International Journal of Scientific Research Updates

Journal homepage: https://orionjournals.com/ijsru/

ISSN: 2783-0160 (Online)

(RESEARCH ARTICLE)

Check for updates

Research on reduction of yarn co-efficient of variation percentage and imperfection from auto-cone yarn

Ashraful Alam [1], Zakaria Ahmed [1,*], Neaz Morshed [2], Pulak Talukder [1] and Taslima Rahman [3]

[1] *Mechanical Processing Division, Bangladesh Jute Research Institute, Dhaka-1207, Bangladesh.*
[2] *Yarn and Fabrics Production Department, Bangladesh Jute Research Institute, Dhaka-1207, Bangladesh.*
[3] *Microbiology Department, Bangladesh Jute Research Institute, Dhaka-1207, Bangladesh.*

International Journal of Scientific Research Updates, 2022, 04(02), 160–164

Publication history: Received on 05 October 2022; revised on 11 November 2022; accepted on 14 November 2022

Article DOI: https://doi.org/10.53430/ijsru.2022.4.2.0176

Abstract

It's been a problem over the years that auto cone produces more imperfection and co-efficient of variation (CV) percentage than ring yarn. It was found that lowering the gauge from the running setting results for better quality yarn (less CV% and imperfection) without affecting any other parameters related with production. Thus, it can clearly be stated that less yarn clearer gauge results for better quality yarn.

Keywords: Karded yarn; CV%; Reduction; Imperfection

1 Introduction

Textile organizations look for ways to improve their product quality in order to remain competitive in the market by reducing the production cost, enhance productivity and improve product quality [1]. In the ring yarn production line after ring frame, winding is the last process. The produced package from the ring frame contains a small amount of yarn having some faults like thick place, thin place, neps, hairiness, bad piecing, slub etc. [2-3]. These thick, thin, neps are called as imperfection. These yarn faults of ring yarn can be reduce by auto cone; but at the same time, the imperfection index (IPI) and percentage of co-efficient of variation percentage (CV %) of auto cone yarn is greater than the ring yarn [4-7]. This research tried to solve out this problem by changing pre clearer gauge setting of auto cone and thus the main purpose of this present study is to reduce this increased IPI and CV% from the autocone yarn and develop the process through which better quality yarn can be produce.

2 Material and methods

Two different yarn counts (28's and 30's) were selected for the test in present study where 28s Karded yarn (100% cotton) and 30s Karded (KH) yarn (100% cotton) were used. Consecutive trials were conducted with varying gauge points and analyzed the properties of the yarn such as IPI & CV% by USTER Tester 5 and optimizing IPI and CV% of individual count by using JINGWEI Ring Frame (Model- F 1520 M) and SAVIO POLAR Autocone (Model-POLAR- M).

Sample of Ring cops were collected from the ring frame machine from both side of the same machine and the cops were collected after the maintenance have done. Collected ring cops were tested by uster tester 5 where the temperature and relative humidity were 27.4 °C and 57.2%, respectively. Tested ring yarn length was 400m and testing time was 1 min for each cops. Collected ring cops of the same lot were input in the auto cone winding machine to building a cone package where the speed of the winding was 1580 m/min and pre clearer gauge was 1.6mm. After building a complete package

*Corresponding author: Zakaria Ahmed
Mechanical Processing Division, Bangladesh Jute Research Institute, Dhaka-1207, Bangladesh, Email: zakariaahmed70@gmail.com

and its collected then it's gone to the next process. Collected cone package were tested by uster tester 5 to check the co-efficient of variation (CV %) and Imperfection Index (IPI). Moreover, for comparing CV% and IPI with the ring yarn, pre clearer gauge was increased from 1.6mm to 2.0mm at the same speed of winding. Collected cone package were then tested by uster tester 5 for comparing variation of CV% and IPI with the previous test result. In order to compare CV% and IPI with the ring yarn, running pre clearer gauge was reduced from 2.0mm to 1.0mm at the same speed of winding. Finally, collected cone package were tested by uster tester 5 for comparing variation of CV% and IPI with the test result of ring yarn and comparing the report (Fig. 1).

