Improvement of Yarn Quality by Placing an Additional Compacting Device Between the Stretching Rollers in A Ring Spinning Machine

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ABSTRACT

This article focuses on improving the physical and mechanical properties of yarns obtained on a ring spinning machine. The properties of the 27-tissue yarn obtained by placing a device that thickens the flow of fibres between the stretching pairs of the ring spinning machine and the quality indicators of the yarns produced at the enterprise were compared. Tables and graphs show the improvement of yarn quality parameters after installing the additional device on the ring-spinning machine. As a result of practical research, the coefficient of variation of the unevenness of spun yarns has improved by 1%, and thin areas of the yarn (Thin -30 % km) have improved by 5%, knots of the yarn (Neps, 200% /km) have improved by 4%.

Keywords: yarn, hairiness, yarn unevenness, linear density, ring spinning machine, fibre, yarn.

Introduction

Today, our country has all the conditions for the development of the textile industry. Technological processes in the textile industry consist of a complex set of physical and chemical phenomena, which can only be successfully studied using modern advances in science and technology [1,2]. Every production, including textile, receives raw materials, produces semi-finished products in various workshops and receives them in the next departments, produces finished products, adopts new techniques, perfects technological processes, placement of technological equipment and their main technological,

On the world scale, the production of cotton yarns from natural and chemical fibres is mainly carried out in two ways, that is, the ring assembly and the pneumatic method of cotton yarns are obtained. In our research work, the

production of threads by ring methods was studied.

Materials and methods

The product of the spinning process varies depending on the type of yarn used, the type of raw materials used and the methods of spinning. Raw materials are selected depending on the cooking of the thread and the customer's order. Also, the quality of the yarn is evaluated based on consumer requirements [4,5]. Various additional works are performed in order to satisfy the customer's demand. In addition to the properties of raw materials, yarn properties also depend on the alternation of the working parameters of technological equipment. It should be noted that yarn with different properties can be obtained from the same raw material in different spinning methods.

The main function of the ring-spinning machine is to produce yarn from the pile. In the spinning machine, it is necessary to ensure the continuity and hardness of the product, which is several times thicker than the thread, and to form a coiled thread with a convenient shape for further processing. In the ring-spinning machine, mainly three technological processes are performed - stretching, cooking and winding [6].

From the coil windings on the suspension handle of the supply device, the film, which is separated by covering the guide pins, passes through the tensioner of the drive mechanism and comes to the supplied pair of the stretching tool. In the stretching tool, the hair is thinned to the specified linear density and comes out from the emitting pair in the form of a thin tuft [7,8]. A fluff suction is installed at the bottom of the take-off cylinder, which pulls the fibres into the fluff suction system when the yarn breaks. After the resulting thread is twisted and turned into a thread, the thread passes through the conductor and is cooked continuously under the influence of a high-frequency spinning iron. Then the thread passes through the loop and is wound into the tube [9].

In the traditional ring spinning machine, the distance between the stretching pairs is different, which leads to the hairiness and strength of the obtained yarn being significantly lower. In this zone, the fibres have no twist. Extraneous fibres in the fibre flow to exit the flow zone and may have little or no effect on yarn strength. One of the important advantages is to increase the strength of the thread, increase the friction resistance of the thread, and reduce hairiness.

Most of the compression of the fibre flow causes the fibres to move laterally by compressing the stretcher pairs, resulting in condensation. Today, the compact method is widely used in yarn production, but this system can also be adapted to a traditional ring spinning machine to obtain yarn. Our products are distinguished by the fact that they require less money from the economic point of view, and that the quality of our products is good enough, compared to the threads obtained by the ordinary traditional method.

In this study, in order to increase the quality indicators of ring-spun yarn, it is aimed to increase the strength of our spun yarn by placing an additional thickener at the spacing of the stretching pairs. In this case, a mechanical additional compactor is cheaper and less complicated when placed on a conventional ring spinning machine than on a compact spinning machine. In addition, no additional energy is consumed during the spinning process. In previous studies, mechanical compact spinning significantly improved yarn hairiness and fibre flow with uniform tension characteristics [10].

To date, there have been many studies comparing the properties of yarns in multiple-ring spinning machines. In our study, to understand how the warp obtained by placing additional compactors at intermediate distances between the stretching pairs of the ring-spinning machine affects the twists of the yarns, we tested dual linear density yarns on a conventional ring spinning machine with additional compactors. yarns obtained were compared. The raw material and spinning process of the yarns obtained for comparison were also obtained homogeneously. Our research was carried out at "UZTEX UCHKURGAN" LLC located in the Uchkurgan district of the Namangan region. In our

research, to eliminate any effect on the quality of our yarn, we took a pile of homogenous linear density, put an additional densifier on one roving on a G32 ring spinning machine, and the remaining roving was conventionally made into a uniform linear density roving. threads are taken. The obtained results were compared with each other by checking the flatness, defects, hairiness, yarn numbers, and diameter properties of the yarn on the USTER TESTER 6 device.

