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Study of the Effect of Speed Variation at Breaker Card Cylinder on Fibre Length and Yarn Quality

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Abstract: Carding is one important step in processing line of jute spinning. The cylinder is the heart of the whole machine due to the carding action, which causes from its cylinder speed and other rollers. This action mainly occurs in breaker card machine. This study was carried out to find out the effectiveness of various speeds of breaker card cylinder on fibre length and quality of jute yarn 276 tex (8 lbs./spy). Medium speed of the brake card cylinder was better than any other speeds for good fibre length and quality of jute yarn.

Key words: Length, fibre, yarn quality, process, speed

Introduction

Jute is the bast fibre, which are obtained from the bark of jute plants. Jute fibers are not particularly strong when compared with some other bast fibers but have good tensile properties. This fibre is naturally hard and brittle and breaks off with abrasion, resistance to mechanical wear is low and not durable especially on exposure to moist warm humid conditions (Ahmed, 1979; Amin, 2001).

In jute spinning carding plays an important role on whole process. The object of carding is to break down and fleece-out the long strips of jute and to convert them into a continuous broad ribbon of fine fibers called sliver. This sliver must be as uniform in size and texture as possible and it must have a definite weight for a definite length. Two main functions, which take place in carding, are (a) carding and (b) stripping. These two main functions are dependent for their activeness upon the method of pinning number of pins per square inch, the manner in which the two active surfaces are placed in relation to each other and their surface speeds. As jute is fed in the breaker card machine, the pins of the faster moving cylinder split-up and vigorously comb away the ribbon of fibers so that it is fleeced-out and carried on the cylinder. Pins of the cylinder are set at such an angle so that the material is being combed. This combing action plays a vital role for uniform carded sliver i.e. good quality yarn. But excessive speed of cylinder occurs damages of fibers.

So, this study is carried out to find a suitable cylinder speed which involves optimum combing action (Ranjan, 1985; Atkinson, 1965).

Materials and Methods

One type of jute fibre Bangla white C (BWC) grade was selected as raw material for this experiment. Jute fibre was piled with the application of 25 % normal emulsion (i.e. 20 mineral oil, 79.7 % water and 0.3 % nonidet) and kept for 48 hours for maturation. The entire piled jute was processed on breaker card machine by changing the gears of the cylinder in three positions i.e., 10000, 12000 and 14000 inch/min delivery speed for producing 276 tex

(8 lbs./spy) yarns. The delivery speed has been calculated as follows:

Delivery speed (inch/min) = cylinder rpm x (no. of teeth cylinder change pinion /no. of teeth in delivery wheel) x π x diameter at delivery roller (Ahmed, 1966).

Slivers of 5 yards length taken randomly from the breaker card and processed with each of the different delivery speed, were weighed. Then % CV of the weight of the breaker card slivers was calculated. The three different slivers obtained from breaker card were further processed through all the stages of conventional jute processing and 276 tex (8 lbs./spy) yarns were spun. Finally, the spun yarns were tested as per standard methods.

Results and Discussion

From the study of the yarns processed from sliver obtained by changing delivery speed of the breaker card cylinder, it was observed that change in the cylinder speed from standard in either direction resulted in yarns of low tensile strength and quality ratio (Table 1). But in case of breaker card delivery speed lower ($10000 \text{ inch min}^{-1}$) than the standard delivery speed ($12000 \text{ inch min}^{-1}$), yarns showed better uniformity in terms of CV % of tensile strength with the less deterioration in the quality ratio %.

It was noted that with the increase of gear teeth of the cylinder, in other words delivery speed of the cylinder, CV% of the weight of the breaker card slivers decreased, indicating more uniformity in the sliver weight.

Three different delivery speeds i.e. 10000, 12000, 14000 inch min^{-1} of the breaker card machine were attained by changing gears in the breaker card cylinder. The effect of this speed variations on the quality of the yarn of 276 tex (8 lbs./spy) in terms of actual count, tensile strength, CV % of tensile strength and quality ratio were studied. With the increase of delivery speed, CV % of the weight of the breaker card slivers decreased

Table 1: Effect of variation of delivery speed of breaker card cylinder in spinning with BWC jute fibre into yarn of 276 tex (8 lbs./spy)

Delivery speed of cylinder (inch/min)	Actual count tex (lbs./spy)	Breaker card sliver CV %	Tensile strength (kg)		CV % strength	QR %	Breaker card droppings %
			Mean \pm SD				
10,000	272 (7.90)	9.06	2.97 \pm 0.339 (6.56)		11.41	83.03	1.20
12,000	279 (8.09)	8.73	3.60 \pm 0.373 (7.93)		10.36	98.10	1.26
14,000	279 (8.09)	6.50	3.35 \pm 0.421 (7.38)		12.23	91.22	1.46

Mahabubuzzaman *et al.*: Effect of cylinder speed on yarn

gradually. Medium speed of the cylinder displayed better effect in terms of quality ratio (98.10 %) of the yarn. This cylinder speed will be attained good quality yarn in jute spinning (Ahmed, 1966; Mather, 1963; Atkinson, 1964).

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