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A COMPARATIVE STUDY OF CONVENTIONAL AND A MODIFIED CARD WITH AN EXTRA ROLLER UNDER TAKER - IN

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In this study, cotton sliver characteristics were compared among different speeds of extra roller fixed under taker-in and a high speed conventional card. Modified card with extra roller running at 150 rpm in clockwise motion produced dominating results over all other settings in respect to card and drawing sliver characteristics. Moreover, maximum waste extraction with minimum card web neps were also achieved at this speed.

Key words: Cotton, Card, Sliver performance.

Introduction

Textile industry is recognised as one of the major industries of Pakistan and a good source of foreign exchange earning. Pakistan ranks sixth in cotton yarn producing countries of the world and first among the yarn exporting countries. Optimum production depends on the application of quality control measures in the processing units. Pakistan produced 791.23 thousand metric tons cotton yarn in 1989 which is expected to increase upto 953.50 thousand metric tons during 1991 [1].

The quality of cotton yarn is directly affected by carding process. Perfect machine setting and proper maintenance of card, not only produce a uniform sliver for fine yarn production but also reduce the percentage of lint losses. In close microscopic studies, nep was simply a group of two or more fibres [2]. A combination of metallic card clothing with a smaller tooth angle reduces neps and impurities in the sliver [3]. A closer bottom rolls setting in front zone gave more uniform sliver than the wider setting was used [4]. The thickness of lap in the machine must be nicely regulated as it determines the grist of the card ends to a great extent and the roving [5]. Improper processing caused variation in nep formation [6,7]. Card setting and card production rate also affect nep potential [8].

The main objective of the present study was how to reduce card web neps and sliver imperfection on both conventional and modified cards which would help in the production of quality carded sliver and ultimately good quality yarn.

Materials and Methods

The research work was conducted in the Department of Fibre Technology, University of Agriculture, Faisalabad and at the Crescent Textile Mills Ltd., Faisalabad during the year 1990-91. Lint samples of MNH-93 cotton were collected from the running materials at the Mills. The average values of fibre

length, fibre fineness and fibre strength were 27.29 mm, 4.78 microgram per inch and 90.68 thousand pounds per square inch respectively. The card machine was run without extra roller and the results were denoted by 'C'. In order to minimize the load of opening on taker-in, an extra roller of diameter 2.18 inches and 10 wire points per square inch was adjusted under the taker-in (Fig.1). It was driven at eight different speeds i.e. 190, 182, 173, 150 r.p.m. both clockwise and anti-clockwise direction. Clockwise observations were denoted as T_1, T_2, T_3, T_4 and those for anti-clockwise as T_5, T_6, T_7 and T_8 . Collected sliver was tested for card neps, card waste, sliver uniformity, drawing sliver U-percentage and roving U-percentage. The average value was calculated from 5 replications for each treatment in each sliver character (Appendix).

Card sliver irregularity, drawing sliver U-percentage and roving U-percentage were determined with the help of 'Zellweger Tester' according to the method described earlier [9] in its operational manual. Its speed was set at 25 meters per minute which gave the value of card/drawing/roving sliver irregularity in percentage.

Card web neps per 100 square inch were determined during carding process, using the Shirley Template having 34

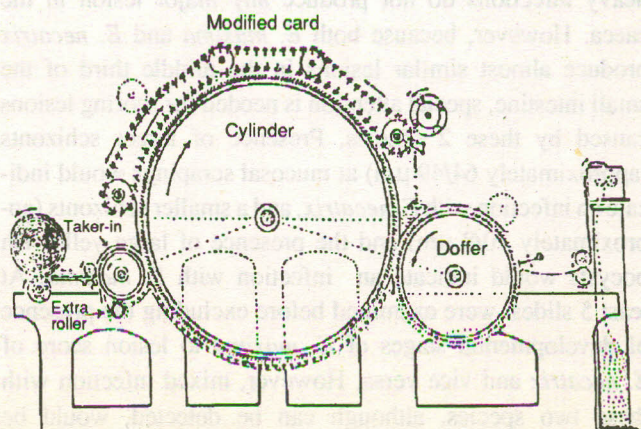


Fig. 1

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holes, each hole of one square inch. Card web was drawn on a block of hard board, then it was covered with Shirley Template. Neps were counted with a pin.

Card wasted was collected from various parts of card machine and weighed on Uster Autosorter-III [10]. The waste calculated in percentage on the basis of total lap weight fed to the card machine.

Completely randomised design (CRD) was applied in the analysis of variance for testing the sliver characteristics. Duncan's new multiple range test was also applied for individual comparison of various treatments [11].

Results and Discussion

The analysis of variance of results data noted for various sliver characteristics are given in Table 1 and comparison among their mean values are presented in Table 2.

Card sliver uniformity. The card sliver uniformity was ranged from 3.35 to 4.00% on both type of cards. The actual values were 3.35, 3.39, 3.42, 3.44, 3.44, 3.51, 3.59, 3.83 and 4% at T₄, T₇, T₁, T₅, T₈, T₆, T₂, T₃ and C treatments respectively. All the speeds of extra roller were found highly significant with the value of C, except T₃. T₄ speed of extra roller is better because at this speed the more uniform sliver was produced.

Drawing sliver U-percentage. Sliver prepared on conventional card was inferior in uniformity whereas highest im-

provement was noted in sample produced by T₄ speed of extra roller of modified card. The lowest value of irregularity was at T₄ speed followed by T₇, T₁, T₈, T₆, T₅, T₂, T₃ and C, and showing actual values of 2.32, 2.34, 2.36, 2.42, 2.44, 2.44, 2.44, 2.48, 2.52 and 2.56% respectively.

