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AN ELITE STUDY FOR YARN THROUGH INTERSECTING GILLING MACHINE AND ITS FUTURE

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ABSTRACT

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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 a double field of fallers and work at a very high speed. 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. The study was also 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. The third drawing sliver passed through the intersecting Gilling of GN5 type into 4:1 input-output ratio of sliver. Yarns spun by this sliver through different types of spinning frame. Quality ratios of yarns produced from different spinning machinery were measured. These were for Hessian Spinning machine is 89.33%, Apron draft spinning frame is 98.75% and Spingard spinning frame 93.0%. These results compared with the yarn produced through conventional jute spinning system (except intersecting Gilling machine). 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.

***Key words**: intersecting, gilling, yarn, machine, yarn quality*

INTRODUCTION

Jute is a versatile natural fibre with unique characteristics for long outstanding applications. It is biodegradable, non-toxic, environment friendly, Ligno cellulosic bast fibre. In conventional jute processing system yarn was manufactured by using different stages of machinery. Drawing machines are very important for making different count jute yarn by spinning. Intersecting gilling machine is one kind of drawing machine used to produce such slivers that can spun through spinning machinery to make fine jute yarn (Atkinson 1965).

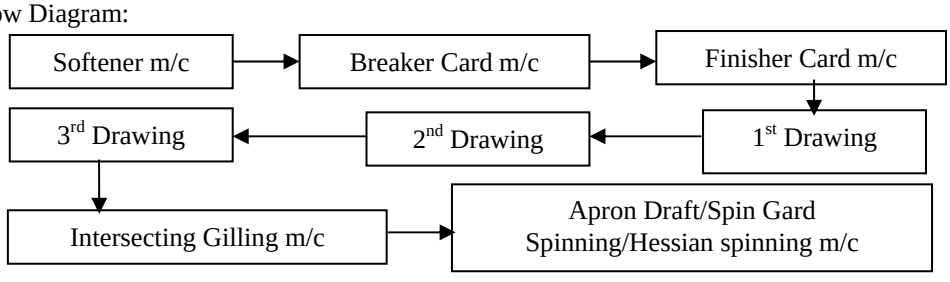
In the conventional drawing machines, finisher card sliver processed by the vertical pin action of several faller bars, which moves horizontally with the same direction of sliver movements. This action occurs by the single side of the fallers movement. On the other hand, in Intersecting Gilling machine sliver processed by two sides of the faller bar movements which is horizontally but upper and bottom sides of vertical pin actions with the same direction of sliver movements. As a result, because of both side pinning actions the more uniform, parallel, stable and straight sliver can be produced. Moreover, this machine is widely used for flax line and flax characteristics are almost similar to jute characteristics with slight variation of chemical constituents. So, there is a very good background of Intersecting Gilling machine to introduce in jute processing system for improving drawing process to produce quality jute yarn (Atkinson 1964).

The combing section of an Intersecting Gilling machine is chain faller driven and maximum faller speed is 2000 faller drops per minute. During drawing operation fibres are combed to make it parallel. Simultaneously, two or more slivers are mixed together and stretched to reduce weight per linear measure to suit spinning. The numbers of fallers used are determined partly by the particular method of operating the fallers, but mostly by the length of the fibre. The vertical pins in the fallers are used to restrain the movements of the fibres. The uses of pins are necessary to the drafting of heavy loads of Jute/Wool/Falx and long fibres. The pin path has an influence on the machine performances and on the quality of produced slivers (Mahabubuzzaman and Lutfar 2002).

MATERIALS AND METHODS

Different kinds of raw jute such as BWB (Bangla White B), BTB (Bangla Tossa B), BTC (Bangla Tossa C) were taken as the raw materials for the experiment. 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. After getting 3rd Drawing sliver it was feed into Intersecting Gilling machine with the input and output ratio of 3:1. The output sliver then feed into Apron Draft and Spin Gard Spinning machine for spinning 3.42lb/spy and 3.28lb/spy jute yarn. In another process, 3rd Drawing sliver was feed into Intersecting Gilling machine with the input and output ratio of 4:1. The output sliver then feed into Apron Draft and Hessian Spinning machine for spinning 4.22lb/spy and 5.37lb/spy jute yarn (Ranjan 1985).

Process Flow Diagram:



RESULTS

BWB, BTB, BTC jute fibre was processed according to the flow diagram. After spinning, the physical properties of the yarn were measured. The obtained results are given in Table 1, Table 2, Table 3 and Table 4.