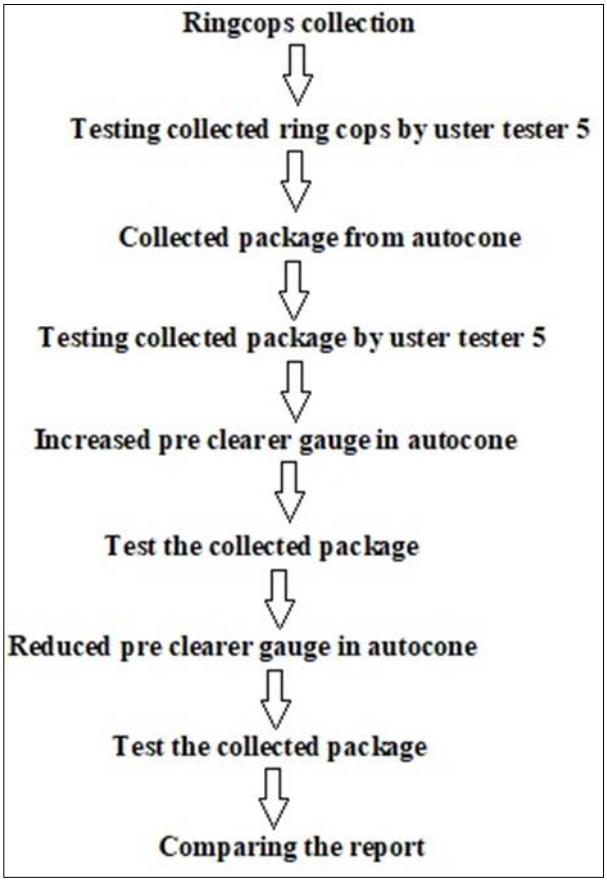


Figure 1 Flow diagram of the experimental method.

3 Results and discussion

It was observed that overall yarn quality in terms of imperfection index (IPI) and co-efficient of variation (CV %) has improved significantly without any change of winding speed (Table-1). The yarns (28s and 30s) made from 100% cotton showed particular CV% and IPI. It has been observed that if 1mm in pre clearer gauge of Auto cone machine was set, then the CV% & IPI decrease which is desirable in present study. Thus, it can be deduced that overall yarn quality has improved by reducing pre clearer gauge.

Table 1 Imperfection and CV% of 28's and 30's KH

Properties	28's KH			30's KH		
	Ring frame	Auto cone Gauge=1.6mm	Auto cone Gauge=1mm	Ring frame	Auto cone Gauge=1.6mm	Auto cone Gauge=1mm
Imperfection	158.7	260.1	200	455.5	613.5	507.5
CV%	13.67	14.45	13.79	14.79	15.53	14.83

It was observed that, when 28's KH ring yarn IPI was 158.7 and when autocone yarn IPI was 200 then pre-clearer gauge was 1mm (Fig. 2). Moreover, IPI of auto cone was 260.1 and 264, when pre clearer gauge was 1.6mm and 2mm, respectively. Therefore, it is clear that when pre clearer gauge is minimum at that time IPI of yarn is also minimum. When 30's KH ring yarn, IPI was 455.5 and when autocone yarn IPI was 507.5, pre-clearer gauge was 1mm. It was also found that IPI of auto cone were 613.5 and 566, when pre clearer gauge were 1.6mm and 2mm, respectively (Fig. 1). Thus, as it is known that minimum IPI results for better quality yarn, so it is clear when pre clearer gauge is minimum at that time IPI of yarn is also minimum.

