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An analysis for comparative study of polyester/cotton and polyester/ flax blended yarn

M.Raihan[1]and A.Ghosh [2]
1. Textile Engineering Department, Faculty of Engineering, Daffodil International University, and Dhaka, Bangladesh
2. Textile Engineering Department, Faculty of Engineering, Daffodil International University, and Dhaka, Bangladesh

Abstract

Process parameter is a key factor for any spinning industry. It is also called backbone of industry. Process control is done with respect to process parameter and from this view the importance of my article is immeasurable. My research for this article is to be compared 30 Ne polyester- cotton and 30 Ne polyester–flax blended yarn. Polyester-cotton is now a common blend yarn widely used all over the world but polyester –flax blend yarn is a new one. Polyester-flax blended yarn used to produce both knit and woven garments. Process parameters from blow room to finishing in every step it is to be controlled very carefully. A large amount of wastage comes out from blow room and carding. It mainly depends on the quality of raw materials. If the quality of raw materials is better less amount of wastage will come out. Therefore, for continuous production in the spinning industry process parameters are must be followed.

Index Term: *Polyester, Flax, Cotton, blend, and process parameter*

1. Introduction:

The blending or mixing of natural and/or manmade fibers has been practiced for many years, but only recently has it attracted great attention from textile manufacturers. Blending may be defined as the mixing of two or more masses of fibers so that the resulting mixture has been characteristics of the average of the component items [1].Blending different types of fibers is a widely practiced means of enhancing the performance and the aesthetic qualities of a fabric. Blended yarns from natural and man-made fibers have the particular advantage of successfully combining the good properties of both fiber components, such as comfort of wear with easy care properties. These advantages also permit an increased variety of products to be made, and yield a stronger marketing advantage [2,3]. There have been many blended yarns such as polyester/cotton, Chief value of cotton, jute/cotton, cotton/flax, flax/ polyester, Polyester/Modal, Polyester / Viscose, Acrylic / Cotton etc. Polyester fiber which is one of the most preferred among synthetic fibers is widely used both alone and blend with other fibers [4].One of these fibers is cotton. Cotton, as a natural cellulosic fiber, has a lot of characteristics, such as- Comfortable Soft hand, Good absorbency, Color retention, Prints well, Machine-washable, Dry-cleanable, Good strength, Drapes well, Easy to handle and sew [5]. Another blended fiber is flax. Flax fibers have some significant advantages such as high tenacity and natural brightness. On account of this, studies about flax and flax blends are getting many interests day by day. When two components are brought together, each will contribute characteristics that are advantageous and less advantageous for the end purpose. These individual characteristics exert a greater or smaller influence depending the blend properties of the components. If both the requirements of the end product and the fiber properties are known, then the optimal blending proportions can be approximately determined [6].

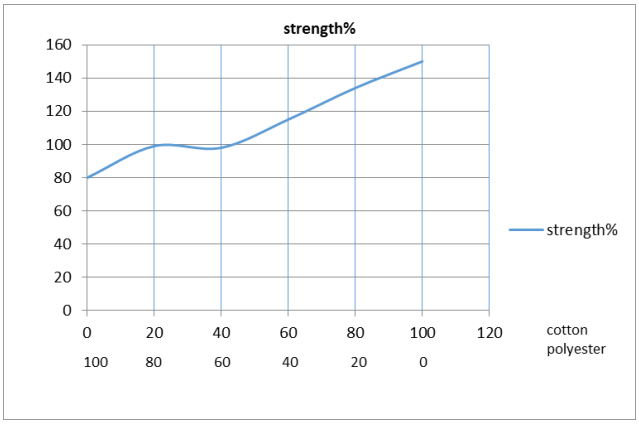


Fig. 1 Yarn strength and blend ratios (%) of cotton and polyester fibre.