Table 1. Physical properties of 3.42lb/spy jute yarn produced from BWB jute by using the 3:1 input and output ratio of Intersecting Gilling machine and spun through Apron Draft spinning

Average Twist Per inch	Average Tensile Strength (lb)	Standard deviation (SD) for Twist	Standard deviation (SD) for Tensile Strength	Coefficient of Variation (CV%) for Twist	Coefficient of Variation (CV%) for Tensile strength	Quality Ratio %
6.4	3.03	2.84	0.313	9.21	10.32	88.59

Table 2. Physical properties of 3.28lb/spy jute yarn produced from BTB jute by using the 3:1 input and output ratio of Intersecting Gilling machine and spun through Spin Gard Spinning

Average Twist per inch	Average Tensile Strength (lb)	Standard deviation (SD) for Twist	Standard deviation (SD) for Tensile Strength	Coefficient of Variation (CV%) for Twist	Coefficient of Variation (CV%) for Tensile strength	Quality Ratio %
7.0	3.16	3.80	0.403	12.38	12.76	96.34

Table 3. Physical properties of 4.22lb/spy jute yarn produced from BWB jute by using the 4:1 input and output ratio of Intersecting Gilling machine and spun through Apron Draft spinning

Average Twist per inch	Average Tensile Strength (lb)	Standard deviation (SD) for Twist	Standard deviation (SD) for Tensile Strength	Coefficient of Variation (CV%) for Twist	Coefficient of Variation (CV%) for Tensile strength	Quality Ratio %
5.0	4.1	1.93	0.225	5.65	5.72	94.31

Table 4. Physical properties of 5.37lb/spy jute yarn produced from BTC jute by using the 4:1 input and output ratio of Intersecting Gilling machine and spun through Hessian spinning

Average Twist per inch	Average Tensile Strength (lb)	Standard deviation (SD) for Twist	Standard deviation (SD) for Tensile Strength	Coefficient of Variation (CV%) for Twist	Coefficient of Variation (CV%) for Tensile strength	Quality Ratio %
6.4	4.52	0.545	0.434	9.60	9.72	84.17

DISCUSSION

Intersecting Gilling machine used in traditional jute spinning to produce regular and fine jute yarn with higher productivity. From the tables, it is observed that, all the tested physical parameters like Coefficient of variation (CV%), Standard Deviation (SD), Tensile Strength, Quality ratio of jute yarn from Intersecting Gilling and Spinning Machines provide desired quality of the fine jute yarn. In Table 1, it was observed that, 3.42lb/spy jute yarn produced from BWB jute by using the 3:1 input and output ratio of Intersecting Gilling machine and spun through Apron Draft spinning and quality ratio was found 88.59%. On the other hand, in Table 2, 3.28lb/spy jute yarn produced from BTB jute by using the 3:1 input and output ratio of Intersecting Gilling machine and spun through Spin Gard Spinning and quality ratio was found 96.34%. In another experimental, setup, the input and output ratio of Intersecting Gilling machine was 4:1. After spinning the physical properties were given in Table 3 and Table 4. In Table 3, 4.22lb/spy jute yarn produced from BWB grade jute fibre and yarn spun through Apron Draft spinning machine (http://www.ijira. Org./techware. htm).

The quality ratio of produced yarn was found 94.31%. In Table 4, 5.37lb/spy jute yarn produced from BTC grade jute fibre and yarn spun through Hessian Spinning machine. The quality ratio of produced yarn was found 84.17%. However, some problems were observed during spinning. Intersecting Gilling Machine delivered scar less/Straight sliver and due to the absence of crimping action the strength of the sliver was weaker than traditional slivers. During spinning naps, hairiness in yarn was formed. To sum up, in these entire study quality ratio and other physical properties of produced yarns are acceptable. So, introduction of Intersecting Gilling machine in conventional jute system has a bright prospect (http:www.nsc.fr).

CONCLUSION

Intersecting Gilling machine is convenient for all the natural and chemical fibres. It is particularly adapted to the process of the most demanding fibres like silk or fibres with a very low cohesion. 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 a double field of fallers and work at a very high speed. The study was aimed to develop a technique for the production of fine jute yarn by using this machine as well as the behavior of this machine was observed. The output sliver from Intersecting Gilling machine was feed into different spinning machines, such as Hessian, Apron Draft, and Spin Gard Spinning to manufacture different fine jute yarn. Moreover, by using Intersecting Gilling machine in conventional jute system, a process was determined with high productivity and yarn quality was evaluated. It is observed that, from this new yarn manufacturing process the end result of yarn quality is encouraging.

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