ANALYSIS OF FIBER TENSIONS IN THE MATURATION TRIANGLE IN SIRO YARN SPINNING

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By developing the textile industry and introducing new innovative technologies to the sector, comprehensive measures are being taken to create new types of resource-saving, competitive and exportable products, and certain results are being achieved. In 2022-2026, the Republic of Uzbekistan is included in the development strategy of the New Uzbekistan, including "Continuing the industrial policy aimed at ensuring the stability of the national economy and increasing the share of industry in the gross domestic product, increasing the production volume of industrial products by 1.4 times, increasing the production volume of textile industry products by 2 times, membership of the World Trade Organization, important tasks have been set to study the impact of textile industries on production, deep processing of yarn, complete recycling of yarn by 2026, development of national brands for finished products and increase their export. In the implementation of these tasks, among other things, it is important to increase the quality of fabrics woven from spun yarns, reduce the breakage of yarns in the process, and produce a new range of fabrics with improved consumption characteristics [1,2].
The quality of textile products mainly depends on the unevenness, thin-thick areas, hairiness and cleanliness of the thread. The quality of the thread depends on the methods of its preparation. Based on the above-mentioned tasks, it was considered one of the most important and urgent issues to determine the factors affecting the physical and mechanical parameters of the yarn, the optimal indicators of the technological processes, and to apply them to the production of "Siro" yarn [3].
Scientists around the world are currently conducting new research on this method, including Subramaniam and Natarajan, who researched the effect of the distance between the pile compactor on the coils. An increase in the distance between the piles and the number of twists led to an increase in the coefficient of friction for all types of yarns [4].
Emrah Temel conducted research on the production of Siro yarn of different linear densities from 100% polyester and cotton and polyester fibres [5].

It is known that unevenness in the thread is one of the important indicators that determine the quality indicators of the thread. To solve this problem, there is a need to produce optimal technological parameters for the "Siro" thread.

Experiments on the evaluation of the effect of the types of pile compactors installed in the production of "Siro" thread on the ring spinning machine and the distance between them on the width of the cooking triangle and the quality of the thread were carried out in the production conditions of the "OSBORN TEXTILE" LLC enterprise in the Bostonliq district of the Tashkent region and at the Tashkent Institute of Textile and Light Industry "Yigirish" researches were carried out on the Zinser 350 ring spinning machine in the educational laboratory of the "technology" department. The effect of changing the distance between the piles, the speed of rotation of the spindle and the number of times cooking on the quality of the yarn was studied. "Siro" yarn with a linear density of 14 tex was produced on the Zinser 350 ring spinning machine installed in the laboratory. The physical and mechanical parameters of the yarn directly depend on the properties of the selected fibre. The higher the quality of the fibre, the higher the quality of the yarn obtained from it.

In addition, the properties of hemp products obtained in technological processes are an important factor in the production of high-quality yarn. In a ring spinning machine, during the spinning process, the tuft from the draw tool creates an even cooking triangle in the direction of movement. The fibrous layer moves toward the centre and twists.

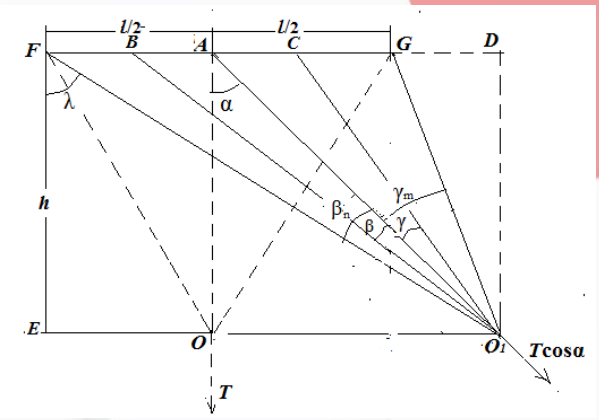

Figure 1. Scheme of the formation of Siro thread

We imagine one of the cooking triangles as a system of fibres located symmetrically in a triangle concerning the line of action of external tension. $FE = h$, $FG = l$ sizes, α angle, let the magnitude of the vertical force T and the angle formed between this force and the vertical be known Fig. 1.

For the fibre system on the left side of the cooking triangle,

$$P_i = \frac{ES_{\text{вол}}}{\cos\alpha_i} + \text{mod}\frac{T\cos\alpha - 0.5 * S_{вол} E\sum_{i=1}^{n}(1+tg^2\alpha_i)tg^2\alpha_i + \sum_{j=1}^{m}(1++tg^2\beta_j)tg^2\beta_j}{ES_{\text{вол}}\cos\alpha_i\sum_{i=1}^{n}} \quad (1)$$

For a fibre system on the right side of the hardening triangle,

$$P_j = \frac{ES_{\text{вол}}}{\cos\beta_j} \quad (2)$$

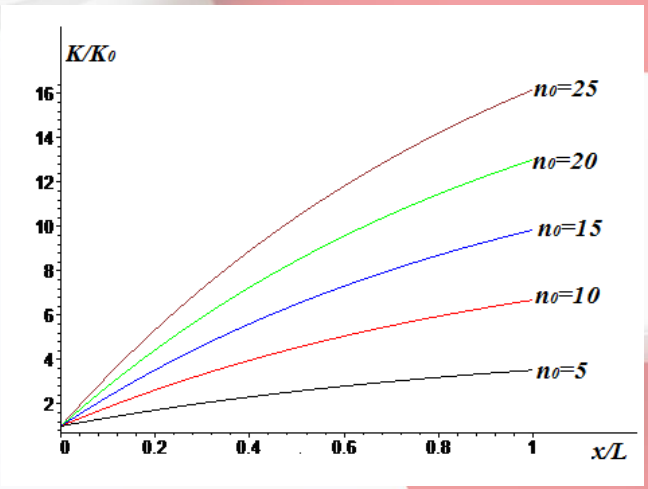

Figure 2. The change in the number of turns per unit length of the height of the hardening triangle

The property of the equations represents the propagation process of monochromatic torsional waves along the thread at certain values of the numbers. It was determined that there is no change in curvature in the radial direction corresponding to the zero form vibration.

To determine the tension force in each fibre, we use the formula recommended in the work, where $\chi_i = \alpha_i$, $\chi_j = \beta_j$, T are replaced by force $T\cos\alpha$.

Conclusion

The test results showed that the tension of the hardening triangle is the same when the distance between the carding comb is 10mm, and the breaking strength increased due to the increase in the number of twists, and the hairiness and unevenness on the surface of the yarn decreased. The tension and structure of the hardening triangle are correct when the height of the tuft is from 1.6 mm to 2.2 mm. It is theoretically determined that the main twists in the hardening triangle reduce the twists given to the tufts by 1.5-2 times.

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