Reprint **ISSN 1997-2571 (Web Version)**

Journal of Innovation & Development Strategy (JIDS)

(J. Innov. Dev. Strategy)

Volume: 5	Issue: 3	December 2011

J. Innov. Dev. Strategy 5(3):78-80(December 2011)

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http://ggfagro.com/ejournals/current issues

JIDS** issn 1997-2571, HQ:19-10 central place, saskatoon, saskatchewan, s7n 2s2, Canada

ISSN-1997-2571 (Online)
J. Innov. Dev. Strategy 5(3):78-80(December 2011)

STUDY OF YARN HAIRINESS DEVIATION ACCORDING TO DELIVERY SPEED OF DIFFERENT WINDING MACHINE

M. ROKONUZZAMAN[1], M.M. BASHAR[1], M.A. AL MAMUN[1], M.A. ABDULLA[2] AND N. AFROZ[3]

[1]Mawlana Bhashani Science and Technology University; [2]Epyllion Fabric Ltd.; [3]Southeast University, Banani, Dhaka.

Corresponding author & address: Md. Rokonuzzaman, E-mail: rokonz71@gmail.com
Accepted for publication on 29 November 2011

ABSTRACT

Rokonuzzaman M, Bashar MM, Al Mamun MA, Abdulla MA, Afroz N (2011) Study of yarn hairiness deviation according to delivery speed of different winding machine. *J. Innov. Dev. Strategy* 5(3), 78-80.

In this study, $30^S/1$ Carded knit yarns were produced at a spindle speed of 15500 rpm with a 40 mm ring diameter, where c type half round travellers of 56 mgs were employed in ring frames. This yarn was produced by using TM (Twist Multiplyer) 3.58. Then the yarns were wound into cones at different speed of different winding machine (Murata 21C, Japan; Savio Orion, Italy; and Schlafhorst 338, Germany) to observe and evaluate hairiness deviation of yarn. Among the yarn produced with three types of winding machine, the less hairiness deviation was obtained from Schlafhorst 338, Germany.

Key words: *spindle speed, twist multiplier, yarn hairiness, traveler*

INTRODUCTION

The structure of spun yarns is more complex than that of continuous filament yarns. The spun yarn would indicate a random grouping of fibres and a variation in twist and in linear density. This results in thick and thin places along the length of yarn, also protruding fibres ends can be seen on the surface of yarn. These protruding fibres form a core in the centre of the yarn and their outer ends protrude on the surface of yarn and these projecting fibres cause hairiness in spun yarn (Anagappan and Gopalakrishnan, 1987).

Hairiness is one of the important parameters for spinners and for further processing in Textiles. Some researchers (Brown 1978) indicate that for cotton yarns the statistical distribution of the number of protruding ends of different lengths is exponential. Due to the hairiness in the yarn some defects on the fabric may appear. Some examples include warp draw-in and warp yarn tangling during the weaving process and hence warp yarn breakages, pilling on the knitted and woven fabrics, and some defects on the appearance of fabrics (Barella 1993). Yarn hairiness is affected several parameters, so is difficult to prevent (Barella 1983). It is defined as protruding ends of yarn from the yarn body and the factors that affect it include type of fibre used, production methods, yarn, machine parameters, etc (Barella *et al.* 1991). Some previous studies (Usta and Canoglu, 2002). have reported that the cause of hairiness (i.e. short fibres, long fibres, fibre bridges, fibre loops, loose fibres, vertical fibres etc.) is due to the positioning within the yarn body, which can be seen from photographs taken with a scanning electron microscope (SEM) (Usta and Canoglu, 2003).

MATERIALS AND METHODS

In this study, the cotton fibre specifications are given Table 1.

Table 1. Specifications of cotton fibre

Parameters	Cotton fibres
Micronaire	4.5
Fibre length	28.9 mm
Fibre strength	29.5 gm/tex
Fibre elongation	4.1%
Rd (Reflectance)	77.2
+ b (Yellowness)	8.5
Color grade	31-2
Short fibre index	7.5

All measured by Uster HVI 900

$30^s/1$ carded knit ring-spun yarns were produced at a twist multiplier of 3.58 and ring spindle speed 15500 rpm. Then the ring-spun yarns were tested by Uster tester-4 and after testing the ring-spun yarns were processed on winding machine for producing cone. Then the cones were tested by Uster tester-4. All yarn samples produced were kept under standard laboratory conditions (Temp. 27 ± 2^0C and 65±2% R.H.) for 48 hours before testing for hairiness. The yarn delivery speed was 400 m/min.

