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Change in Unfairness Indicators and Correlation Coefficient of Cotton Obtained From a Mixture of Different Composition and Recycled Fibers

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Abstract: in this article, the research work was carried out in "Safira-Samira textile" LLC in Bukhara region, joint enterprise of "EURASIYA ALLIANCE TEX" LLC and "CHACH TEX" LLC in Chirchik district of Tashkent region. For it, wick and yarn were produced from a mixture of 10% nitron, 60% cotton and 30% secondary fiber at the production enterprise, and from a mixture of 90% secondary fiber and 10% nitron fiber at the laboratory of the "Spinning Technology" department at TTESI. The quality parameters of the obtained braids and yarns were determined on the equipment of the "CentexUz" laboratory and the "Uster Tester-5" device of the "UZTEX TASHKENT" LLC enterprise, and the change in the correlation coefficient was determined.

Keywords: unevenness in linear density, volume weight (density) of the product according to the weight of the section of different lengths or the number of fibers in the cross section of the product, unevenness in its physical and mechanical properties.

I. INTRODUCTION

The textile industry is a complex of production of a wide range of products of the economy. The consumer market of textile products is very extensive, and its products are used for household purposes, in engineering and medicine, machine building, defense, space and automobile industry.

The main factor determining the cost of textile products is the consumption of raw materials. Therefore, it is an important and urgent issue to find all the possibilities of full and effective use of raw materials in the industry, to substantiate them scientifically and to determine the directions of their correct use.

Any technology, no matter how perfect it is, cannot eliminate the generation of waste. The possibility of reducing the amount of waste is limited. Because the generation of waste is an objective necessity and technological inevitability, and it is related to the essence of these processes.

In practice, two main directions of product cost reduction can be distinguished. The first of them is to reduce the amount of industrial waste based on the improvement of technological processes. Such a technology can be called waste technology.

As the need for textile fibers increases, the volume of waste and secondary raw materials generated during their processing also increases.

The production of products from fiber waste in textile enterprises cannot be said to be at the level of demand. The technology of preliminary treatment of fiber waste in textile enterprises requires improvement. The research shows that the practically studied properties of yarn industry wastes are of high technological importance.

One of the promising directions for solving the global problem of reducing energy and material costs in the production of industrial products is the maximum use of secondary material resources. Therefore, it is important to introduce new resource-saving technologies and scientific and technical achievements aimed at increasing the efficiency of using raw materials, new machines, low-waste and zero-waste technologies.

The main task of scientific and technical progress in the field of effective use of secondary material resources should be considered to ensure the most complete processing of textile production and consumption waste into useful materials and products. This helps to save primary raw materials while eliminating the negative impact of secondary material resources on the environment and obtaining maximum economic efficiency.

Currently, a large reserve of secondary material resources in the production of fibers in textile, chemical and light industry has been created, the main part of which can be used.

It should not be forgotten about the environmental factor that the effective use of textile secondary material resources significantly reduces the negative impact on the environment associated with the production of fiber raw materials and the elimination of secondary material resources.

The risk of environmental pollution can be reduced by making maximum use of secondary material resources in the production process, so that they allow the recycling of substances in nature.

Secondary material resources are waste in the textile industry in the process of processing raw materials, during the cutting of sewing and knitting products, and waste in the form of discarded worn-out products, which can be used as raw materials in the manufacture of industrial products.

Unevenness indicator is the negative properties of the products in the spinning enterprise, which often has a negative effect on the technical and economic indicators of the enterprise, as well as on the physico-mechanical properties of the yarn.

It is important to test and control the unevenness of the products in the spinning plant, which determines the causes and time of the unevenness.

In spinning machines, the more breaks during winding and forming, the higher the unevenness of the yarn. As a result of increased breakage of threads, it leads to a decrease in the productivity of the machines.

If the unevenness of the cooked threads in terms of linear density is high, defects are formed in the appearance and structure of the gauze, as a result, the surface of the gauze becomes striated, chipper, mohair or rim-like. These defects can also be observed in knitted fabrics.

In terms of linear density, uneven woven yarns lead to the formation of specific defects in production. Therefore, it is important to study and control the unevenness of spinning products under production conditions according to the above factors.

Unevenness has a negative effect on the technical and economic indicators of the work, as well as on the physical and mechanical properties of spinning and weaving products. Many factors, such as the uneven properties of raw materials, are often caused by the technological process and machine design, the violation of the working regime, and the workers moving away from the machines and repairing them.

