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Optimization of Opening Roller Speed on Properties of Open End Yarn

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Abstract

An experiment conducted to spun 6's, 12's count on well-maintained open end machine by changing opening roller speed i.e.,7000 and 8000 rpm. Present investigation reveals that, as increases opening roller speed yarn properties Like Rkm, Unevenness, total IPI improved, but there is marginal improvement in U% and RKM, and drastic reduction in total IPI, of the both yarn count. Investigation also summarized that as increases opening roller speed the cleaning intensity increases, deposition of trash in rotor groove increases leads to increase end breakages for both count. For reducing the end breakages frequency of cleaning rotors were suggested. This study also gives the difference between the properties of yarns which are produced from two different opening roller speeds. The quality parameters of the yarns produced were evaluated on an Uster Evenness Tester, the Uster Tensorapid with a testing speed of 250 mm/m and the UT4 with a testing speed of 400 m/m.

Keywords: Opening roller speed; IPI; Uneveness; Rkm; Uster tensorapid; Uster tester

Introduction

New spinning technologies introduced in late sixties and early seventies, only rotor spinning sustained its promise and in the years to follow, it established itself as a worthy alternative to ring spinning in the course and medium count range [1-3]. The reasons for its phenomenal growth were very high productivity, around 5-8 times that of ring system, and amenability to automation and elimination of roving and winding process [3-5].

Today rotor yarns account for 30% of total spun yarn production and 23% of equivalent ring spindle installation in the world is on rotor spinning. Despite these breath taking achievements, the Indian textile industry has not responded adequately to it. The total number of rotors installed in India till date amount to less than a lac accounting for less than 2% of equivalent ring spindle installation and 10% of total spun yarn production. The yarns normally produced are 4^s, 6^s and 10^s cotton yarns for end products like carpet backing,ropes, bed sheets, cycle tyre card and 7^s, 8^s and 10^s for denim some of these yarns are also exported to produce cheap quality rugs. It is interesting to note that the number of rotors in India till 1984 was only 5000. This number increased significantly only after 1985 when LMW made available indigenous rotor frames at low price [6]. It is really surprising when this is contrasted with the fact that 35-40% of all yarns are spun on rotor system in USA and Europe of this 10.5% yarns are spun from acrylic, polyester in blends with cotton and viscose. The inescapable conclusion is that there is lot of scope in India to extend rotor spinning to blends and course and finer cotton yarns. Present study aimed at, Effects of opening roller speed on yarn properties for 6^s, 12^s count [7-9].

Experimental Plan

6's, 12's carded cotton yarn was spun at an open end machine at speed of 65000 and 105000 rpm. Trials were conducted at open-end machine by changing speed of opening roller speed 7000 rpm and 8000 rpm on well-maintained rotor spinning machine schlafhorst Autoscore SE9288. One passage of draw frame material processed, through open-end machine to determine effect opening roller speed on yarn quality in rotor spinning (Table 1). Usually imperfection, (thick, thin, neps) and short term evenness (U%) of yarn rather than length, strength are influenced by the changes in opening roller speed, adopted for large-scale working in spinning department. The mean breaking force of the yarn was measured using a standard Tensorapid tensile tester. The CV% of the yarn mass was tested with a uster Evenness tester, to analyze the effect of opening roller speed (Figure 1).

The specification of the cotton, which was used in the study, is as follows

Effective Length - 23 mm

Bundle Strength (gm/tex) – 23

Micronaire – 2.9 gm/cc

Trash content – 6.8%

Short fiber percentage –5.2

Machinery details

Make - Schlafhorst (Auto Coro)

Model - SE9 ACO 288

Made - West Germany

Year - 1998

Result and Discussion

Present investigation summarized from Tables 2-4 and Figures 2-3

Rotor diameter	36 mm	36 mm
Opening roller diameter	60 mm	60 mm
Rotor speed	65000 rpm	1,05,000 rpm
Opening roller speed	7000/8000 rpm	7000/8000 rpm
Draft	57.2	114.8

Table 1: Machinery specifications.

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that, As opening roller speed increases for courser count Rkm value increases and count slightly shifted toward finer side More opening, cleaning of cotton takes place due intensity of opening increases, deeply embedded trash particles associated with fibers were removed, total IPI were and unevenness were improved for both count.

Blow room hank	0.0012	0.0012
Carding hank	0.100	0.100
Draw frame hank	0.105	0.105
Open end count	6^s	12^s
Rotor diameter	36 mm	36 mm
Opening roller diameter	60 mm	60 mm
Rotor speed	65000 rpm	1,05,000 rpm
Opening roller speed	7000/8000 rpm	7000/8000 rpm
Draft	57.2	114.8

Table 2: Shows hank organization and draft.

Count	**6's**	**12's**
Rotor speed	65000 rpm	105000 rpm
Rotor type	T336	T336
Sliver hank	0.105	0.105
Draft	57.2	114.8
TM	5.2	5.3
TPM	501	727.8
Package length	31 Km	77 km

Table 3: Shows process parameters of the open end spinning.