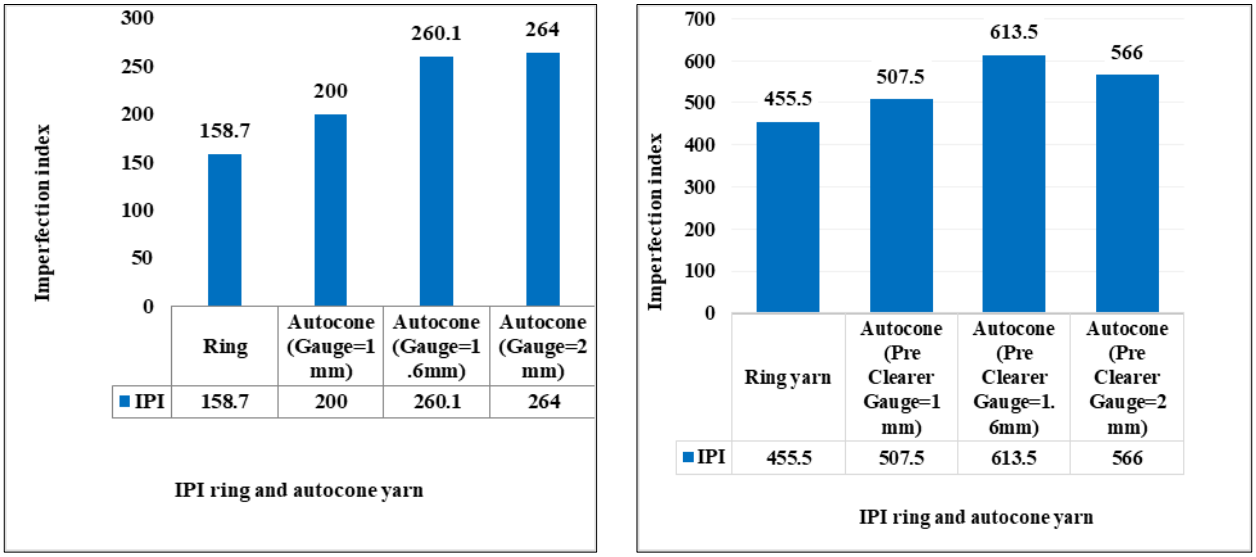


Figure 2 IPI analysis of KH ring and autocone yarn- (A) 28's KH (B) 30's

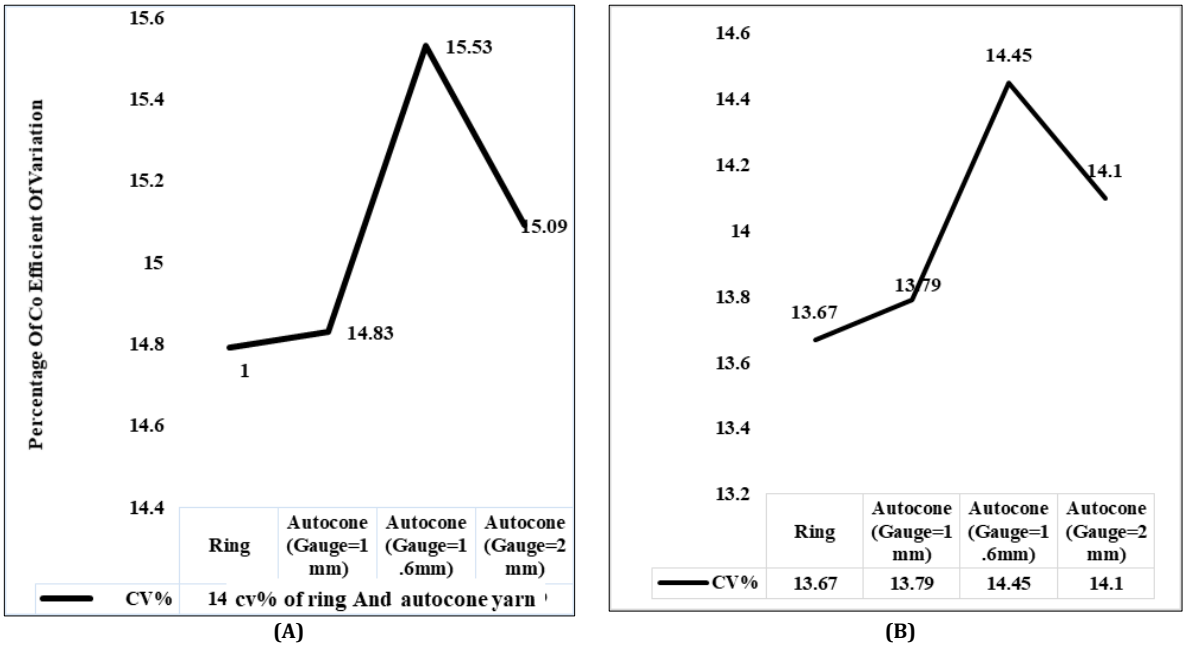
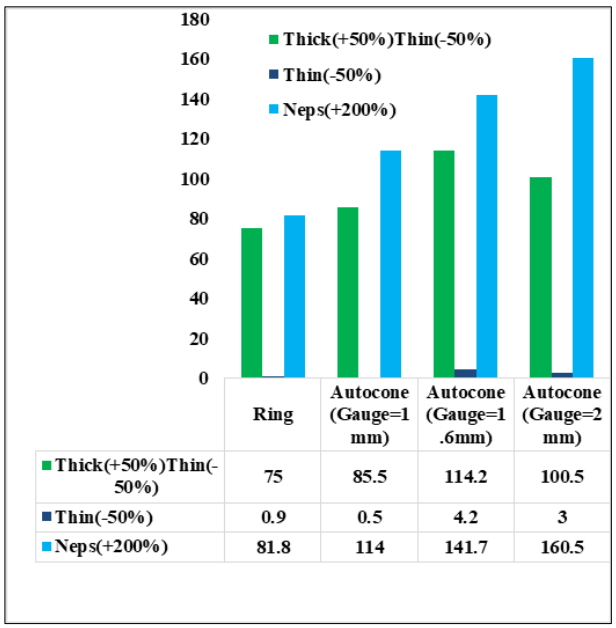