Unevenness in the change of product properties along the length is determined based on the following forms: unevenness in linear density, volume weight (density) of the product according to the weight of the section of different lengths or the number of fibers in the cross-section of the product, unevenness in physical-mechanical properties and hakoza.

II. METHODOLOGY

Analyzing the unevenness of spinning products is very complicated. There are many types of roughness for spinning products: they are formed in the first stage of spinning and change in subsequent stages and add new types of roughness to it.

The formulas given above were used to determine the parameters of unevenness in the mass of the obtained pile based on the location of the piles in the piling machine.

The average values of the obtained results are presented in Table 1.

Table 1. Variation of pile roughness readings obtained based on pile location on the pile machine

t/r	Indicators	A wick obtained from a mixture of 10% nitrone, 60% cotton and 30% secondary secondary fiber under production conditions	Scheme of placement of wicks obtained from a mixture of cotton fiber and secondary fiber in a wicking machine		
			1	2	3
1.	Arithmetic mean value	0,1405	0,1505	0,1522	0,1566
2.	Mean squared deviation	0,015	0,0098	0,0084	0,0058
3.	Coefficient of variation, %	10,9	6,5	5,52	3,7

The results of the analysis of the changes in the unevenness indicators of the braid obtained based on the location of the braids in the braiding machine showed that, compared to the indicators of the braid obtained from a mixture of 10% nitron, 60% cotton and 30% secondary fiber under production conditions, the coefficient of variation of the braid obtained according to option 1 in laboratory conditions is 40, It was found that by 4%, the coefficient of variation of the sample obtained according to the 2nd option decreased by 49.4%, and the coefficient of variation of the sample obtained according to the 3rd option decreased by 66.1%.

With the help of correlation (connection) analysis, we define correlograms or plot the correlation function, and with their help we find periodic and longitudinal waves in the irregularities that appear in the product.

If we know the parameters of certain working parts of the machine that give periodic irregularity and the magnitude of its elongation, it is possible to determine which working part creates this periodic irregularity with the help of a correlogram.

III. RESULTS AND DISCUSSION

The correlogram shows the change of the correlation (connection) coefficient r(x) according to the location of the fibers in the product cross-sections equal to the interval X. Alternatively, the correlation coefficient for building a correlogram based on the unevenness indicators of the piles was determined using the following formula.

$$r(x) = \frac{\sum_{i=1}^{n-x} (y_i - \bar{y})(y_{i+x} - \bar{y})}{\sqrt{\left[\sum_{i=1}^{n-x} (y_i - \bar{y})^2\right]\left[\sum_{i=1}^{n-x} (y_{i+x} - \bar{y})^2\right]}} = \frac{A}{\sqrt{BC}} \quad (1)$$

Here y_i and y_{i+x} - the ordinate values in the chart are changes in roughness; x-$r(x)$ the range of variation of the unevenness in the ordinates of the chart to calculate the correlation coefficient; n- the total number of ordinates in the variation of roughness.

Here $A = \sum_{i=1}^{n=x} (y_i - \bar{y})(y_{i+x} - \bar{y})$, $B = \sum_{i=1}^{n=x} (y_i - \bar{y})^2$;

$$C = \sum_{i=1}^{n=x} (y_{i+x} - \bar{y})^2 \; ; \; \bar{y} = \frac{\sum_{i=1}^{n} y_i}{n}$$

Graphs of changes in the unevenness of piles with different composition of the mixture are presented in Figures 1-4.

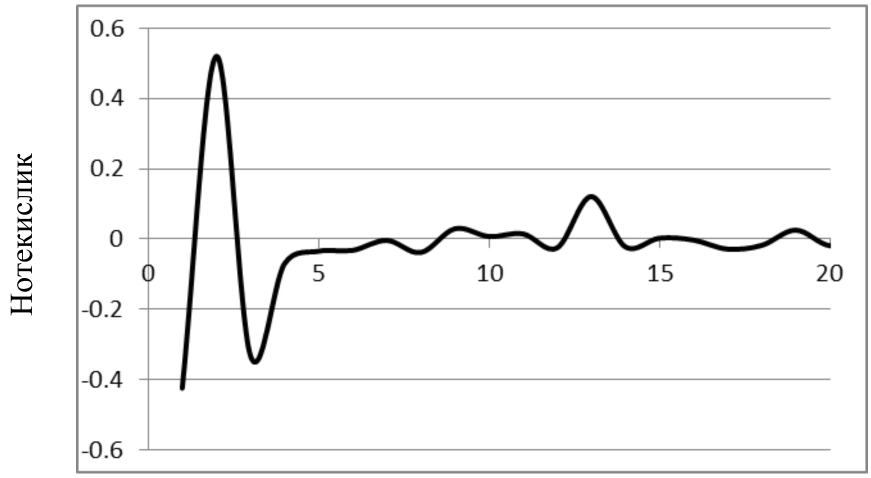


Figure 1. Variation of correlogram of pile unevenness obtained from a mixture of 10% nitrone, 60% cotton and 30% secondary fiber.