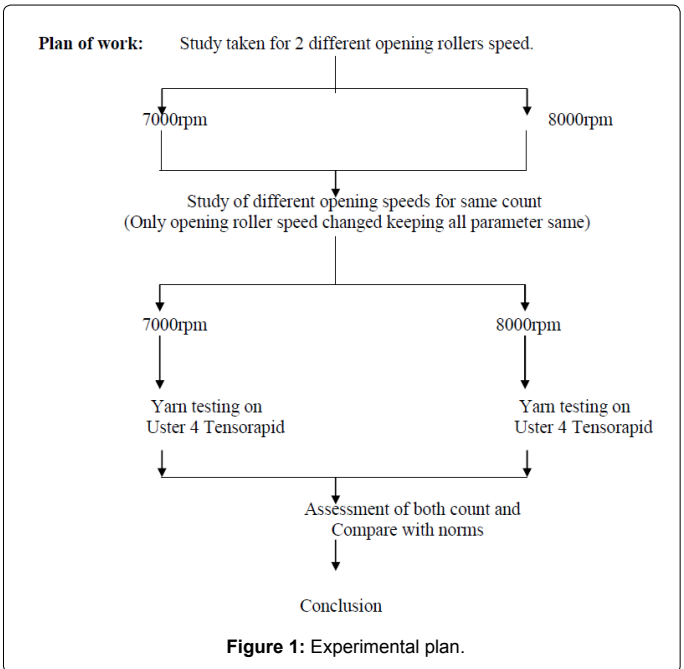

Figure 1: Experimental plan.

As the opening roller speed increases, the carrying factor (i.e., the effective number of wire points per unit time) increases, which in turn increases the opening efficiency of the opening roller. Owing to the better opening of fibres, it can be observed that, the fibre tufts of smaller size and uniform dimensions are fed into the transport tube and fibre orientation and sufficient drafting and doubling takes place in rotor groove which leads to improve Rkm value and reduction in unevenness and coefficient of variation of both counts (Table 2).

It was also observed during experimentation, A yarn break with a trash particle embedded end increases in the case of both yarn, because the high feed rate of fibre at the rotor groove causes the flow of trash particles to accelerate; thus, the chances of the suction tube chocking will be higher, and this will allow trash particles to go along with the fibre on the rotor surface, causing end breakages increase in open end spinning for both count (Table 3).

Conclusions

Present investigation summarized as follows, as opening roller speed increases from 7000 to 8000 rpm for both count, quality parameters such as RKm value, unevenness, Total IPI improved this because of intensity of opening action and trash particles were removed. It was also noted in experiment a yarn breaks increases with a trash particle embedded in the rotor groove, because the high feed rate of fibre at the rotor groove causes the flow of trash particles to accelerate; thus,

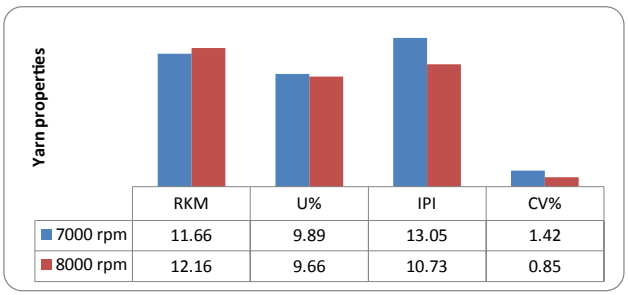

Figure 2: Effect of opening roller speed on yarn properties for 6's count.

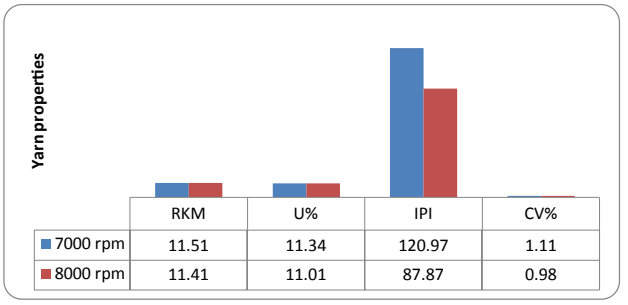

Figure 3: Effect of opening roller speed on yarn properties for 12's count.

S.no	**Yarn parameters for 6's count**	**Opening speed 7000 rpm**	**Opening speed 8000 rpm**	**Yarn parameters for 12's count**	**Opening speed 7000 rpm**	**Opening speed 8000 rpm**
1	**RKM**	11.66	12.16	**RKM**	11.51	11.41
2	**U %**	9.89	9.66	**U %**	11.34	11.01
3	**IPI**	13.05	10.73	**IPI**	120.97	87.87
4	**CV%**	1.42	0.85	**CV%**	1.11	0.98

Table 4: Shows Yarn testing parameters for 6's and 12's count.

the chances of the suction tube chocking will be higher, and this will allow trash particles to go along with the fibre on the rotor surface, causing end breakages increase in open end spinning for both count. End breakages rates reduced by the increasing the frequency of rotors cleaning.

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