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# THE FACTORS AFFECTING THE QUALITY OF YARN PRODUCED ON RING-SPINNING MACHINES

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**Abstract**
The article compares the unevenness of the linear density of 20 tex yarn, produced on a ring spinning machine at twist speeds of 11000, 12000, 13000, 14000, and 15000 twists of 740 rpm.

**Keywords**: text, thread, cylinder, coefficient of variation, linear density, ring spinning machine, hairiness, stretching pair.

## Introduction

During the period of independence of our country, one of the priority directions of the development strategy of the republic, deepening reforms and renewing society is to ensure structural changes in the economy.

These changes are aimed at the modernization and technical re-equipment of enterprises, the full and effective use of the rich natural, mineral and raw material potential of the country, and the creation of capacities for the production of export-oriented and import-substituting products. After gaining independence from our republic, the tactics of enterprise management and its strategy have changed. Important attention is focused on planning the internal production and economic activities of the enterprise, the main thing is that the development of an assortment policy plays an important role in the enterprise. Because, on the one hand, the

assortment policy provides for maximum satisfaction of consumer needs, and on the other hand, sufficient profit and production efficiency.

Each spinning mill can produce yarn of a certain thickness and quality. Therefore, depending on the spinning system, the quality of the raw materials, as well as the length and fineness of the fibre, a spinning plan is drawn up to obtain a yarn of a certain thickness. It determines the brewing coefficient of the wick, pile and thread, the number of turns, the amount of stretching and the speed of the main working bodies of the equipment.

**Materials and Methods**

An integral connection of the properties of the thread with the cooking process. When twisting the yarn on a ring-spinning machine, the fibres in its cross-section occupy different positions. The edge, i.e., the fibres on the periphery, located at the edge of the twisted triangle, as a result of twisting, the threads become more stretched and tense, putting pressure on the inner fibres. If the fibres inside are not fully straightened and have relatively little tension, they will be squeezed out and replaced with straightened fibres. Thus, during the pulping process, the position of the fibres in the cross-section of the yarn is continuously changing. This process is a fibre migration process resulting in a change in the structure of the yarn.

The quality and physical and mechanical parameters of the thread 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. But if the highest grade cotton fibre is used to make medium-thickness yarn, then the quality of the yarn is good, but the price is high. Therefore, to obtain a thread of a certain thickness, it is necessary to select such a fibre so that the quality indicators of the produced thread fully comply with the requirements of the standard, and it is necessary to ensure its cheap price.

It should be noted that pulping is the main factor in solving the problem of improving the quality of yarn. When the thread is sintered, the fibres in it are connected under the action of friction forces, which ensures the tensile strength of the thread. Annealing reduces the tensile strength of the fibres by placing them at an angle to the yarn axis. Several scientists are also researching the fact that pulping has a significant effect on the elongation of the yarn, its hardness, modulus and the shape of the "Elongation" curve.

In particular, it has been noted that a significant change in the tensile strength of the thread occurs as a result of the adhesion of the fibres due to twisting. It should be noted that for yarns with a high degree of pulping, after the critical time of pulping, the decrease in stiffness occurs sharply, while for yarns with a low degree of pulping, it is gradual.

**Results and Discussion**

As mentioned above, an increase in twist leads to an increase in pressure in the cross-section of the thread, an increase in the friction forces between the fibres and a decrease in the mutual sliding of the fibres. On the other hand, as the twist increases, the tensile strength of the fibre decreases as a result of the fibre being inclined relative to the yarn axis. Thus, the properties of the thread are determined by these two factors. The main role is played by the adhesion of the fibres before the critical pulping, and after the critical pulping - the inclined position of the fibre relative to the yarn axis. When twisting is significantly below the critical value of cooking,

a mutual displacement of the fibres is observed. In addition, different twist sizes are recommended for different yarns, taking into account yarn preparation, physical properties and cost of finished products.

They have been tested to determine their physical and mechanical properties. The results are presented in table 1.