Table 1. Quality indicators of spun yarn

No	*Yarn quality indicators*	*Enterprise*	*Research*
1	The thread number is the coefficient of variation	9.19	9.1
2	Coefficient of variation of the unevenness of thread	11.64	11.54
3	Thin areas of the thread -30% /km	445	423
4	Thick areas of the thread 50% /km	38	23
5	Knots in the thread Neps 200% /km	30	18
6	Hairiness of the thread H	7.28	7.03

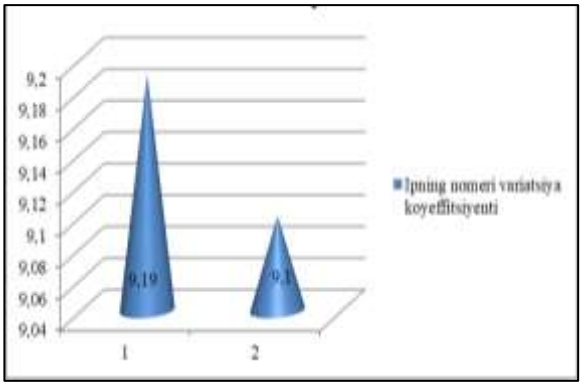

Figure 1. Coefficient of variation difference histogram by several yarns obtained in two options.
1- yarn produced at the enterprise
2– thread obtained by installing a compactor

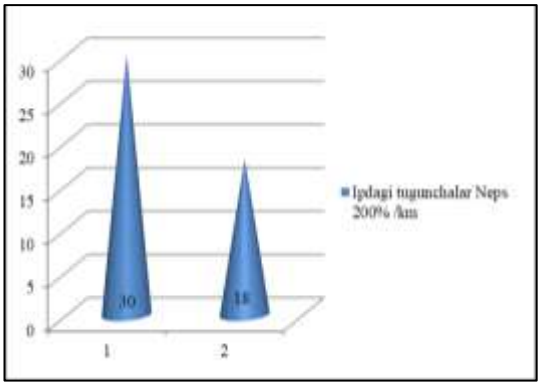

Figure 1. Histogram of the difference in Neps, 200%/km of the knots of the yarn obtained in the two options.
1- yarn produced at the enterprise
2– thread obtained by installing a compactor

In our study, all the tests of the spun yarns, i.e., the yarns produced in the factory, were performed after the spun yarns were stored in standard atmospheric conditions at 65% relative humidity for 24 hours, and the test results were analyzed.

When evaluating the properties of spun yarns, according to the experimental results, the linear density of the yarn is compact compared to the yarn obtained by the traditional method, and the fibres coming out of the yarn body are less compared to the yarn obtained by the traditional method. We analyzed the main characteristics of spun yarns, which are linear density, twist coefficient and spinning system.

According to statistical analysis, when measuring the diameter of the yarns spun by traditional and with an additional compactor placed between the cylinders, the spinning twist triangle of the spun yarn obtained by placing the additional compactor on the spinning machine is reduced, as a result of the addition of fibres to the yarn, the traditional compared to the yarn obtained by the method, the diameter of the spun yarn obtained by placing an additional thickener is smaller. Of course, the linear density of the yarn spun in

the spinning system also depends on the incoming fibre flow [11-14].

The results of the strength and elongation ratio of the spun yarn were obtained by the traditional method, and according to statistical analysis, the strength of the spun yarns obtained by placing an additional thickener is less than the yarns obtained by the traditional method. In terms of the elongation of the spun yarns, the additional thickening device differs from the yarns with low elongation indicators. The strength of threads increases the abrasion resistance of fabrics made from these threads. The difference between the values of the friction force of woven fabrics obtained by the traditional method is less noticeable than that of woven fabrics made of spun yarn with an additional thickening device.

In our research, it was found that the yarn obtained through the additional thickener placed between the stretching pairs of the spinning machine on the ring spinning machine and the yarn obtained by the traditional method is larger in diameter, and has less elasticity. As the thread diameter decreases, the fibre interaction increases, which leads to an increase in thread strength.

Conclusion

The external appearance of the spun threads affects the surface of the fabric made from this product. The higher the strength of our spun yarn and the lower the degree of hairiness, these properties greatly affect the appearance of the fabrics woven from these yarns.

Using the Uster tester, the yarn unevenness variation coefficient is 1%, the thin areas of the yarn are -30%/km, 5%/km, knots in the yarn are Neps 200%/km, 40%/km. The hairiness H indicators of the thread are shown in the first table. The quality indicators of spun yarn obtained by placing an additional densifier are better than those obtained by the traditional method

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