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RESEARCH ARTICLE

IMPROVING THE NEPP PROBLEM BY DEVELOPING A COMBING HUB ON THE COMBING MACHINE IN THE PRODUCTION OF KAMGARN YARN

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ABSTRACT

In the yarn production, the combing process is very important in order to make the fibers parallel, clean and prevent the problem of nepp which adversely affects the quality of yarn and fabric. In this study; a new combing hub has been developed which improves the number of nepp errors after combing, spinning and winding(bobbining) processes as a result of making the combing process more efficient on the combing machine. Improvement of yarn quality due to decrease of yarn nepp amount and reduction of work load due to nepp cleaning process on the fabric as a result of increase of fabric quality are among the most important contributions of the work done.

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INTRODUCTION

The combing machine is used to produce high quality yarn in worsted and half worsted yarn spinning. A significant proportion of short fibers and foreign materials are separated in combing machines. Fiber band in the combing machines are produced by homogenous mixing of the material (Wool, polyester etc.). With the combing machines, the fibers are cleaned and made parallel to ensure irregularity. When the process of combing on the combing machine cannot be performed at the desired level, the positions of the fibers in different directions and the faults which are related to each other are termed nepp. It has been determined that there is a distinct image and color difference on the surface of the fabric especially in the contrasting colors after the non-removable nepp defect dyeing process which cannot be remedied in this stage. Nepp cleaning is done in the quality control phase of the fabric. The amount of fabrics that have been manufactured but subjected to quality control due to nepp errors constitutes extra cost, workload and time loss.In this study, the working principle of combing machines is examined. It has been determined that the most effective machine element for the nepp problem is the combing hub.

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The design of the combing hub has been modified within the framework of an experimental plan. The currently applied combing speeds, the construction of the gears, the values of the applied process time, the alignment of the needle cassettes on the combing belts and the optimization of the machine cycle parameters have been carried out. Tests after fiber combing, spinning and winding processing have shown that the developed combing hub has positive effects in reducing the amount of nepp. Robot machine was developed and used for cleaning the nepp, and online image processing was performed to determine the nepp and their coordinates. The robot identifies the coordinates of the nepp on the fabric and cleans them in a systematic order (Coşkun, 2015). Nepp counting and sizing on scanned web samples using optical scanning method. Neppiness index has been determined as the result of this study which is a more reliable and consistent method compared to the existing nep cpounting method (Chamberlain and Jordan 1956). New approach to nepp identification and analysis based on image processing methods. Local contrast analysis has been used to define nepp with a new edge detection method that requires it. Methods for nep element searching, iden tification, and merging are developed (Lype and Wan1998). A method that can be automatically controlled to reduce the proportion of waste fiber in the work they do. It has been determined that the control and management of the combing process is improved by the tool used as a result of this method(Atkinson and friends, 2009).

MATERIALS AND METHODS

Materials: In this study, NSC PB31LM model combing machine was used for design and development studies (Fig. 1). The raw material used is 21 microns 100% wool and supplied by Tianyu company The polyester fiber used is 2,4 dtex, 75-76 mm long and supplied by Trevira. Unevenness tests made on the used fiber were made using Uster Tester 5 device. Solid works three-dimensional drawing program was used to design the combing hub. The experiments were carried out at a relative humidity of 65% and an ambient temperature of 25° C.

Methods: In order to improve the amount of nepp, the hub diameter of the combing machine was kept constant and the combing angle and combing length were increased. Needle arrangements are often designed.

Fig. 1. Combing machine

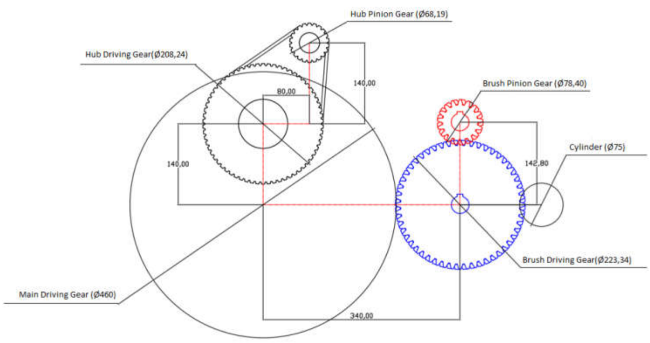


Fig. 2. Position of the machine elements on the combing hub

The combing hub in the current combing machine consists of a half vario core and 8 cassettes. Each cassette form has a different frequency. The hub diameter is 150 mm. The turn / turn ratio was observed as 1.For the optimization studies, 5 different experiments were performed on the parameters affecting the combing. The experiments are given in Table 1. The distances of the elements on the machine are given in fig. 2. The combing hub is designed as a full vario hub instead of a half vario hub.

