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Effect of Winding Tension Parameters and Rewinding Passages at Winding on Cotton Yarn Properties

Bagwan AS[1]*, Rajput A[1], Dalal S[2] and Aakade A[2]

[1]Center for Textile Functions, Mukesh Patel School of Technology, Management, Engineering, Shirpur, India

[2]Maral Overseas Khalghat, Nimrani, India

Abstract

In present study, the trials were undertaken on winding machine to study the effect of winding tension process variables on yarn properties. The winding tension was varied at 3 levels and five yarn counts were selected: two medium counts (30s and 36s) and three coarse counts (20's, 24's, and 26's). In all, 15 trials were conducted. The yarn samples were assessed for important yarn properties, such as imperfections, classimat faults, RKm and hairiness, Elongation, IPI, Package density and optimizing tension parameters of individual count for obtaining quality yarn.

Keywords: Unevenness; RKm; Hairiness; Winding tensions; Elongation; Yarn imperfections

Introduction

Yarn tension control is a vital parameter for quality and efficiency in textile processes. It determines the build and structure of the package, and it has a significant influence on productivity of various processes such as winding, twisting and cabling, and in subsequent processes such as weaving and knitting [1]. However, a great majority of yarns are tensioned by primitive means (textile parameters), resulting in loss of production and inferior quality. The ideal solution for most processes is the ability to set the yarn tension to a desired level and to be assured that it does not change over time at any yarn position. However, this ideal is rarely achieved. In Most cases, it almost becomes a game of trying to find out how much tension variations a process can tolerate and then adjusting the process speed accordingly. With precise tension control, many processes can run at least 30% faster and have the added benefit of quality improvement at the same time [2-6].

Material and Method

In order to study effect of the winding tension variations on yarn count at winding machine and the effect of number of winding passages on yarn parameter, Five different yarn counts were selected on winding machine [5-9].

Auto coner – 338, two were medium counts (30s and 36s) and three were coarse counts (20's, 24's, and 26's). In all, 15 trials were conducted with varying tensions and increasing winding passages and analyze the properties of the yarn .The yarn samples were assessed for important yarn properties, such as imperfections, classimat faults, RKm and hairiness, Elongation, IPI, Package density and optimizing tension parameters of individual count for obtaining quality yarn [10-16]. Following cotton used to prepare various yarns counts (Table 1).

Results and Discussion

From Figure 1 it can be observed that the overall yarn quality in terms of imperfections, and hairiness were not improved significantly with lower breaks at winding. The yarns (20's) made from 100% cotton showed particular trend, improvement found in RKm, Elongation, total IPI value. It has been observed that at 650cn tension level RKm, elongation, winding cuts founds to be improved. This is due to the better control on winding tensions. From the results, it can be inferred that the improvement is more distinct at winding tension 650cn which gives improvement in yarn properties of 20's count.

From Figure 2 it is clear that at, rewinding the overall yarn quality in terms of imperfections, and hairiness not improved significantly with lower breaks at winding. The yarns (20's) made from 100% cotton shows particular trend, at rewinding and improvement found in, Elongation, total IPI value. It has been observed that tension level elongation was at 650cn, with an improvement in winding cuts significantly. This is due to the better yarn control on rewinding tensions. From the results, it can be inferred that, the improvement is more distinct in at rewinding tension 650cn, which gives improvement in yarn properties of 20's count. By this the total cuts /100 km found to be decreased at rewinding when compared to winding.

Mixing	Property range
Mean Length	27.3
Micronaire	4.28
Strength	32.4
Elongation	6.8
Trash	3.14

Table 1: Properties of cotton.

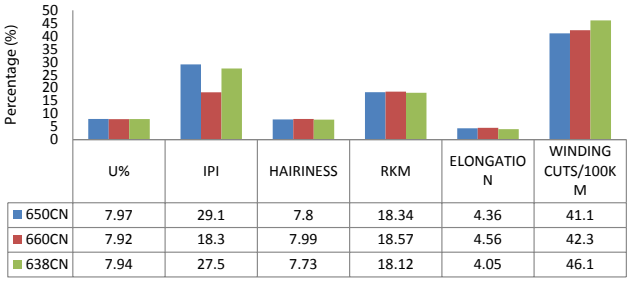

Figure 1: Effect of winding tension on yarn parameters (20s).