Table 1. Test results

| № | High rotation speed, $н_у$, $min^{-1}$ | Nominal twisting, $К_н$, tw/n | Linear density, T, tex | Unevenness in linear density, C {T}, % | Practical twisting, $К_а$, б/м | Unevenness in twisting, C {K}, % | Relative breaking strength, R, (sN/tex) | Unevenness in relative breaking strength, $C^2$ {P}, % |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 1. | 11000 | 740 | 20,0 | 2,3 | 734,9 | 2,1 | 12,4 | 6,3 |
| 2. | 12000 | | 19,9 | 0,8 | 727,7 | 4,7 | 12,4 | 5,9 |
| 3. | 13000 | | 19,9 | 0,8 | 716,7 | 2,9 | 12,2 | 6,2 |
| 4. | 14000 | | 19,7 | 0,7 | 720,6 | 3,5 | 12,0 | 5,2 |
| 5. | 15000 | | 19,6 | 1,2 | 721,0 | 2,9 | 11,4 | 6,3 |

The unevenness of linear density, C2 {T}, % The graphs of the unevenness of linear density as a result of increasing the speed (11000, 12000, 13000, 14000, 15000) when the twist given to the spinning thread is 740 tw/meter are presented in Fig. 1.

The textile industry is one of the most important sectors of the economy. It produces yarn, woollen yarn, silk, spun yarn, gauze, knitted and non-woven fabrics from various raw materials, as well as products required for other industries. The textile industry is second only to the food industry in terms of its importance, essence, and necessity for man.

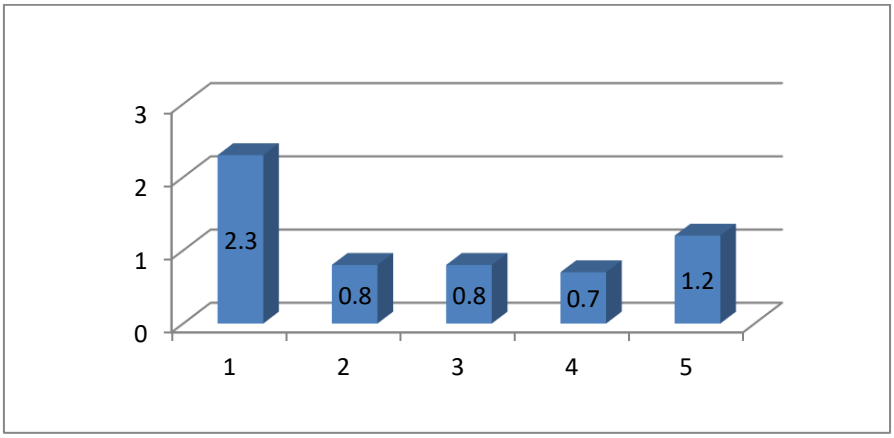


Figure 1. Linear density unevenness, C2 {T}, %

The practical pulping ratio of 20 tex yarn with increasing speed (11000, 12000, 13000, 14000, 15000) practical pulping ratios changes in the following order.

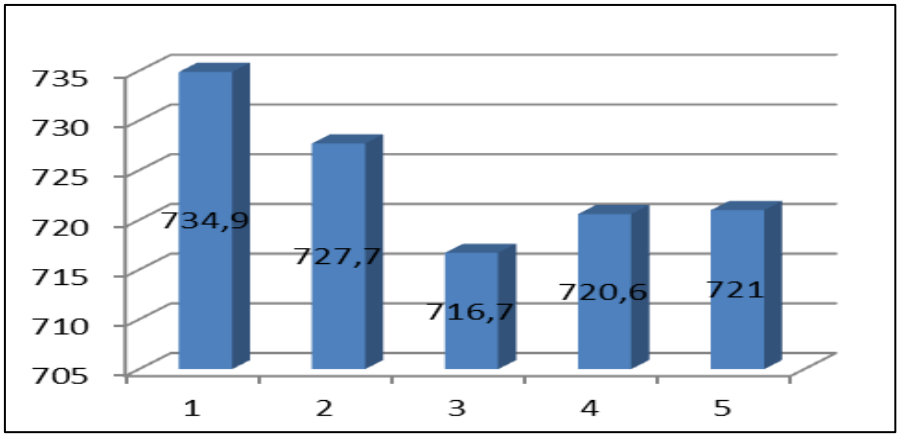


Figure 2. Practical cooking coefficient, b/m

**Conclusion**

Thus, when twisting a 20-tex yarn produced on ring spinning machines, with a twist of 740 tw/m and given speeds of 11000, 12000, 13000, 14000, 15000, the unevenness of the linear density, C{T}, % of the speed coefficient is 11000, when the speed of the machine is divided by 2. We see that 3 C {T}, % and 0.7 C {T}, % when the machine is set to a speed of 14000. The practical hardness Ka, b/m is also 734.9 Ka, b/ m at a machine speed of 11000, and at a machine speed of 14000 it was found that the practical hardness Ka, tw/m is 720.

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