Figure 3 CV% analysis of KH ring and autocone yarn- (A) 30's (B) 28's.

It was found that CV% 14.45, where pre clearer gauge was 1.6mm and when the pre clearer gauge was change to 1mm, CV% was 13.79 resulting decreased the CV%. Then the changed another pre clearer gauge to 2mm and tested the output yarn, found the CV% 14.1 which was more than the previous ones. That was why selected the gauge 1mm for the better quality of yarn. Moreover, collected the 30's KH ring cops from ring machine and tested the ring cops found that CV% was14.79 and in case of the autocone yarn, CV% was 15.53, where pre clearer gauge was 1.6mm. In case where change

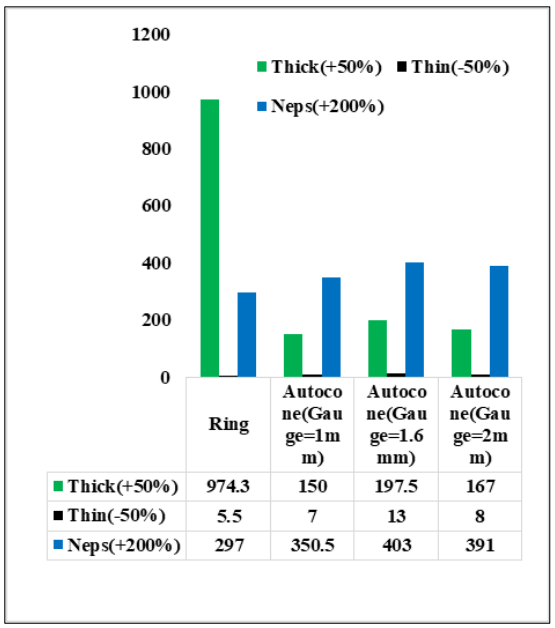
the pre clearer gauge to 1.0mm; CV% was 14.83. It seems that the CV% result had decreased. When another pre clearer gauge was changed to 2.0mm, the CV% 15.09 which was more than the previous ones (Fig. 3).