***Corresponding author:** Bagwan AS, Center for Textile Functions, Mukesh Patel School of Technology, Management, Engineering, Shirpur, India E-mail: abdulsalaambagwan@gmail.com

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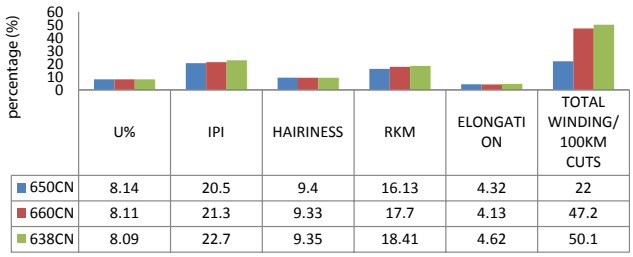
From Figure 3 it is clear, that the overall yarn quality in terms of imperfections, and hairiness not improved significantly with lower breaks at winding. The yarns (24's) made from 100% cotton shows particular trend, and improvement found in RKm, Elongation, total IPI value. It has been observed that at 610cn tension level RKm, elongation, winding cuts founds to be improved. This is due to optimization of tension level at winding. From the results, it can be inferred that the improvement were more distinct at winding tension 610cn which gives improvement in yarn properties of 24's count, as compare to 600cn and 590cn tension at winding stage. It was also observed that total cuts /100 km found to be decreased at winding.

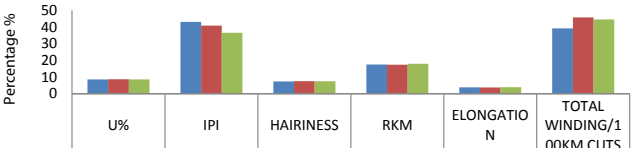
From Figure 4 it was observed that at rewinding the overall yarn quality in terms of Hairiness and Elongation not improved significantly with lower breaks at winding. The yarns (24's) made from 100% cotton shows particular trend, improvement found in RKm, total IPI value. It has been observed that at 610cn tension level RKm, IPI level, winding cuts founds to be improved. This is due to the better control at rewinding tensions. From the results, it can be inferred that the improvement is more distinct in at winding tension 600 CN which gives improvement in yarn properties of 24's count.

From Figure 5 it was observed that, the overall yarn quality in terms of imperfections, and hairiness improved significantly with lower breaks at winding. The yarns (26's) made from 100% cotton shows particular trend, the improvement not found in RKm, Elongation value. It has been observed that at 29cn tension level RKm, elongation, winding cuts founds to be improved. This is due to the better control on winding tensions. From the results, it can be inferred that the improvement is more distinct in at winding tension 29 CN which gives improvement in yarn properties of 26's count.



	U%	IPI	HAIRINESS	RKM	ELONGATION	TOTAL WINDING/ 100KM CUTS
650CN	8.14	20.5	9.4	16.13	4.32	22
660CN	8.11	21.3	9.33	17.7	4.13	47.2
638CN	8.09	22.7	9.35	18.41	4.62	50.1

Figure 2: Effect of rewinding tension on yarn parameters (20s).



	U%	IPI	HAIRINESS	RKM	ELONGATION	TOTAL WINDING/100KM CUTS
600CN	8.54	43	7.35	17.47	3.79	39.1
610CN	8.67	40.8	7.55	17.4	3.74	45.7
590CN	8.54	36.5	7.48	17.97	3.96	44.5

Figure 3: Effect of winding tension on yarn parameters (24s).

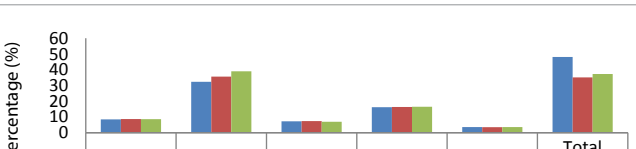
	U%	IPI	HAIRINESS	RKM	ELONGATION	TOTAL WINDING/100KM CUTS
600CN	8.85	52.3	8.85	16.95	3.69	39.3
610CN	8.84	38.6	8.67	16.59	3.87	53.7
590CN	8.84	50	8.85	16.81	4.08	49.2

Figure 4: Effect of rewinding tension on yarn parameters (24s).