2. Methodology:

2.1 Materials: Polyester, Flax and Cotton 30's count for same blend ratio, for example; polyester : flax (PX) = 60:40 and polyester : cotton (PC) = 60:40. Blow room blending is done here. As cotton and flax both are natural fibers. So it remains huge amount of impurities. Before blending with polyester both cotton and flax are pre-processing in the blow room machinery. Extra processing is applied for flax fiber. Though flax fiber is harsh so conditioning is done before processing. In the conditioning period softener is applied then it is kept 16-20 hours. After conditioning flax and polyester fiber is blended in the lay down of blow room.

2.2 Some Pictures of experimental work:


Flax Fiber


Conditioning flax fiber


Opening of flax fiber


Polyester Fiber


Cotton Fiber


Polyester-Flax blend


Chute Mat


Filmy Web


Carded Sliver


Drawn Sliver


Creeling in simplex


Bobbin of Simplex


Creeling of Ring frame

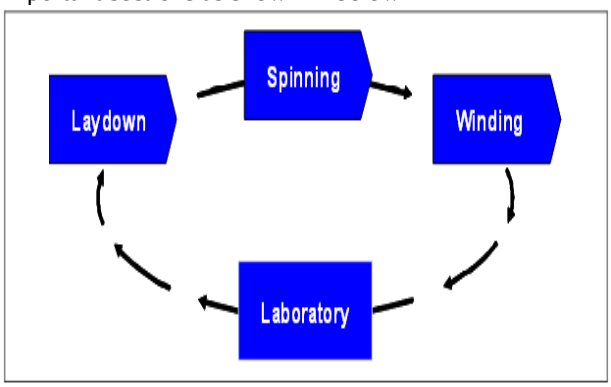

Ring frame


Ring cops


Winding package

2.3 Machines: Uster Tester: (Uster Evenness Tester), Blowroom, Carding, Draw frame, simplex and Ring Frame.

The spinning process can be divided into four main important sections as shown in below-



The bale lay-down and the bale management are the platform of the yarn quality consistency. Some cotton producing countries already supply all the bale data tested on USTER® HVI instruments along with every bale. The spinning mill has to produce a yarn

which should fulfill the agreed requirements of the customers. In the blow room line some machines are used in which beater speed is more important for production. In the carding which is called the half of spinning mill is to produce carded sliver. So in the carding state delivery speed & neps removal efficiency is to be maintained. In flax polyester blended yarn production delivery speed is very less than polyester cotton blended yarn production. The main object of draw frame is to maintain weight per unit length of drawn sliver. Here doubling & draft is more experimental factor. Normally the more the doubling ratio the more to reduce the weight per unit length of the drawn sliver & when increased draft then it also deteriorate the quality. For optimum quality auto leveler is used here. TPI, draft, flyer speed is a major focus in speed frame. It is mainly varied from count to count, process parameters & raw material. Ring frame is key factor for producing yarn. Here different process parameters & testing equipment's are used to measure the quality. Mainly Uster Tester is used to evaluate different quality parameters. Unevenness (U%), co-efficient of variation of mass (CVm%), yarn hairiness, imperfection index (IPI) and thick, thin place, neps etc. of yarn, roving &sliver can be measured or calculated is called Uster Evenness Tester or Uster Tester – 5.

Fig. 2 USTER® TESTER 5

3. Data & Result:

Table 1: Delivery in kg per hour, sliver hank in ktex & NRE% of carding machine.

Carding	PC	PX
Delivery wt.	75	23.36
Sliver Hank	7.5	6.5
NRE%	65	60

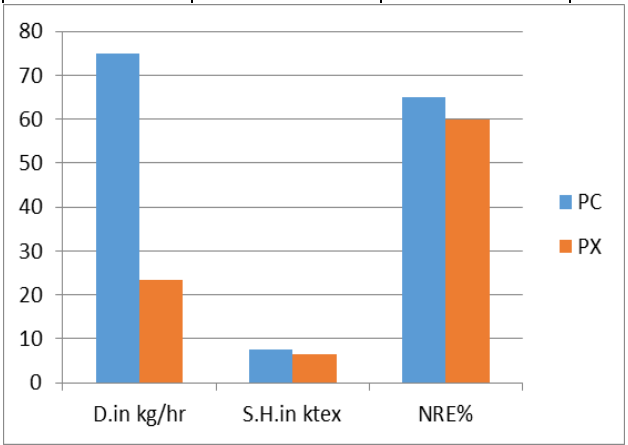


Fig. 3 Delivery weight, sliver hank & Neps removal efficiency in carding of PC & PX blending process

From the figure-3, in the carding machine for both polyester-cotton (PC) and polyester-flax (PX) blended sliver delivery or production is shown in kg per hour. Delivery in polyester-cotton is higher than the polyester-flax blending process. Sliver hank (S.H) is nearly same for PC & PX processes. And also Neps Removal Efficiency (NRE %) of PC is quite similar with PX in the blending process.

