

INVESTIGATIONS OF CORE YARN PROPERTIES PRODUCED FROM CONVENTIONAL RING SPINNING FRAME USING NEWLY DESIGNED CORE YARN MECHANISM

S Sundaresan¹

Kandhavel.A², Kiruba.k³, Prasanth⁴.S, Sathyapriya.S.A⁵

1. Assitant Professor (SRG), Textile Technology, Kumaraguru college of Technology, Coimbatore-49, E mail Id: shobsundar@gmail.com

2,3,4,5: B.Tech students/VIII semester/Textile Technology/ Kumaraguru college of Technology, Coimbatore-49

Abstract:

Core yarns are known as multi-component yarns in which one component, the core material, stays nearly at the center of the yarn while the others cover it. Core-spinning is a process by which fibres are twisted around an existing yarn, either filament or staple spun yarn, to produce a sheath core structure in which the already formed yarn is the core. ... Generally continuous filament yarn is used as core and the staple fibres used as sheath covering. Core spun, or “poly core”, yarn is created by twisting staple fibers around a central filament core, usually made of polyester for extra strength. It is 40% to 50% stronger than normally spun yarn of the same weight, and reduces the number of broken stitches when sewing seams and hems on denim. In this work a simple positive driven gear attachment is fabricated to provide drive to feed the core yarn to the existing drafting unit and also the effective guiding roller is also incorporated in the front drafting zone of the spinning machine to ensure the position of core yarn at the center of yarn during twisting. For producing the core yarn lycra with 7 denier is used. The core yarn of two varieties has been produced (cotton sheath - lycra core, and Viscose staple staple fibre sheath – lycra core). The properties of yarn is analyzed with respect to tenacity and elongation

Key words: Lycra, Core yarn, staple fibre, sheath fibre, core yarn attachment

1. Introduction

Core-spun yarns are two-component structure with Core and sheath. Generally continuous filament yarn is used as core and the staple fibres used as sheath covering. The core-spun yarn used to enhance functional properties of the fabrics such as strength, durability and stretch comfort. The production of Core-spun yarns done successfully by many spinning systems. Each system has its own features .The conventional ring spinning is simple and economy but the core positioning in the center is difficult and major strip back problem may arise during subsequent process and the core filaments get twisted. Ring spinning has been favored compared to other spinning systems; however friction spinning has also been described as quiet good apart from the major disadvantage of false-twisted core material and low core-sheath slippage resistance. The main aim of using core spun yarn is to take advantage of the different properties of its both components. The filament increases yarn strength and also permits the use of lower twist level, while the sheath provides the staple fibre yarn appearance and surface physical properties. Core spun yarn spinning is preferred to other yarn blending types because the technique has proved effective in integrating core filament properties with sheath filament properties. Applications have further been realized in manufacturing of industrial and household threads, lightweight apparel fabrics, industrial clothing, tents, underwear and outwear Lycra presents very good stretch elasticity that reaches about 600% with its remarkable elastic recovery reaching 90%, although with a poor tenacity that cannot exceed 0.9 cN/tex Filament draft, pre tensioning, twist multiplier as well as the spindle speed are considered important parameters during lycra-cotton core spinning Researchers have further revealed that, filament draft is an important factor especially the tension draft/pre-tensioning as it ensures proper core alignment as well as uniformity in yarn strength. The twist multiplier is also imperative as it contributes to the core spun yarn strength and proper arrangement of the sheath around the core. The amount of twist inserted is

responsible for holding the fibres at intact to the yarn axis. In addition to influencing the production rate, the spindle speed also affects the stability of core yarn alignment; slower speeds show poor alignment.

