

INTRODUCTION OF INTERSECTING GILLING MACHINE IN JUTE PROCESSING FOR MAKING JUTE AND BLENDED YARN

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Abstract: The study was aim to determine the suitability of intersecting gilling machine in jute processing system. In this regard the machine was used for processing of jute fibre to yarn [1]. The third drawing sliver passed through the intersecting gilling of GN5 type into 4:1 input –output ratio of slivers. Yarns spun by this slivers through different types of spinning frame. Quality ratio of jute yarns produced from different spinning machines were measured. These were for Hessian Spinning machine is 84.17%, Apron draft spinning frame is 88.59% and Spingard spinning frame 96.34%. However for medium count jute-polypropylene blended yarn, the quality ratios are between 102-112 and yarns were spun by hessian spinning frame. These results compared with the yarn produced through conventional jute spinning system (except intersecting Gilling machine, table 2). Findings of the study indicate a new era for the jute processing by using intersecting Gilling machine. It is observed that the introduction of Intersecting Gilling machine has a potential prospect in jute processing for making fine jute yarn.

Keywords: Intersecting gilling, drawing achines, spinning machines, jute yarn.

1. Introduction

Intersecting Gilling machine is usually used for the process of natural and chemical fibres. It is actually different kinds of drawing machine which can produce straight sliver with the facility to take multiple sliver input from other drawing machines and its head consists in double field of fallers and work at a very high speed[2]. The operation is done between drawing and spinning frame. The machine is suitable for most demanding fibres like silk, flax, wool or fibre with a very low

cohesion. Intersecting Gilling machine is convenient for all the natural and chemical fibres [3].

The study was aimed to develop a processing technique for the production of fine jute and blended yarn by using this machine. The output silver from Intersecting Gilling machine was feed into different spinning machines, such as Hessian, Apron Draft, and Spin Grad Spinning to manufacture different fine jute and blended yarn. In conventional jute processing system yarns are being produced by using different stages of machinery. Drawing machines are very important for making different types of jute yarn. Parallelisation action of fibres are takes place in this stage. Intersecting Gilling machine is one kind of drawing machine used to produce slivers that can spun through different spinning machines to make fine jute yarn.

In conventional drawing machines, finisher card sliver processed by the vertical pinning action of several faller bars which moves horizontally with the same direction of sliver movements. This action occurs by the single side of the fallers movement. On the other hand, in intersecting Gilling machine sliver processed by two sides of the faller bar movements. As a result, because of both side pinning actions the more uniform, parallel and straight sliver can be produced. Moreover, this machine is widely used for flax processing and the flax characteristics are almost similar to jute characteristics with small variation of chemical constituents. So there is a very good prospect of intersecting Gilling machine to introduce in jute processing system for

improving drawing process to produce quality jute yarn.

There are different types of jute spinning machinery [4,5,6]. Some of them are describe below.

Flyer Spinning System

Flyer spinning system is the most popular and widely used of jute spinning. In this system, spinning frame inserts the twist by means of overhung flyers suspended above the bobbin. The flyers are carried on ball bearing whereas mounted on the front of the frame at about waist-height. The part of the wharf projecting above the mounting assembly is called the cap and plays an important part in the actual operation of the frame. The wharf is driven through a cotton or nylon flat belt from the main cylinder of the machine.

The yarn comes down the drafting tip to the top of the wharf cap where it enters a central hole and continues down through the wharf. At the exit of the hole a ceramic disc is cemented to protect the metal from the abrasive action on the yarn. The flyer legs have small eyes at the foot through which the yarn passes on the bobbin in the system, flyers are designed to run at high speeds, they must be dynamically balanced otherwise any eccentricity would ultimately damage the whole assembly and could cause a serious accident.

Centrifugal Spinning (Gardella spinning Machine)

The Spinning is a centrifugal type dry spinning system. The machine was used for production of fine yarn. The yarn can be spun from 71,90 tex (2.08 lbs/spy) to 266.56 tex (7.74 lbs /spy).As there is no on-winding tension during spinning there is no question of yarn breakage[7].

Apart from the case of the “Spingard” innovating principle, all existing spinning frames, although gradually improved in search of the ultimate performances, belong to models and technologies developed last century when certain jute machines took shape from the existing flax processing ones. The “Spingard” operative principle, on the contrary is something completely different and new. The

idea was developed in late 50’s and brought soon to the realization of a jute spinning frame offering performances and advantages never reached before. The machine, named “Spingard” after the combination of the wards “Spingard” and “Gardella” obtained full success on industrial utilization since the beginning of the 60’s in its previous versions “3rd Series” and 4th Series”. This continued in the 70’s with the latest version “15M”. Country to any existing spinning system, the “Spingard” doesn’t employ any flyer or ring. The sliver after having been reduced to the due weight by the high draft unit is guided by a tube inside the spinning pot. Since this rotates at high speed (6,000 to 9,500 rpm), the sliver coming out of the tube is pushed by the centrifugal force against the wall of the pot and compelled to rotate with it. In this way any revolution of the pot creates one turn of twist in the yarn. Varying the ratio between the spinning pot speed and the delivery speed of sliver from the high draft unit, yarns with any desired grade of twist are obtained. The tube-guiding sliver inside the pot has an up-and-down motion for the regular distribution of the yarn inside the pot in progressive coils. It is not at all necessary for the machine to apply extra moisture into the yarn, as there is no question of minimization of hairiness as that of other ring spinning yarns. The cutting of the yarn is carried out automatically. The same machine is capable of spinning fine, medium and heavy counts.