Table 2: Draft, TPI, Count, CV%, & TM in simplex machine.

Simplex	PC	PX
Draft	8.35	8
TPI	1.274	1.274
Count	0.96	0.96
CV%	3	6.37
TM	1.3	1.3

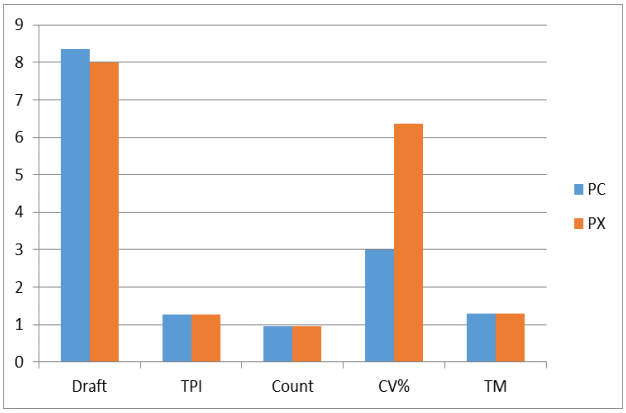


Fig. 4 Draft, TPI, Count, CV%, & TM in simplex of PC & PX blending process

From the figure 4 it is highlighted mainly in Draft & CV% of both blending processes. In the simplex machine twist per inch (TPI), roving hank (Count) in Ne and twist multiplier (TM) kept same for the analyzing process. The draft of PC was higher than the PX in the blending process. Thus CV% of PC is much lower than the PX due to drafting problem in polyester flax processing period.

Table 3: Delivery speed in spinning process

Delivery speed	PC	PX
B.rpm in uniclean	680	680
B.rpm in uniflex	525	530

D.S.in B.D/F(m/min)	850	600
D.S.in F.D/F(m/min)	750	650
F.rpm in simplex	1100	900

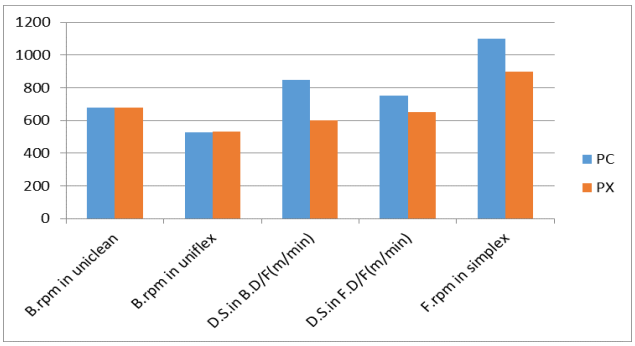


Fig. 5 Delivery speed in spinning process of PC & PX blending process

Here in figure 5 shows that delivery speed up to speed frame. Beater rpm of Unclean and Uniflex machine in Blow room is nearly same for both PC & PX yarn processing but delivery speed in Breaker and Finisher draw frame is quite different in blending process. On the other hand Flyer rpm in Simplex machine is abruptly higher than others. Flyer rpm in PC yarn is higher than the PX yarn processing.

Table 4: Draft, TPI, U% & CV% in ring frame machine.