Fig. 3. General picture of the working principle of the combing machine

Fig. 4. The current combing hub

Fig. 5. Designed new combing hub

The number of needles on the full vario combing hub has been thickened. And the combing area of one tour of the full vario combing hub has been increased. The design work on the combing hub is given fig. 3. In this study, a new combing hub designed for the combing machine used was installed. The comparison of the old combing hub and the new combing hub on the machine is given in fig. 4 and fig. 5.

RESULTS AND DISCUSSION

All Fiber samples with blends of Wool / Elastane (95/5%), Wool / Elastane (75/25%), Wool / Polyester (60/40%) were divided into two. Some of the bifurcated parts have been passed through the optimized combing machine.

Table 1. Experiments on the parameters affecting the combing hub

Technical comprasion	Reference	Test number				
		1	2	3	4	5
Combing angle (°C)	145	217,5	290	348	410	435
Hub tour	1	1,5	2	2,4	2,8	3
Hub diameter(mm)	150	150	150	150	150	150
Hub combing length(mm)	190	285	380	456	537	570
Broush tour	1	1,6	2,1	2,5	2,9	3,1
Hub driving gear	51	51	51	55	62	66
Hub pinion gear	51	34	25	23	22	22
Brush driving gear	32	32	32	40	45	52
Brush pinion gear	38	24	18	16	18	17
Hub casette(pieces)	8	18	18	18	18	18

Table 2. Comparison of nepp numbers in wool / elastane (95/5%) blend

Wool/Elastane (95/5%) Blend		
Process	Number of nepp before optimization (pieces)	Number of nepp after optimization (pieces)
After combing	1	0
After yarn spinning	4	0
After winding	7	2

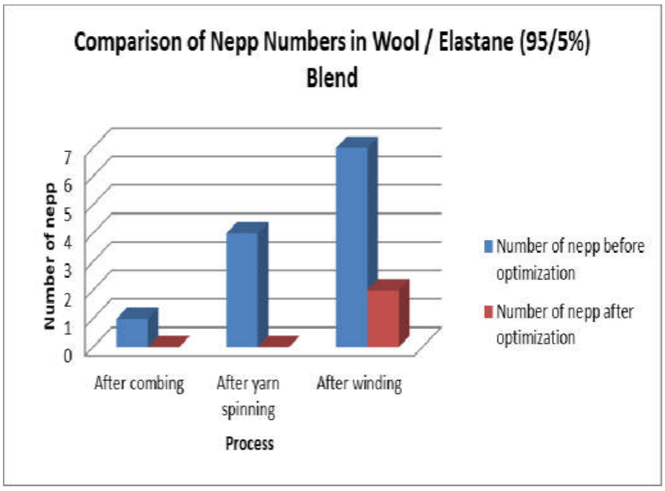
Table 3. Comparison of nepp numbers in wool / elastane (75/25%) blend

Wool/Elastane (75/25%) Blend		
Process	Number of nepp before optimization (pieces)	Number of nepp after optimization (pieces)
After combing	0,3	0
After yarn spinning	4	0
After winding	12	4

Table 4.Comparison of nepp numbers in wool / polyester (60/40%) blend

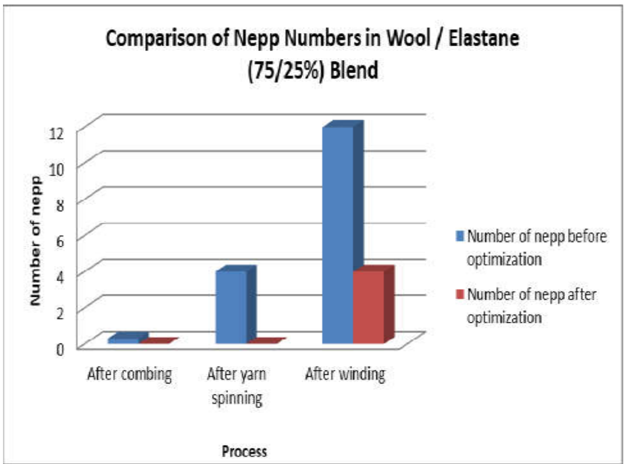
Wool/Polyester (60/40%) Blend		
Process	Number of nepp before optimization (pieces)	Number of nepp after optimization (pieces)
After combing	2	1
After yarn spinning	28	13
After winding	6	2

The remaining part is passed through the unoptimized combing machine. The variation of the nepp numbers after the combing, spinning and winding processes are given in Tables 2, 3 and 4. In 95/5% Wool / Elastane blend, the wool fibers were passed through the combing process in a combing machine.

