Elastic Recovery Characteristics of Waist Band using High Stretch Polyester in Place of Lycra- A Experimental Review

Prof. Ashwin Thakkar[1] Prof. Vaishali D. Shah[2] Ladumor Hareshbhai Chitharbhai[3]
[1,2]Professor
[1,2,3]Department of Textile Technology
[1,2,3]L. D. College of Engineering, Ahmedabad

Abstract—Lycra is one of the best yarn to use in different field. It is being used to manufacture in narrow width fabric. Like Wrist bandages, head bandages, innerwear etc. It has many advantages while it is used in elastic field. But Now a days there is a serve problem of presence of low elastane content and low elongation of typical Lycra When it is used in garments have Jeans/pants, woven shirts, knit shirts, swimwear, innerwear. High stretch polyester (T400) has excellent properties which aid in elastic field. Here in this paper using two yarn T400 and Lycra in case of elasticity and recovery property in two application like innerwear tape and waist bandages so finally found that in both of application some improvement in elasticity and recovery property of T400 yarn compare to Lycra.

Key words: T400 (High Stretch Polyester), Lycra, Elasticity, Recovery

I. INTRODUCTION

Lycra is a man-made elastic fibre. Invented and produced only by DuPont Company. Spandex for a synthetic fabric material with elastic properties of the sort known generically as "spandex". Lycra is commonly used in athletic or active clothing or Narrow wear fabrics mostly. Lycra as a clothing material is fetishized by some people, perhaps on the basis that the Garment forms a "second skin" that acts as a fetishist surrogate for the wearer's own skin. This called as Lycra fetishism. Lycra is normally one of the fabrics in leggings. Lycra can be stretched 4 to 7 times its initial length, yet springs back to its original shape once tension is released at that time. While Lycra appears to be a single continuous thread, it is in reality a bundle of tiny filaments.

II. WHAT IS T400 FIBRE?

High Stretch Polyester (T400) fibre is a special type of bi-component fibre in which two different polymers are joined together within each filament. The differential shrinkage between these two polymers provides a smooth, helical crimp. Additional crimp is developed during the dyeing and finishing process when the fibre is exposed to heat. The result is fabrics and garments with great stretch and recovery properties.

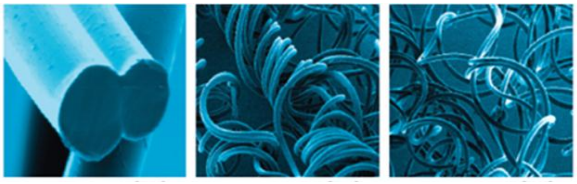


Fig. 1: T400 yarn appearance.

A. *Stress – Strain of Behaviour of Yarn*

The Stress – Strain behaviour the yarn is tested using ASTM D2256M Method and the results obtained as shown below. The Force applied for the Elongation at break is shown in a chart form of different yarn samples. Here show the below graph comparison of the T-400(high stretch polyester) yarn and Lycra (spandex).so elongation value of the T-400 (high stretch polyester)yarn like theoretically 27% compare to Lycra yarn is having practically 20.21% at under ASTM D2256M Method. So T-400 yarn having more its mean excellent value of the elongation.

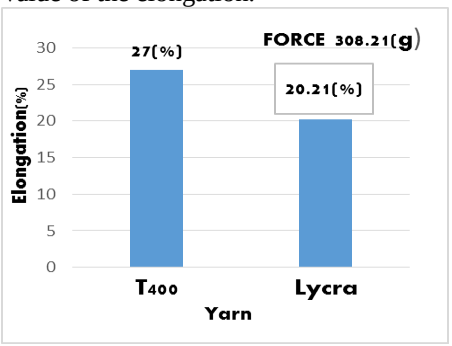


Fig. 1: Graph.1 Comparison of elongation Lycra and T400 yarn.

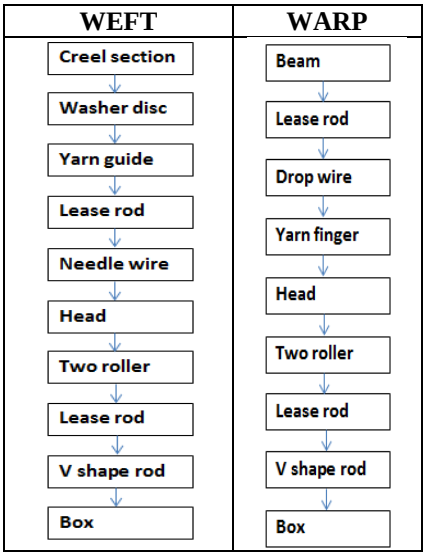
III. DESIGN OF EXPERIMENT

A. *Preparation of samples:*

To prepare the different samples on JINGYI" jyc762/B3 CROCHET machine by using the same denier of yarn and fabric will be prepared on "JINGYI" machine.