Ring frame	PC	PX
Draft	31.25	31.25
TPI	18.45	20.55
U%	8	15.01
CV%	1.37	5.52

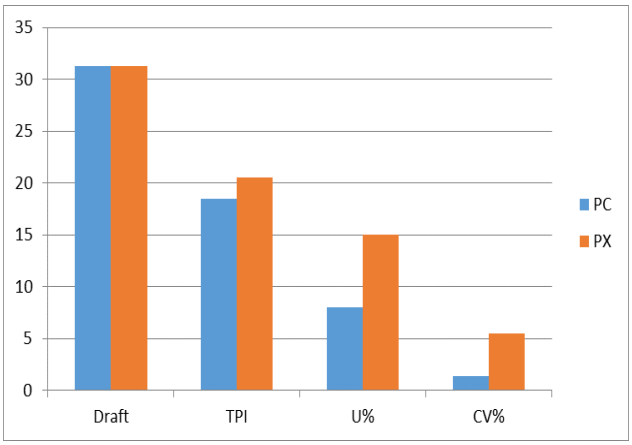


Fig. 6 Twist, Unevenness & Co-efficient of variation of PC & PX blending process

Here in figure 6 depicts that for 30 Ne PC and PX blended yarn production draft is already kept same but TPI is different due to variation of fiber processing. Here TPI of PX is higher because CSP of PX is more than PC yarn. So TPI is higher for PX blended yarn production. From the graph it is also clear that U% and CV% of PX yarn is higher than PC yarn.

Table 5: Imperfection & CSP in ring frame machine.

Ring frame	PC	PX
Neps (+200%)	252	3407
Thick (+35%)	841	1492
Thin (-40%)	210	359
CSP	3500	4416

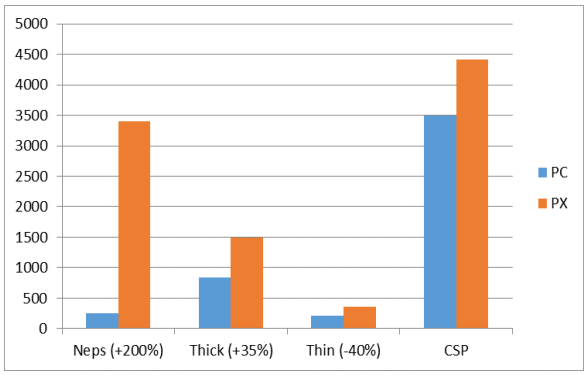


Fig. 7 Imperfection & CSP in PC & PX yarn processing

From figure 7 it is clear that Neps, Thick place & Thin place in PC and PX yarn testing, quality of PC is quite higher than PX but in CSP value that means count in Ne & strength in pound (lb) product that is called CSP is higher in PX yarn production and less in PC yarn production.

Table 6: Spindle speed in Ring spinning machine

Ring frame	PC	PX
Spindle Speed,rpm	18000	10000

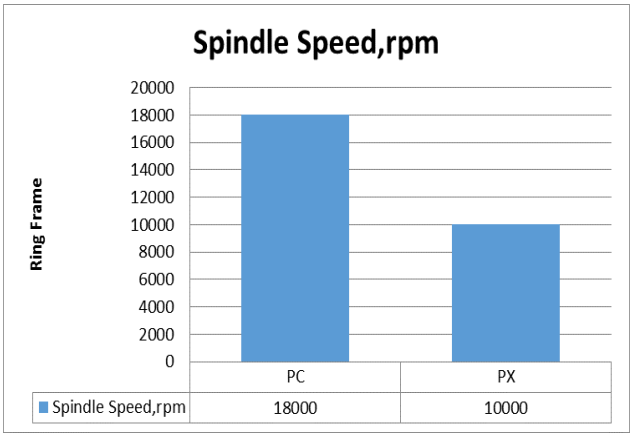


Fig. 8 Spindle speed in PC & PX yarn processing.

From Figure 8 it is highlighted only in spindle speed because it is mainly related with production. It shows the spindle speed of PC yarn production is nearly double that of PX yarns production due to problem of flax fiber production.

4. Conclusion:

In the bottom line, it is clear that polyester-flax blended yarn processing is very difficult due to problem of flax fiber processing. But new product is necessary to discover due to high demand fibres. Gauge setting as well as other settings in different zone is important parameters for PC & PX yarn production. And finally the proportion of flax should always keep low amount in any flex blending process for quality yarn production.

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