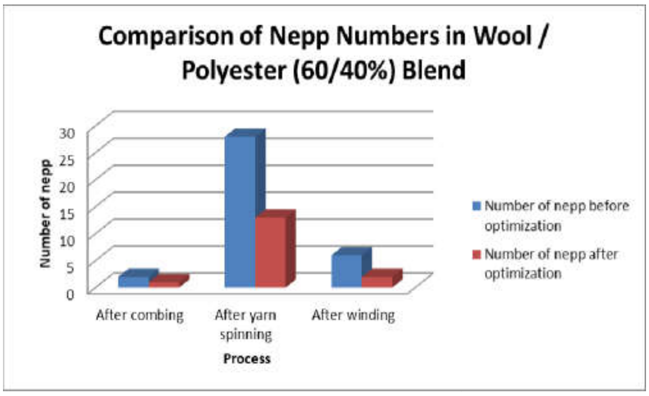


When the number of nepp after the fiber combing and spinning process was examined, it was seen that the nepp formation was totally prevented by the use of the developed combing hub. It was determined that the number of nepp dropped from 7 to 2 nepp with the combing hub developed after the winding process (Table 2).

75/25% Wool / Elastane blend showed less nepp formation than 95/5% wool / elastane blend. For this reason, as the wool ratio used increases, the formation of nepp is also increasing. It is seen that the formation of nepp is completely prevented by the combing hub developed after combing and spinning processes.



With the new combing hub used after the winding process, the number of nepp was reduced from 12 to 4, and a considerable improvement was observed (Table 3). 60/40% Wool / Polyester fiber combing process seems to be very important. Because there is a significant increase in the number of nepp formed after the spinning process.



However, the number of nepp by the use of the developed combing hub has improved by about 50%. After the spinning process, the number of nepp decreased from 28 units to 13 units. After the winding process, the number of nepp decreased to 2 (Table 4).

Conclusion

In the present study, optimization studies have been made on the machine in order to make the design studies. At the same hub diameter, the combing angle is increased. In this mode, the length of the combing hub increases and the formation of nepp is reduced. It has been observed that the amount of fiber waste is increased in the case of reduction of the umbilicus distance and this change enhances the scanning performance. The machine kinematics is redesigned. With the reduction of the nepp numbers, the amount of time left for nepp cleaning in the quality control is reduced. By reducing the nepp amount, fabric quality is improved. Quality yarn prevents breaks in the weaving mill and increased productivity. When passing through the before optimization combing machine and after the winding process the most nepp fault was found in the wool / elastane 75/25 blend. 66% improvement in nepp fault has been achieved after optimization. When passing through the before optimization combing machine and after the yarn spinning process the wool / elastane 60/40 blend occurred at the most nepp fault. After the optimization, a 54% improvement in the nepp fault was achieved. When passing through the before optimization combing machine and after the combing process the wool / elastane 60/40 blend occurred at the most nepp fault. After the optimization, a 50% improvement in the nepp fault has been achieved. Due to the high number of Nepp, the optimization of the wool / polyester blend (60/40%) with the highest quality problem resulted in a 55% improvement in the nepp problem.

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REFERENCES

Coşkun, M. 2015. Neps detection for wool fabric by using image processing techniques, University of Gaziantep Graduate School of Natural&Applied Sciences Msc thesis.

Chamberlain, N.H. and Jordan, G., 1956. The Determination of Neppiness in Carded Webs, Textile Research Journal, Vol 26, Issue 8.

Lype, C., Wan T.R. 1998. Nep Structure Identification and Analysis Using Image Processing Methods, Textile Research Journal, Vol 68, Issue 12.

Atkinson, K., Stannard, W., Bagshaw, K. 2009. A Method for the Continuous Measurement of Combing Noil and Its Application in Wool Topmaking, Textile Research Journal, Vol 80(5): 439–447.

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