2. Experimental set up

The following table gives the experimental set up to produce the core yarn

Table 2.1 Details of raw material used

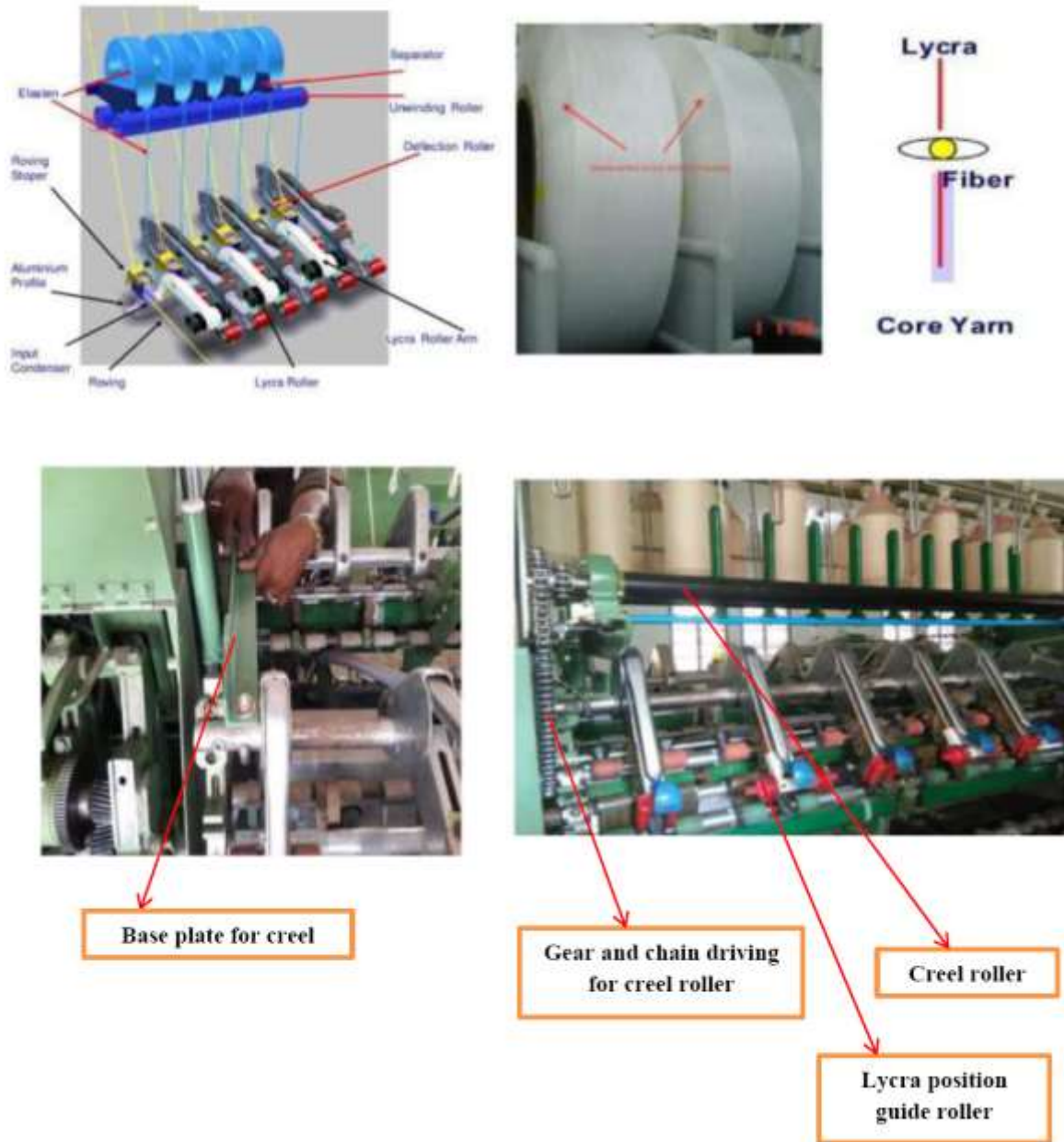
Sample 1	Cotton sheath\ Lycra core
Sample 2	Viscose rayon staple fibre sheath/Lycra core
Sample 2	100% cotton yarn
Sample 4	100% Viscose rayon staple fibre yarn
Cotton details	MCU 5 Effective length: 27mm Uniformity ratio: 47.3 Fineness value: 4.1 Micrograms/Inch Trash %: 5.1 Tenacity in grams/tex: 18.5
Viscose rayon fibre details	Cut length: 30mm Denier: 1.2
Lycra core filament details	Single filament Denier: 7 Density 1.30 gm/cc Tenacity:0.gm/denier Elongation at break: 400 % Colour: white

The Technical details of the machine parameters and settings used to produce the core yarn is given in the table 2.2

Type of drafting system	3/3 spring loaded drafting
Main draft	25.1
Break draft	1.32
Hank of roving	1.0
TPI	25.2
Count of yarn	40'sN _e
Lycra by weight in the yarn	7%
Spacer used	4
Traveller used	6/0 elliptical
Spindle speed	8,500 rpm
Feed ratio	1:0.75
Lycra draft	0.72

Positive driven creel arrangement for feeding the Lycra core material is fabricated by using suitable design (figure 1). The drive for the creel is taken from the from bottom roller of the ring frame drafting unit using gear and chain drive arrangement. The gear ratio is arranged in such a way that the core yarn to delivery roller feed ratio is maintained as 1:0.75 and the lycra draft is maintained as 0.72 to maintain the optimum stretch of lycra core during spinning. By maintain the uniform feed ratio the core yarn produced is having good uniformity wiyh minimum stretch of core material.

