

THE ROLE OF DRAWING PROCESS ON THE PROPERTIES OF RING SPUN YARN



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(Signed)

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Chapter 1

Introduction

1.1 Introduction

The concept of quality is primarily vital to every field, but, it is more dominant in Textile Industry. Because of the developments in technology the demands placed on the quality of the yarn are increasingly high. It is quite hard to meet to meet the customers' needs with the minimum utilization of the resources and completing the tasks in the shortest possible time. According to an estimate made by ministry of Industries in year 2007 the total share of textiles in exports is about 70% with total share in construction is about 50%. The textiles share in employment is about 45% with exports over 8 Billion dollars per annum. All these statistics reveal that how much importance textile sector has in Pakistan. Process improvement and optimization is the sole criterion to increase the above mentioned values. Spinning is one of the major processes of textile. All other processes are dependent on the spinning process, because a good quality fabric or garment can not be made if the yarn is not fault free. Drawing department has its own importance in the spinning mill. It is actually the quality control department of the spinning mill. Because after that the faults in the yarn can not be corrected or reduced, but, actually, are further elongated after being drafted.

From a purely commercial viewpoint the draw frame is of little significance-it usually contributes less than 5% to production cost of the yarn. However, its influence on quality, especially regularity or evenness, is of great importance to the whole spinning process. Further, if the draw frame is not properly adjusted, there will also be effects on yarn strength and elongation.

There are two main reasons for the considerable influence of the draw frame on evenness. Firstly, within the sequence of machines in the cotton spinning mill, the draw frame is the definitive compensation point for eliminating errors. Inadequacies in the product leaving the draw frame not only pass into the yarn, they are actually reinforced by the drafting effects following the draw frame. The yarn is never better than the draw frame sliver.

Secondly, a defect arising at the draw frame itself can exert an effect of significant proportions on the overall process. High performance draw frames currently produce over 200 kg of sliver per hour at each delivery. Very large quantities of poor quality sliver will be produced in the time that elapses before discovery of the defect. It is therefore understandable that even draw frames are being used to an increasing extent in the short staple spinning mill. It is also clear that, of all departments in the spinning mill, the drawing section is the least suitable place for making rigorous economies.

At the drawing stage, the material passes not just one machine but usually two, arranged one after the other and combined to form a group. Processing in two passages is necessary completely to fulfill the requirements. The second passage is often superfluous after the combing machine, because then it does not normally generate any improvement in quality. If a second passage is nevertheless included after combing, it serves mainly to obscure joins from combing, and possibly to improve hank constancy. Also, a single

passage can or must suffice when comber noil or other waste is processed in the rotor spinning mill.

Chapter 2

Aims and Objectives

2.1 Aims and Objectives

The Textile Industry is one of the biggest industries in South Asia. It has remained backbone of the economy of the developed countries of the world like the USA, UK and some of the European countries as well. The Spinning Industry has its prime importance in the textile industry. In the past few years, the industry has been shifted from the USA and other parts of the world to the developing countries of Asia like India, China, Bangladesh and Pakistan. The reason behind that shift is that because of the increase in the production cost due to the rise of the labour cost, it is not possible to produce goods at a cheaper rate. So, the demand for the good quality yarn from the South Asian countries has risen, especially, in the USA and Europe. As drawing process is that department in which the quality of the yarn is controlled. Hence, its effects on the yarn properties can not be underestimated.

Our study is primarily focused on “the role of the drawing process on the properties of the ring spun yarn”, but we also studied the sophisticated spinning process in detail as a whole as well. The properties of ring spun yarn which are affected by the drawing process are tensile, irregularity, hairiness, compression, bending rigidity and moisture transport. But our special focus will be on tensile properties and irregularity in the ring spun yarn. It was primarily intended to broaden our knowledge in the spinning process. Drawing process is a very critical process in which faults arising from the previous processes can be eliminated or compensated. If not controlled in this process, they can become bigger and severe after passing through the drafting stage. All these faults will lead to the final yarn and deteriorate the yarn quality. So, the effect of drawing process on the properties of the ring spun yarn is phenomenal.

The objectives of the drawing process are given below.

2.1.1 Equalizing

One of the main tasks of the draw frame improving evenness over short, medium and, especially, long terms. Card sliver fed to the draw frame have degree of unevenness that can not be tolerated in practice, and slivers from the comber contain the infamous piecing: these must be obscured. It should be noted, however, that short wave sliver evenness is not- as sometimes assumed- is not the sole criterion for evaluating the performance of the draw frame. It is true, for example, that unevenness over short lengths can be noticeably reduced by very narrow setting of the drafting arrangement, but this is often associated with deterioration in other quality parameters of the yarn, particularly strength.