Firstly, collected the 28's KH ring cops from ring machine and tested the ring cops by USTER TESTER 5. The results of Thick place were75, Thin place 0.9, Neps 81.8. Then tested Auto cone yarn, the results of Thick place 114.2, Thin place 4.2, Neps141.7, where present setting of pre clearer gauge was 1.6mm. In this project objective was to reduce the Thick, Thin, Neps. So we change Auto cone machine pre clearer gauge points to 1mm and tested output yarn, the results of Thick place was 85.5, Thin place0.5, Neps 114. Thenchanged another pre clearer gauge points to 2mm and tested output yarn , the results of Thick place was 100.5, Thin place 3 ,Neps160.5.So we finally made a decision that lower pre clearer gauge results for maximum yarn quality. Secondly, we collected the 30's KH ring cops from ring machine and tested the ring cops by USTER TESTER 5. The results of Thick place were974.3, Thin place 5.5, Neps 297. Thentested Auto cone yarn, the results of Thick place 197.5, Thin place 13, Neps 403, where present setting of pre clearer gauge was 1.6mm. In this project objective was to reduce the Thick, Thin, Neps. So we change Auto cone machine pre clearer gauge points to 1mm and tested output yarn, the results of Thick place was 150.5, Thin place 7, Neps 350.5. Then we changed another pre clearer gauge points to 2mm and tested output yarn, the results of Thick place was 167, Thin place 8, Neps 391 (Fig. 4). Therefore, finally it was decided that lower pre clearer gauge results for maximum yarn quality.



	Ring	Autocone (Gauge=1 mm)	Autocone (Gauge=1 .6mm)	Autocone (Gauge=2 mm)
Thick(+50%)Thin(-50%)	75	85.5	114.2	100.5
Thin(-50%)	0.9	0.5	4.2	3
Neps(+200%)	81.8	114	141.7	160.5

(A)



	Ring	Autocone(Gauge=1mm)	Autocone(Gauge=1.6mm)	Autocone(Gauge=2mm)
Thick(+50%)	974.3	150	197.5	167
Thin(-50%)	5.5	7	13	8
Neps(+200%)	297	350.5	403	391

(B)

Figure 4 Overall analysis of KH- (A) 28's, (B) 30's.

4 Conclusion

The main thing in present research is to reduce CV% and IPI rate in the final product. Effort has been taken in every department to reduce these opportunities and gave a solution in the form preventive action. In winding department, there is an auto cone machine which winds the yarn on the cone and makes a final package for the end customers. In autocone where changed have been done in pre clearer gauge as compared to other machine in the same speed. It causes an increase CV% and IPI rate in the final product of yarn. The yarns (28s and 30s) made from 100% cotton showed particular CV% and IPI. It has been observed that if 1.0mm was set in pre clearer gauge of auto cone machine, then the CV% and IPI decrease compared to the other settings. The decision that lower pre clearer gauge results for better quality of card yarn.

Compliance with ethical standards

Acknowledgments

Authors thank their colleagues from Bangladesh Jute Research Institute for sharing their pearls of wisdom with us during the course of this research.

Disclosure of conflict of interest

All authors declare that they have no competing interests.

References

[1] Klein W. Manual of Textile Technology, Vol 1-6, 2016.

[2] Cook JG. Handbook of Textile Fibres, Vol 1&2, 1st Edition, 1984.

[3] Booth JE. Principles of Textile Testing, CBS Publishers & Distributors, 1st Edition, 1996.

[4] Morton WE and Hearle JWS. Physical Properties of Textile Fibres, Woodhead Publishing, 2008.

[5] Lawrance CA. Fundamentals of spun yarn technology, CRC Press, 2003.

[6] Gupta N. Analysis on the defects in yarn manufacturing process and its prevention in textile industry. Inter J EngiInven.2(7): 45-67, 2013.

[7] Gupta N. Implementation of Six Sigma for Minimizing the Defects Rate at A Yarn Manufacturing Company. Inter J Engi Res Appli.3(2): 1000-1011, 2013.