In this instrument the yarn is illuminated by a parallel beam of infra-red light as it runs through the measuring head. Only the light that is scattered by fibres protruding from the main body of the yarn reaches the detector. The direct light is blocked from reaching the detector by an opaque stop. The amount of scattered light is then a measure of hairiness and it is converted to an electrical signal by the apparatus. The instrument is thus monitoring only that hairiness, but using the Uster evenness data collecting system can monitor changes in hairiness along the yarn by means of a diagram, spectrogram, cv% of hairiness, and mean hairiness in a manner similar to that used in evenness testing.

RESULTS AND DISCUSSION

The hairiness of yarn from winding machine Murata 21C, Japan was observed against five different winding speed. The recorded hairiness against winding speed 1200 m/min, 1300 m/min, 1400 m/min, 1500 m/min and 1600 m/min was 6.55, 6.75, 6.89, 6.95 and 7.12 respectively. Higher the winding speed higher the hairiness. The average hairiness deviation% was found 19.78 (Table 2).

Table 2. Hairiness of ring cops and cones with deviation% of Murata 21C, Japan

Spindle speed of ring frame	Hairiness of ring cops	Delivery speed of winding machine (Murata 21C, Japan)	Hairiness of cone	Hairiness deviation%	Average Hairiness deviation%
15500 rpm	5.72	1200 m/min.	6.55	14.51	19.78
		1300 m/min.	6.75	18.00	
		1400 m/min.	6.89	20.45	
		1500 m/min.	6.95	21.50	
		1600 m/min.	7.12	24.47	

Hairiness deviation% = (Hairiness of cone-Hairiness of ring cops)/Hairiness of ring cops*100

The hairiness of Savio-Orion winding machine was recorded 6.73, 6.85, 6.93, 6.95 and 7.15 against 1200, 1300, 1400, 1500 and 1600 m/min respectively (Table 3). The hairiness of Savio-orion is higher than that of Murata 21C winding machine. It can be said that the Savio-Orion machine has more tendency to generate protruding fibers from yarn while winding.

Table 3. Hairiness of ring cops and cone with deviation% of Savio-Orion, Italy

Spindle speed of ring frame	Hairiness of ring cops	Delivery speed of winding machine (Savio-Orion, Italy)	Hairiness of cone	Hairiness deviation%	Average Hairiness deviation%
15500 rpm	5.72	1200 m/min.	6.73	17.65	21.01
		1300 m/min.	6.85	19.75	
		1400 m/min.	6.93	21.15	
		1500 m/min.	6.95	21.50	
		1600 m/min.	7.15	25.00	

Among the three winding machines Schlafhorst-338, Germany shows lower tendency to produce yarn hairiness. The value of hairiness against 1300, 1400, 1500 and 1600 m/min were found 5.98, 6.15, 6.29, 6.38 and 6.44 in that order (Table 4).

Table 4. Hairiness of ring cops and cones with deviation% of Schlafhorst-338, Germany

Spindle speed of ring frame	Hairiness of ring cops	Delivery speed of winding machine (Schlafhorst-338, Germany)	Hairiness of cone	Hairiness deviation%	Average Hairiness deviation%
15500 rpm	5.72	1200 m/min.	5.98	4.54	9.22
		1300 m/min.	6.15	7.51	
		1400 m/min.	6.29	9.96	
		1500 m/min.	6.38	11.53	
		1600 m/min.	6.44	12.58	

It can be concluded that the hairiness deviation of Murata 21C winding machine is lower than that of Savio-Orion and lowest hairiness and deviation is found from Schlafhorst-338 winding machine.

CONCLUSION

In this study, it is found that Schlafhorst-338 is the best winding machine among Murata 21C and Savio-Orion due to the observation of less hairiness deviation%. So, it is concluded that Schlafhorst-338 should be preferred for winding process in spinning department to get less yarn hairiness and better quality.

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