Roving U-percentage. On comparison of individual mean values, the lowest value of roving U-percentage was observed for the sample prepared at speed T₄. The actual values were 3.12, 3.22, 3.32, 3.37, 3.56, 3.58, 3.68 and 3.76% in case of T₄, T₇, T₈, T₅, T₆, T₂, T₃, and C respectively. The values of T₄, T₇, T₁ and T₈ differed highly significantly with respect to C.

Card neps. Significant differences were recorded among all the mean values of card neps of extra roller speeds with the mean value of 'C'. The mean values of card neps were counted as 8.0, 8.2, 8.4, 8.4, 8.6, 9.2, 9.2, 9.8 and 11.8 per 100 square inch for T₂, T₇, T₁, T₈, T₄, T₅, T₆, T₃ and C respectively. The lower values of neps 8.0 to 9.2 per 100 square inch ranged in same category so we can say that T₁, T₂, T₄, T₅, T₆, T₇, T₈ speeds of extra roller produced best results than C without extra roller.

Card waste. The actual values of card waste in sliver making were 6.2, 6.03, 5.90, 5.66, 5.56, 5.54, 5.46, 5.42 and 5.25% in case of T₄, T₇, T₁, T₈, T₅, T₆, T₂, T₃ and C respectively. All the speeds of extra roller produced higher percentage of waste in sliver than the treatment of without extra roller. T₄ speed showed better due to more cleanliness and opening of fibres in the sliver.

TABLE 1. ANALYSIS OF VARIANCE OF VARIOUS SLIVER CHARACTERISTICS.

SOV	DF		SS				MS				FR			
	Card Neps drawing & roving U-percentage	Sliver uniformity	Card neps	Sliver uniformity	Drawing sliver U-percentage	Roving U-percentage	Card neps	Sliver uniformity	Drawing sliver U-percentage	Roving U-percentage	Card neps	Sliver uniformity	Drawing sliver U-percentage	Roving U-percentage
Treatment	8	8	55.2	3.908	0.265	1.868	6.9	0.4	0.033	0.233	4.312**	9.046**	1.675 ^{N.S.}	7.06**
Error	36	81	57.6	4.417	0.712	1.21	1.6	0.054	0.0197	0.033	-	-	-	-
Total	44	89	112.8	8.325	0.977	3.078	-	-	-	-	-	-	-	-

** = Highly significant; N.S. = Non-significant.

TABLE 2. INDIVIDUAL MEAN VALUES OF SLIVER CHARACTERISTICS AT VARIOUS TREATMENTS.

Characters	T ₁	T ₂	T ₃	T ₄	T ₅	T ₆	T ₇	T ₈	C
1. Card waste (Percentage)	5.90	5.46	5.42	6.20	5.56	5.54	6.03	5.66	5.26
2. Card neps (per 100 square inch)	8.40**	8.00**	9.80*	8.60**	9.20**	9.20**	8.20**	8.40**	11.80
3. Card sliver (uniformity)	3.42**	3.59**	3.83 ^{N.S.}	3.35**	3.44**	3.51**	3.39**	3.44**	4.00
4. Drawing sliver U-percentage	2.36	2.48	2.52	2.32	2.44	2.44	2.34	2.42	2.56
5. Roving U-percentage	3.32**	3.58 ^{N.S.}	3.68 ^{N.S.}	3.12**	3.56 ^{N.S.}	3.56 ^{N.S.}	3.22**	3.37**	3.76

* = Significant; ** = Highly significant; N.S. = Non-significant.

The present findings are in close agreement to Byerley [12] who described that if waste is not removed satisfactory from the taker-in, it results in poor quality.

The sample of sliver prepared at T₄ speed is better for processing point of view since at this speed highest waste was removed, lower neps formed and hence sliver regularity, drawing and roving U-percentage were improved.

These studies confirmed the findings [6-8, 13, 14], wherein stated that improper machine setting is possible cause for nep

formation, and the role of neps is important in determining the final product. However, the aim/purpose of the study, how to reduce card neps and sliver imperfection, was observed/gained.

Conclusion

It is concluded that modified card with extra roller running at 150 rpm clockwise rotation superspeeded to all other treatments in respect to card waste and neps, card sliver uniformity, drawing and roving U-percentage.

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APPENDIX

	Card specifications	
	Cylinder	Doffer
Heel thickness	0.75 mm	0.8 mm
Wire height	2.8 mm	4.0 mm
Teeth/inch	16	13
Front angle	68°	65°
Teeth/sq. inch	580	388
Tooth depth	0.85 mm	2.2 mm
Company	Kanai (Japanese)/CC 58P	DR-39.5

FLATS	Mastui (Japanese)/B-450	
	Points per sq. inch	= 450
	Wire height	= 9.0 mm
	Dia of the wire points	= 0.38/0.28
	Acting angle	= 75°

TAKER-IN	Kanai (Japanese) / TC 50 KII	
	No. of Teeth/3"	= 15
	Front angle	= 80
	Overall height	= 5.6 mm
	Tooth depth	= 3.5 mm
	Taker-in to extra roller gauge	= 12"/1000

EXTRA ROLLER

Diameter (inches)	Points/sq. in.	Speeds (rpm)							
		Clockwise				Anticlockwise			
		T ₁	T ₂	T ₃	T ₄	T ₅	T ₆	T ₇	T ₈
2.18	10	190	182	173	150	190	182	173	150
Speeds (rpm)		Conventional card				Modified card			
Taker-in		750				750			
Cylinder		350				350			
Flat		5.5				6.0			
Doffer		20				20			