- Innerwear tape
- Wrist bandages

B. *Passage of JINGYI jyc762/B3 machine*



Here show the above passage of JINGYI jyc762/B3 CROCHET machine in case of weft yarn is passes from creel section to box and in case of warp yarn passes from beam to box and finally we can produce the application of narrow wear fabric like some applications innerwear tape and wrist bandages.

IV. RESULTS AND DISCUSSIONS

A. Samples Description: Innerwear Tape Application:

- Sample 1: 75D with width 49mm (T400)
- Sample 2: 75D with width 49mm (Lycra)
- Sample 3: 75D with width 36 mm (T400)
- Sample 4: 75D with width 36mm (Lycra)
- Sample 5: 75D with width 28 mm (T400)
- Sample 6: 75D with width 28mm (Lycra)

Sample no:	Test Method (ASTM D 5278)	Elasticity (After 10 second)	Recovery (After 10 second)
1.T400	Tension 1kg/cm. Width= 49mm	176.0%	98.5%
2.Lycra	Tension 1kg/cm. Width= 49mm	144.8%	99.2%
3.T400	tension 1kg/cm. Width= 36 mm	177.2%	97%
4.Lycra	tension of 1kg/cm. Width=36 mm	151.6%	98.1%
5.T400	tension 1kg/cm Width= 28mm	145.57%	96.71%
6.Lycra	Tension 1kg/cm Width= 28 mm	132.28%	97.92%

Table 1: Observation table of elasticity and recovery properties of T400 and Lycra sample for innerwear tape application.

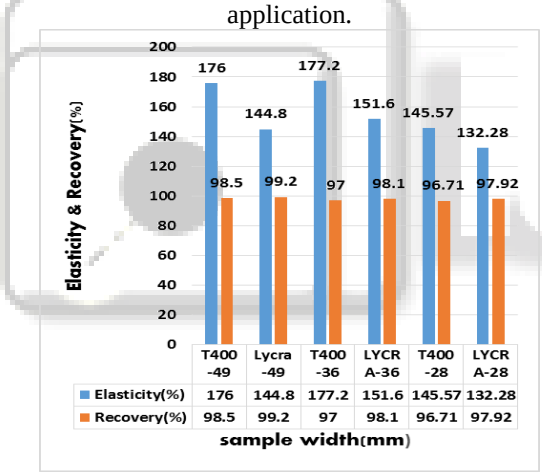


Fig. 2: Graph 2: comparison of Lycra and T-400 sample during elasticity and recovery testing for innerwear tape application.

We can see the results from the above observation tables and as shown the above graph elasticity and recovery of the Lycra (spandex) and T-400(high stretch polyester) for the purpose of innerwear application. In T-400 (high stretch polyester) yarn sample.T-400 having a 177.2% stretchability compare to the Lycra having a 151.6% stretchability at the same width is about 36mm for the both sample one is Lycra (spandex) and another is T-400(high stretch polyester) and other sample T-400 yarn having a 176% elasticity compare to Lycra having a 144.8% stretchability at the same width is about 49mm.Hence, the T-400 yarn having excellent elasticity as compare to the Lycra. Yarn.T-400 yarn having a good strength with good elasticity but Lycra having a low strength with elasticity purposes. Hence the T-400 yarn have a high elasticity it is better compare to Lycra one and recovery of the T-400 yarn having a 98.5(%) compare to Lycra having a 99.2(%) and width is about 36mm.Other sample T-400 is 97.0(%) recovery at that time Lycra having a 98.1(%) recovery and width is about 36mm so, recovery wise Lycra sample is a slightly more compare to T-400 sample.so finally in innerwear application T-400 sample having excellent elasticity but slightly low recovery.