Figure 1 Overall arrangement of core yarn spinning



3. Ex
The y

Sample details	Peak load (KG)	Tensile Strength KG/SQ.CM	Elongation at break %
100% Cotton yarn	0.1674	113022	4.69
Cotton –Lycra core yarn	0.1694	121624	6.10
100% viscose rayon yarn	0.1664	205366	11.92
Viscose rayon-lycra core yarn	0.1694	215269	19.55

Figure 2 Tensile strength of yarn

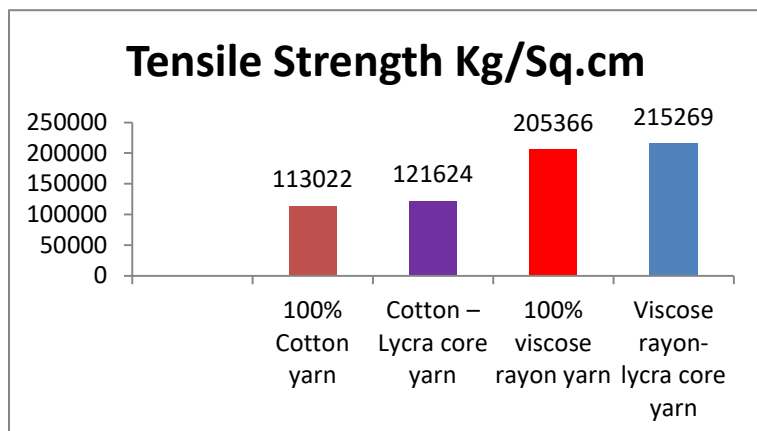
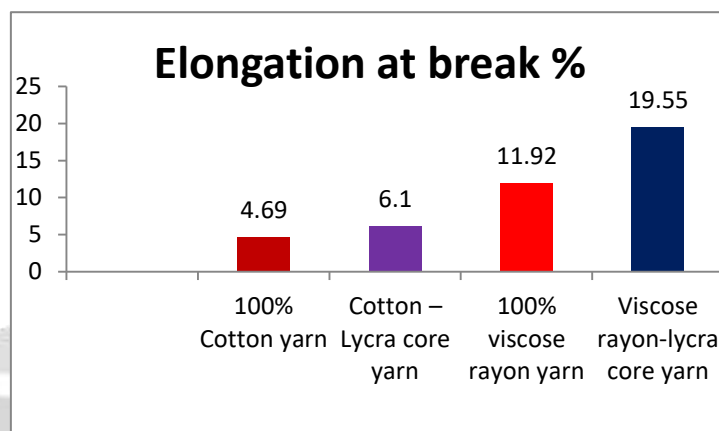


Figure 3 Elongation at break of yarn



The core yarn exhibits higher strength than that of the ordinary yarn. In case of 100% cotton yarn compared with cotton lycra yarn the later has got % increase in tensile strength. In case of the viscose rayon and viscose rayon core spun yarn the later has got 4.6% increase in strength. The core yarn also exhibits more elongation property when compared to the ordinary yarn. So it can be concluded that the use of lycra material in core will increase the tensile strength and elongation of the yarn.

References:

1. N.Balasubramanian, S.K.Nerurkar; Strength and elongation of Cotton, Polyester and Polyester/Cotton Blends at Different Stages of Manufacture, *Textile Research Journal*, 10(44), 106-111 (1974).
2. G.F.Ruppenicker, R.J.Harper, A.P.Sawhney, K.Q.Robert; Comparison of Cotton Polyester Core and Staple blend Yarns And Fabrics, *Textile Research Journal*, **59(1)**, 12-17 (1989).
3. Yang et al; Comparisons of Core-Sheath Structuring Effects on the Tensile Properties of High-Tenacity Ring Core-Spun Yarns, *Textile Research Journal*, 79(5), 453-460 (2009).
4. A.A.Jeddi, A.A.Merati; A study on the Structural and Physical Properties of the Cotton-Covered Nylon filament Core-spun Yarns, *Journal of the Textile Institute*, 88(1), 12-20 (1997).
5. J.K.Lee; A Study on the Core-Spun Yarn, *Journal of Korean Fiber Society*, 13(2), 36-41(1976).
6. C.I.Su, H.Y.Yang ; Structure and Elasticity of Fine Elastomeric yarns, *Textile Research Journal*, 74(12), 1041-1044 (2004).
7. H.S.Lee, H.K.Jung; Segmental and Chain Orientation Behavior of Spandex fibres, *Journal of Polymer Science*, 35(11), 1821-1832 (1998).
8. C.W.Lou, J.H.Lin, C.H.Lei, W.H.Hsing; Production of a polyester core-spun yarn with spandex using a multi-section drawing frame and a ring spinning frame, *Journal of the Textile Institute*, 75(4), 395-397 (2005).
9. O.Babaarslan; Method of producing a polyester/ viscose core-spun yarn containing spandex using a modified ring spinning frame, *Textile Research Journal*, 71(4), 367-371 (2001).
10. B.Shahbaz S.M.Nawaz, M.A.Saeed; Technological Studies on Elastic core Cotton covered yarn, *Pakistan Journal Of Applied Sciences*, 2(6), 690- 683 (2002).