Also, it is a mistake to assume that sliver evenness- especially over short length- can be significantly improved by use of several passages. A second passage brings hardly any improvement and a third can actually lead to deterioration. In relation to settings and number of passages, therefore, it is important to find the optimum rather than to seek the maximum.

Equalizing is always performed by a first process, namely doubling, and can optionally be performed by a second process, namely autolevelling. The draft and the doublings often have the same value and lies in the range 6 (short fibers) to 8 (medium and long fibers). In processing of pure comber noil in the rotor spinning mill, however, it is usually necessary to settle for a value of 4.

Uster statistics can serve as a quality comparison for short length. The percentage ranges indicate the proportion of spinning mills that achieve the stated value or lower (CV %). The statistics are based upon values from spinning mills all over the world. In relation to the carded material, the table shows for example that 5% of all mills achieve a value of 3.4% or better, 10% of mills achieve a value of 4%, and so on.

2.1.2 Parallelizing

To obtain an optimum value for strength in the yarn characteristics, the fibers must be arranged parallel in the fibers strand. The draw frame has the task of creating this parallel arrangement. It fulfils this task by way of draft, since every drafting step leads to straightening of the fibers. The value of the draft must be adapted to the material, i.e., to several fiber parameters (here, mainly the staple length) and also to:

- the mass of the fibers,
- the volume of the strand, and
- the degree of order (parallel disposition).

It will be clear that the draft can not be high immediately following the card (if possible not above 8), but thereafter can increase from machine to machine.

2.1.3 Blending

In addition to the equalizing effect, doubling also provides a degree of compensation of raw material variation, by blending. This result is exploited in particular in the production of blended yarns comprising cotton/synthetic or synthetic/synthetic blends. At the draw frame, metering of the individual components can be carried out very simply by selection of the number of slivers entering the machine. For example to obtain a 67:33 blend, four slivers of one component and two slivers of the other are fed to the draw frame. Of course, these slivers must have the same hank.

2.1.4 Dust Removal

Dust is steadily becoming a greater problem both in processing and for the personnel involved. It is therefore important to remove dust to the greatest practical extent at every possible point within the overall process.

Unfortunately, dust removal can only be carried out to a significant degree when there are high levels of fiber/fiber or fiber/metal friction, since a large fraction the smallest particles (dust) adhere relatively strong to the fibers. Such friction arises especially at the card and the draw frame: in the latter case, mainly owing to the drafting operation. The draw frame is therefore a good dust- removing machine. On high performance draw frames equipped with appropriate suction removal systems, more than 80% of the incoming dust is extracted.

2.2 Mill Profile

I participated in the Energy Efficiency Audit of Sapphire Spinning Mills No.5, conducted by SMEDA, Lahore. It also helped a lot in the completion of our project. We got the chance to observe each and every process of the mill which comprises about 50,000 spindles. We got the chance to meet the top management and engineers and share their valuable expert opinions during our stay in the mill.

But for the project, the mill under observation is “Riaz Textile Mills (Pvt.) Ltd.” Riaz Textile Mills Limited is a privately owned company by the ‘Riaz Group’. Other projects include an edible oil refinery located in the north of the country with approx 150 tons/day of production and a terminal for handling edible oil with a capacity of 20,000 tons at one time located at Port Qasim Karachi.

It is the spinning process of Riaz Textiles for a carded yarn from UNIT – 2. In this unit they are making four types of yarn given below:

Lycra + Cotton (Plain)
Lycra + Cotton (Slub)
Cotton (Plain)
Cotton (Slub)

And are using two types of cotton as a raw material

Pakistani Cotton
Imported Cotton

The mill has the following profile mentioned below:

Company Name: Riaz Textile Mills Limited

Address: 23 KM, Sheikhpura Faisalabad Road
Feroze Wattoan, District Sheikhpura
Pakistan

Products: 100% cotton yarn: carded and combed both

Market: Worldwide

Machinery Details:

UNIT-2 Trutzchler

It is the spinning process of Riaz Textiles for a carded yarn from UNIT – 2.

Blow Room

There are two Blendo Mates are used in Riaz Textile. One was treating with imported cotton and link with line – 1 and other was treating with PAK cotton and linked with Line – 2 & 3.