Apron Draft Spinning Machine

The Apron Draft Spinning Machine is the latest contribution of Mackie’s (jute machinery manufacturing company of Ireland, England) to jute industry [8]. The machine is the out come of long research and development for perfecting the drafting apparatus for jute fibre. The new frame in design, efficiency and productivity has set a revolutionary standard in the modern concept of jute spinning. Mackie’s deserve appreciation for such an appropriate and ideal spinning frame that had in course of time replaced all old models.

There are several factors, mechanical and others to be taken into consideration when examining a spinning frame. The yarn is, as a result of precision drafting more regular then conventionally spun yarn. There is also an

increase of about 30% more in yarn strength compared with ordinary machine spinning from same batch. The machine is applicable for jute [8].

2. Materials and Method

Different kinds of raw jute and synthetic fibre such as Acrylic and Polypropylene were taken and blended with jute with different proportions. Jute fibre was piled with required emulsion and kept for 48 hours for maturation. Then the fibre was processed through Breaker Card, Finisher Card, 1st Drawing 2nd Drawing and 3rd Drawing Machines. Jute with acrylic and Polypropylene were blended through Breaker card machine with different proportion separately. 3rd Drawing silver was feed into Intersecting Gilling machine with the input and output ratio of 3:1 and in another set up it was 4:1. The out-put sliver then feed to Apron

Draft, Spingard Sinning, Hessian spinning machines and different count yarns were produced.

3. Results and Discussion

In this study 100% jute and jute blended with acrylic and polypropylene were processed through different spinning machinery with input-output ratio of 3: 1 and 4:1 at intersecting gilling machine. In 100% jute yarn quality ratio were 88.59, 96.34, 94.31 and 84.17. In case of jute acrylic blended yarn quality ratio was 90.97, 99.33, 97.00 and 86.40. Quality ratios of medium count blended yarn of jute-polypropylene were 110, 106, 112 and 102 (table 1). Textile properties of the product yarns were tested following standard testing method [9].

Table 1: Physical properties of jute and blended yarns by using Intersecting gilling with different spinning machines

Spinning Machine	Ratio of blended yarn	Input: Output ratio	Count (Lb/spy)	Average Tensile Strength (Lb)	SD for Tensile Strength	CV (%) for Tensile strength	Quality Ratio (QR%)
Apron Draft	100% jute (BWB)	3:1	3.42	3.03	0.313	10.32	88.59
Spin Grad	100% jute (BWB)	3:1	3.28	3.16	0.403	12.76	96.34
Apron Draft	100% jute (BWB)	4:1	4.22	3.98	0.225	5.65	94.31
Hessian	100% jute (BWC)	4:1	5.37	4.52	0.434	9.60	84.17
Apron Draft	80:20 (Jute :Acrylic)	3:1	3.15	2.86	0.195	6.83	90.97
Spin Grad	80:20 (Jute :Acrylic)	3:1	3.00	2.98	0.261	8.77	99.33
Apron Draft	80:20 (Jute :Acrylic)	4:1	4.00	3.88	0.218	7.16	97
Hessian	80:20 (Jute :Acrylic)	4:1	5.00	4.32	0.269	6.24	86.40
Hessian	60:40(Jute: Polypropylene)	3:1	8.00	8.8	0.450	12	110
Hessian	60:40(Jute: Polypropylene)	3:1	8.00	8.5	0.460	13.5	106
Hessian	60:40(Jute: Polypropylene)	3:1	8.00	9.0	0.443	13	112
Hessian	60:40(Jute: Polypropylene)	3:1	8.00	8.2	0.502	16	102

Table 2: Physical properties of 5lbs/spy (172 tex) blended yarn using existing jute processing system

Drafts	Nominal Count lbs/spy (tex)	Actual Count lbs/spy (tex)	TPI (Twist per inch)	Tensile strength Lbs (kg)			Quality Ratio%
				Mean	SD	CV% of strength	
18	5(172)	5.20 (179.14)	6.8	4.75 (2.15)	0.361	16.79	91.34
19		5.19 (178.79)	6.8	4.96 (2.25)	0.355	15.78	95.56
20		5.20 (179.14)	6.8	5.20 (2.36)	0.297	12.58	100.00
22		4.99 (171.90)	6.8	4.76 (2.16)	0.278	12.87	95.39
23		4.95 (170.52)	6.8	4.45 (2.02)	0.299	14.80	89.89

4. Conclusion

Intersecting Gilling machine can be used in traditional jute spinning to produce regular and fine jute and blended yarn with better quality. Yarns of different linear density were produced through different spinning machines using Intersecting Gilling with different input and output ratio. Here, all jute yarns and blended yarn with different ratios were produced. Physical properties of yarns were tested and found satisfactory. As a result, introduction of Intersecting Gilling machine in jute processing system is encouraging.

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