The correlation coefficient of a 10% nitrone, 60% cotton, and 30% secondary fiber blend under production conditions is around the correlation coefficient $r(x) \cong 0$, which corresponds to periodic or non-linear randomness in terms of roughness.

$$m_r = \pm \frac{1 - r^2}{\sqrt{n}} = \frac{1 - 0{,}86}{\sqrt{40}} = 0{,}13$$

The reliability is very small $\frac{r}{m_r} > 3 = \frac{0{,}37}{0{,}13} = 2{,}8$. In the correlogram (Fig. 1), it should be noted that randomness, not periodicity, is distinguished in the correlative function, the periodicity varies over a large interval by 13 points.

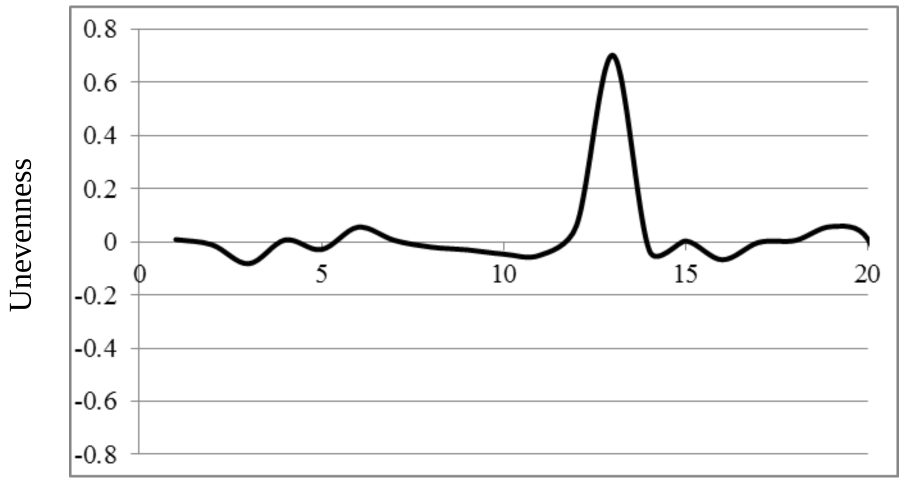


Figure 2. Variation of the correlogram of the piles obtained from option 1 on the unevenness.

The error of the correlation coefficients $r(x) \cong 0$ is around the correlation coefficient of the pulses obtained according to option 1, which corresponds to periodic or non-linear randomness according to the irregularity.

$$m_r = \pm\frac{1-r^2}{\sqrt{n}} = \frac{1-0{,}185}{\sqrt{40}} = 0{,}128$$

The reliability is very small $\frac{r}{m_r} > 3 = \frac{0{,}43}{0{,}128} = 3{,}3$. In the correlogram (Fig. 2), it should be noted that randomness, not periodicity, is distinguished in the correlative function.

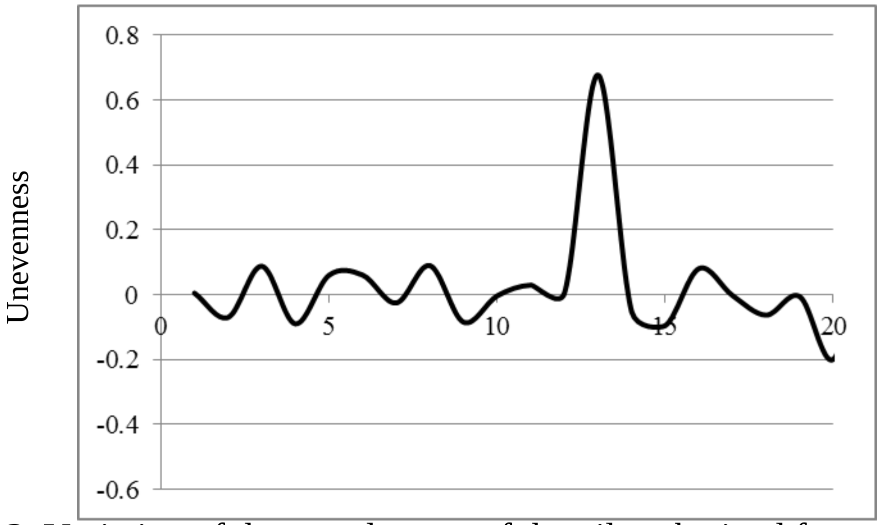


Figure 3. Variation of the correlogram of the piles obtained from option 2 according to the unevenness.