From Figure 6 it was observed that at rewinding the overall yarn quality in terms of imperfections, and hairiness improved significantly with lower breaks at winding. The yarns (26's) made from 100% cotton shows particular trend, the improvement is not found in RKm, Elongation value. It has been observed that at 29 CN tension level RKm, elongation, winding cuts founds to be improved. This is due to the better control on winding tensions. From the results, it can be inferred that the improvement is more distinct in at winding tension 29 CN which gives improvement in yarn properties of 26's count.

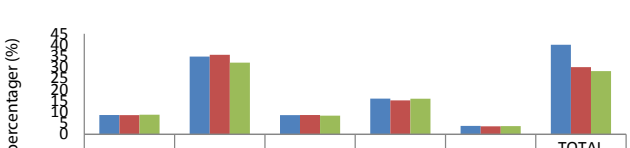
From Figure 7 it was observed that the overall yarn quality in terms of imperfections, RKm and improved significantly with lower breaks at winding. The yarns (30's) made from 100% cotton shows particular trend, the improvement is not found in Hairiness, Elongation value. It has been observed that at 25 CN tension level RKm, elongation, winding cuts founds to be improved. This is due to the better control on winding tensions. From the results, it can be inferred that the improvement is more distinct in at winding tension 25 CN which gives improvement in yarn properties of 30's count. As compare to lower tension level in winding.

From Figure 8 it was observed that at rewinding the overall yarn quality in terms of imperfections, RKm improved significantly with lower breaks at winding. The yarns (30's) made from 100% cotton shows particular trend, the improvement is not found in Hairiness, Elongation value. It has been observed that at 25 CN tension level RKm, elongation, winding cuts founds to be improved. This is due to the better control on winding tensions. From the results, it can be



	U%	IPI	Hairiness	RkM	Elongation	Total winding/ 100km cuts
27.0cn	8.49	32.3	7.23	16.21	3.56	48.1
29.0cn	8.64	35.6	7.41	16.35	3.5	35.1
25.0cn	8.6	39	6.98	16.45	3.58	37.3

Figure 5: Effect of winding tension on yarn parameters (26s).



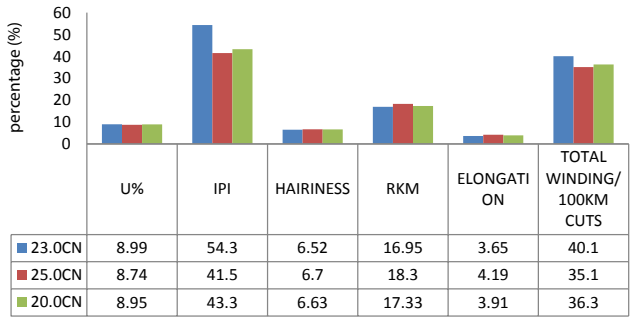
	U%	IPI	HAIRINESS	RKM	ELONGATION	TOTAL WINDING/ 100KM CUTS
27.0CN	8.67	34.8	8.62	16.01	3.8	40.1
29.0CN	8.61	35.6	8.63	15.22	3.6	30.1
25.0CN	8.77	32.1	8.37	15.97	3.68	28.3

Figure 6: Effect of rewinding tension on yarn parameters (26s).

inferred that the improvement is more distinct in at winding tension 25 CN which gives improvement in yarn properties of 30's count.

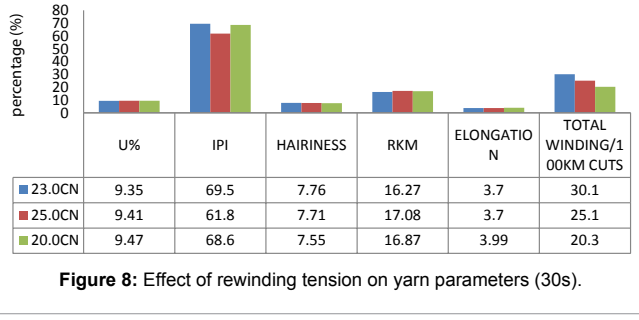
From Figure 9 it was observed that the overall yarn quality in terms of imperfections, and hairiness improved significantly with lower breaks at winding. The yarns (36's) made from 100% cotton shows particular trend, There is no improvement found in RKm, Elongation value. It has been observed that at 19 CN tension level RKm, elongation, winding cuts founds to be not improved. This is due to the better control on winding tensions. From the results, it can be inferred that the improvement is more distinct in at winding tension 19 CN which gives improvement in yarn properties of 36's count.