10.2.1 Line – 1 & 2 (Trutzschler):-

Blendo Mate BDT-019

Beater Roller = 1600 RPM

Lay Down = 12/min

SP-MF (Metal and Fire Separator)

CL-P (Pre Cleaner)

Fan = 2200 RPM

Dust Cage = 110 RPM

Stripper = 400 RPM

Beater Type = Pin Beater

Beater1 RPM = 700 RPM

Beater2 RPM = 680 RPM

MX-I-10 (Multi Mixer)

NO. Carbines = 10

3 Opening Roller = 762 RPM

3 Opening Roller = 780 RPM

Conveyor Belt = 16.8 RPM

Pressure = 250 Pascal

CL-C3 (Fine Opener)

Beater1 Type = Spike Beater

Beater1 RPM = 1070 RPM

Beater2 Type = Wire Beater

Beater2 RPM = 1905 RPM

Beater3 Type = Wire Beater
Beater3 RPM = 3015 RPM

SP-F (Foreign Metal Separator)

10.2.2 Line -3 (China Made):-

Blendo Mate BDT-019

Beater Roller = 1400 RPM

SP-MF (Metal and Fire Separator)

M6-X (Multi Mixer)

NO. Carbines = 06
3 Opening Roller = 462 RPM
3 Opening Roller = 471 RPM

FA-102 (Pre Cleaner)

Beater Type = Pin Beater
Beater RPM = 725 RPM

CL-16 (Fine Opener)

Beater Type = Wire Beater
Beater RPM = 625 RPM

Condenser

Card Machines

All machines of carding are TC – 03 (Trutzschler)

Line 1

Number of Machine = 08
Production = 75 grains/yard

Line 2

Number of Machine = 06
Production = 75 grains/yard

Machine Settings

Takerin1 Speed	= 1150 /min
Takerin2 Speed	= 1795 /min
Takerin3 Speed	= 2366 /min
Cylinder Speed	= 505 /min
Top Set Speed	= 250 /min
Doffer Speed	= 235 /min
Delivery	= 75 grain/yard
Production	= 74.8 kg/hr
CV	= 1.98%

Line 3

Number of Machine	= 03
Production	= 75 grains/yard

Machine Settings

Takerin1 Speed	= 1150 /min
Takerin2 Speed	= 1795 /min
Takerin3 Speed	= 2366 /min
Cylinder Speed	= 505 /min
Top Set Speed	= 250 /min
Doffer Speed	= 235 /min
Delivery	= 75 grain/yard
Production	= 95 kg/hr
CV	= 1.86%

Drawing Machines

Breaker

All machines of breaker drawing are DX – 8 (Toyota) with double spinning points.

Line 1

Number of Machine	= 02
Doubling	= 5
Production	= 75 grain/yard
Speed	= 650 m/min
Drafting	= 5/4
Gauges	= 1.5, 5, 7.5

Line 2 & 3

Number of Machine	= 02
-------------------	------

Doubling	= 5
Production	= 75 grain/yard
Speed	= 650 m/min
Drafting	= 5/4
Gauges	= 1.5, 5, 7.5

Finisher

All machines of finisher drawing are TD – 03 (Trutzschler) with single spinning points and have an autoleveller in each machine.

Line 1

Number of Machine	= 04
Doubling	= 6
Production	= 80 grain/yard
Speed	= 575 m/min
Drafting	= 4/3
Gauges	= 42, 52

Line 2 & 3

Number of Machine	= 04
Doubling	= 6
Production	= 80 grain/yard
Speed	= 575 m/min
Drafting	= 4/3
Gauges	= 42, 52

Simplex Machines

All machines of simplex are FL - 100 (Toyota) with 120 flyers in each machine.

Line – 1

Number of Machine	= 04
TPI	= 0.89, 0.96, 0.60, 0.70
Count	= 0.6
Flyer revolutions	= 1000 RPM
Production Speed	= 24.5 m/min
Total length on Bobbin	= 2255 m
Drafting	= 4/4
Gauges	= 6.5, 19, 25

Line – 2 & 3

Number of Machine	= 04
TPI	= 0.89, 0.96, 0.60, 0.70
Count	= 0.6
Flyer revolutions	= 1000 RPM
Production Speed	= 24.5 m/min
Total length on Bobbin	= 2255 m
Drafting	= 4/4
Gauges	= 6.5, 19, 25

Ring Machines

All machines of ring are RM – 350 (Zinser)

Number of Machines	= 19
Number of Spindles	= 1200
Spindle Speed	= 7000 – 17000 RPM
Arm Pressure Gauge	= 3mm
Front – to – Middle	= 44.5 mm
Middle – to – Bottom	= 60 mm
Ring Up	= 56mm
Balloon Control	= 58mm
Spindle Gauge	= 75, 82.5
Motors Used	= 45 * 13 Kw

UNIT-1 Reiter

It is the spinning process of Riaz Textiles for a carded yarn from UNIT – 1.

Blow Room

- 1-UNI Floc – A11 with two assortments at one time
- 2-UNI Clean – B11
- 2-UNI Mix – B70
- 2-Vision Shields (color contamination sorters) Jossi
- 4-UNI Flex – B60

Carding

- 26-Rieter C51 Hi per Cards with A70 Chute Feed
- 1-Automatic waste removal system in blow room and card from best air