B. Samples Description: Wrist Bandages Application:

- Sample 1: 75D with width 12.7mm (T400)
- Sample 2: 75D with width 12.7mm (Lycra)
- Sample 3: 75D with width 20.3mm (T400)
- Sample 4: 75D with width 20.3mm (Lycra)
- Sample 5: 75D with width 25.4mm (T400)
- Sample 6: 75D with width 25.4mm (Lycra)

Sample no:	Test Method (ASTM D 5278)	Elasticity (After 10Sec)	Recovery (After 10Sec)
1.T400	tension load 1kg Width= 12.7 mm	147.41%	97.02%
2.Lycra	tension load 1kg Width= 12.7mm	105.22%	97.33%
3.T400	tension load 1kg Width 20.3mm	168.50%	97.66%
4.Lycra	tension Load 1kg Width= 20.3 mm	143.2%	97.77%
5T400	tension load 1kg Width= 25.4 mm	156.0%	97.44%
6.Lycra	tension load 1kg Width= 25.4 mm	146.59%	97.26%

Table 2: Observation table of elasticity and Recovery properties of T400 and Lycra sample for waist bandages tape application

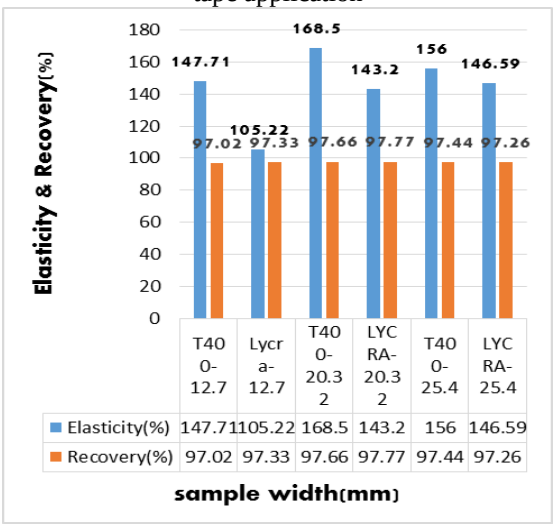


Fig. 3: Graph: 3 comparison of Lycra and T-400 sample during elasticity and recovery testing for waist bandages application

Here, We can see the results from the above observation tables and as shown the above graph elasticity and recovery of the Lycra(spandex) and T-400 (high stretch polyester) yarn samples for waist bandages application Elasticity of T-400(high stretch polyester) sample is about 147.71(%) at that time Elasticity of the Lycra sample is

about 105.22(%). And width is about 12.7mm.So compare to Lycra (spandex) sample T-400 (high stretch polyester) sample having a high stretchability and recovery is so less of the all sample is almost same but elasticity purposes show the graph in all sample of T-400 having an excellent elasticity compare to all sample of Lycra (spandex).in case of recovery T400 yarn having some improvement in recovery properties

V. CONCLUSION

A. Elasticity:

Sample one T400 (high stretch polyester) sample having 15.46% higher elasticity property compare to Lycra (spandex) sample. Sample two T400 (high stretch polyester) sample having 14.45% higher elasticity property compare to Lycra sample. Sample threeT400 (high Stretch polyester) sample having 2.27% improvement in elasticity property compare to Lycra sample. Sample fourT400 (high stretch polyester) sample having 28.63% higher elasticity property compare to Lycra sample. Sample fiveT400 (high stretch polyester) sample having 15.02% higher elasticity property compare to Lycra sample.T400 (high stretch polyester) sample having 6.04% improvement in elasticity property compare to Lycra sample. Because of T400 (high stretch polyester) yarn having higher elongation compare to Lycra (spandex) as well as density of T400 yarn is 1.13 g/cm^3 and Lycra (spandex) is 1.00 g/cm^3. So, density of the T400 yarn is higher compare to Lycra (spandex).its mean strength of the T400 yarn is slightly more compare to Lycra yarn.

B. Recovery:

sample one recovery property of T400 (high stretch polyester) sample having 1.5% and Lycra sample having 0.8% recovery it's mean in T400 sample slightly improvement in recovery property. In sample two T400 having 3% of recovery at that Lycra having 1.9% So, T400 sample having slightly more recovery compare to Lycra sample. In sample number five recovery of T400 sample is 2.34% and Lycra having 2.03% recovery. So In all sample there is no significant difference in recovery property of T400 and Lycra samples But in T400 sample having slightly improvement in recovery property because of T400 sample having higher elasticity property compare to Lycra sample

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