From Figure 10 it was observed that the overall yarn quality in terms of imperfections, and hairiness improved significantly with lower breaks at winding. The yarns (36's) made from 100% cotton shows particular trend, There is no improvement found in RKm, Elongation value. It has been observed that at 19 CN tension level RKm, elongation, winding cuts founds to be not improved. This is due to the better control on winding tensions. From the results, it can be inferred that the improvement is more distinct in at winding tension 19 CN which gives improvement in yarn properties of 36's count.



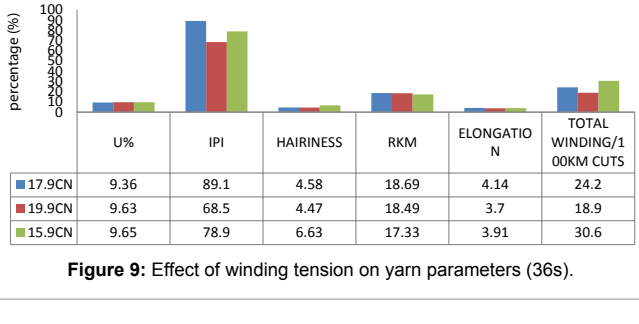
	U%	IPI	HAIRINESS	RKM	ELONGATION	TOTAL WINDING/ 100KM CUTS
23.0CN	8.99	54.3	6.52	16.95	3.65	40.1
25.0CN	8.74	41.5	6.7	18.3	4.19	35.1
20.0CN	8.95	43.3	6.63	17.33	3.91	36.3

Figure 7: Effect of winding tension on yarn parameters (30s).



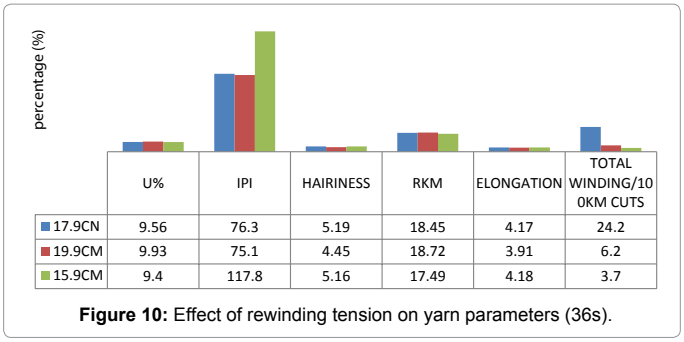
	U%	IPI	HAIRINESS	RKM	ELONGATION	TOTAL WINDING/1 00KM CUTS
23.0CN	9.35	69.5	7.76	16.27	3.7	30.1
25.0CN	9.41	61.8	7.71	17.08	3.7	25.1
20.0CN	9.47	68.6	7.55	16.87	3.99	20.3

Figure 8: Effect of rewinding tension on yarn parameters (30s).



	U%	IPI	HAIRINESS	RKM	ELONGATION	TOTAL WINDING/1 00KM CUTS
17.9CN	9.36	89.1	4.58	18.69	4.14	24.2
19.9CN	9.63	68.5	4.47	18.49	3.7	18.9
15.9CN	9.65	78.9	6.63	17.33	3.91	30.6

Figure 9: Effect of winding tension on yarn parameters (36s).



	U%	IPI	HAIRINESS	RKM	ELONGATION	TOTAL WINDING/10 0KM CUTS
17.9CN	9.56	76.3	5.19	18.45	4.17	24.2
19.9CM	9.93	75.1	4.45	18.72	3.91	6.2
15.9CM	9.4	117.8	5.16	17.49	4.18	3.7

Figure 10: Effect of rewinding tension on yarn parameters (36s).

Conclusion

Reference to Figures 1-6, Present investigations summarized that, As increase the tension level at winding machine on 20^s, 24^s, 26^s, 30^s, 36^s count RKm, Elongation not improved significantly but Total IPI value and winding cuts found improved significantly. For coarser and medium finer count, among the three tension levels, lower tension contribute towards optimum Rkm value and improvement in winding cuts.

At Rewinding for all the counts, number winding cuts were reduced, because in winding all the objectionable fault were removed in previous winding passage and As decreases the tension level at winding machine for all five counts the unevenness, RKm, elongation were not improved significantly but total IPI and winding cuts/100km reduced at lower tension levels at rewinding stage.

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