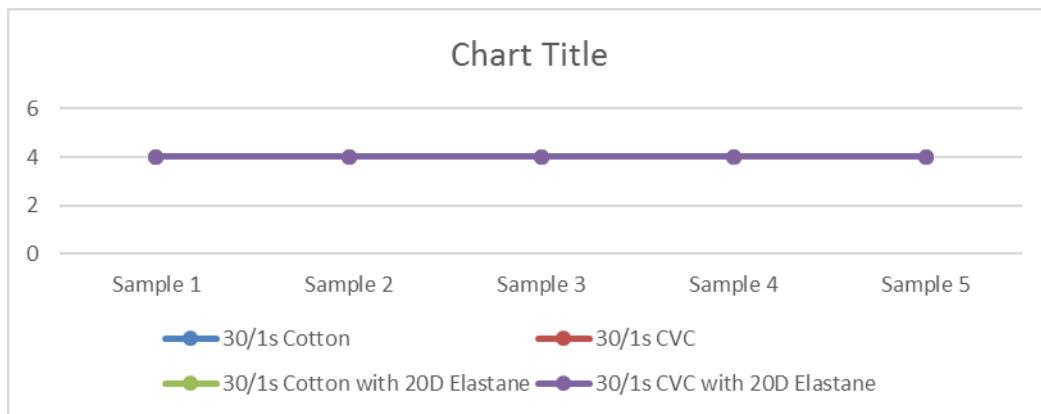
strength is found to be lower than 100% CVC fabric. Similarly spandex/Cotton fabric bursting strength is lower than spandex/CVC fabric.

Effect of fabric Pilling:

Table no. 5

Experiment No	Pilling Test Rating			
	30 ^s /1 Cotton fabric	30 ^s /1 CVC fabric	30 ^s /1 Cotton fabric with 20D Elastane	30 ^s /1 CVC fabric with 20D Elastane
Sample 1	4	4	4	4
Sample 2	4	4	4	4
Sample 3	4	4	4	4
Sample 4	4	4	4	4
Sample 5	4	4	4	4

Here:
 Rating 5 means - No visual change
 Rating 4 means - Partially formed pill
 Rating 3 means - Moderate surface pilling
 Rating 2 means - Distinct surface pilling
 Rating 1 means - Dense surface pilling



Graph No 5: Effect on pilling property

Result: No variation is observed in terms of pilling properties for Cotton and CVC samples before and after using elastane.

Acknowledgements

Special thanks goes to my students Md. Mofijul Islam and S.M. Nazmus Sakib for their efforts to make this study successful.

References

[1] Abdessalem, S. B., Abdelkader, Y. B., Mokhtar, S., & Elmarzougui, S. (2009). Influence of elastane consumption on plated plain knitted fabric characteristics. *J. Eng. Fiber Fabr*, 4(3034), 18.
 [2] Gokarneshan, N., & Thangamani, K. (2010). An investigation into the properties of Cotton/Elastane and polyester/Elastane knitted

fabrics. *The Journal of The Textile Institute*, 101(2), 182-186.
 [3] Herath, C. N., & Kang, B. C. (2008). Dimensional stability of core spun Cotton/Elastane single jersey fabrics under relaxation. *Textile Research Journal*, 78(3), 209-216.
 [4] Kumar, V., & Sampath, V. R. (2013). Investigation on the physical and dimensional properties of single jersey fabrics made from Cotton sheath-elastomeric core spun. *Fibres & Textiles in Eastern Europe*, (3 (99)), 73-75.
 [5] Marmarali, A. B. (2003). Dimensional and physical properties of Cotton/Elastane single jersey fabrics. *Textile Research Journal*, 73(1), 11-14.
 [6] Sadek, R., El-Hossini, A. M., Eldeeb, A. S., & Yassen, A. A. (2012). Effect of Elastane extension percent on single jersey knitted fabric properties. *Journal of Engineered Fibers and Fabrics*, 7(2), 11-16.

[7] Tasmac, M. (1996). Effects of Elastane yarn on single jersey fabrics. *Tekstil Konfek*, 6, 422-426.

[8] Tezel, S., & Kavuşturan, Y. (2008). Experimental investigation of effects of Elastane brand and tightness factor on dimensional and physical properties of Cotton/Elastane single jersey fabrics. *Textile research journal*, 78(11), 966-976.