The error of the correlation coefficients $r(x) \cong 0$ is around the correlation coefficient of the pulses obtained according to option 2, which corresponds to periodic or non-linear randomness according to the irregularity.

$$m_r = \pm\frac{1-r^2}{\sqrt{n}} = \frac{1-0{,}152}{\sqrt{40}} = 0{,}134$$

The reliability is very small $\frac{r}{m_r} > 3 = \frac{0{,}39}{0{,}134} = 2{,}9$. In the correlogram (Fig. 3), it should be noted that randomness, not periodicity, is distinguished in the correlative function.

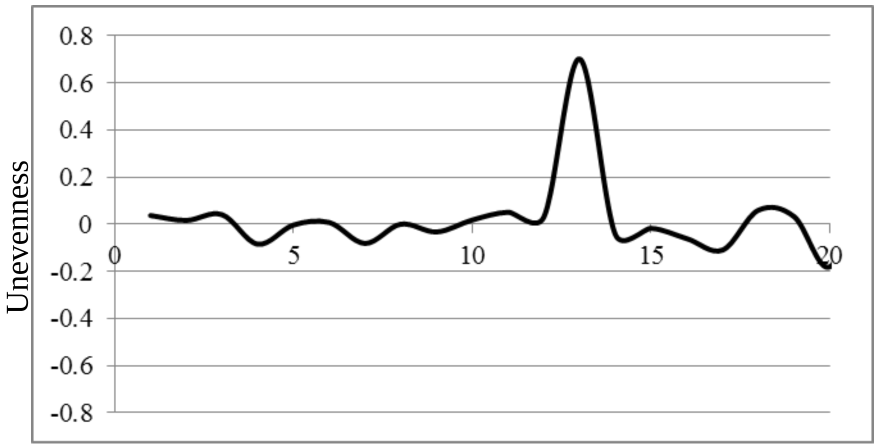


Figure 3. Variation of the correlogram of the piles obtained from option 3 according to the unevenness.

The error of the correlation coefficients $r(x) \cong 0$ is around the correlation coefficient of the pulses obtained according to option 2, which corresponds to periodic or non-linear randomness according to the irregularity.

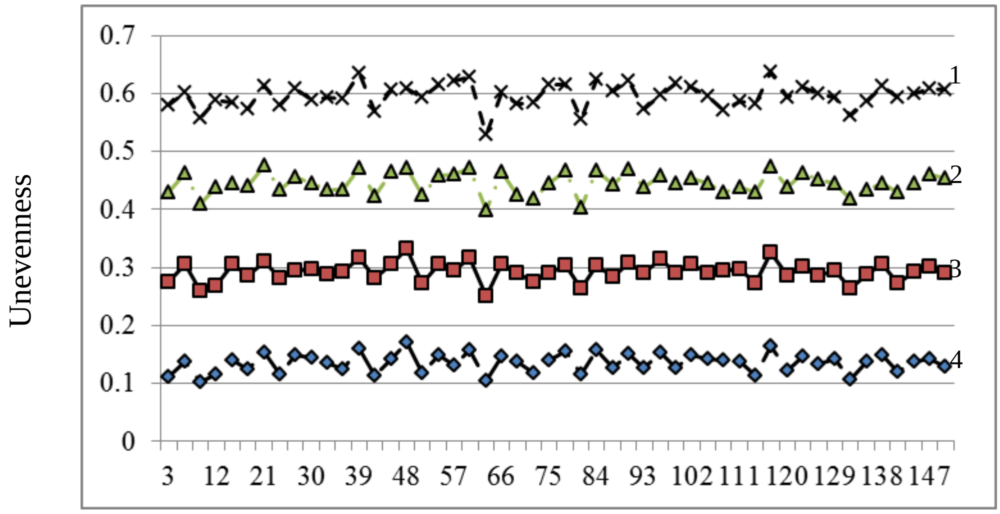
$$m_r = \pm\frac{1-r^2}{\sqrt{n}} = \frac{1-0{,}1444}{\sqrt{40}} = 0{,}136$$

The reliability is very small $\frac{r}{m_r} > 3 = \frac{0{,}38}{0{,}136} = 2{,}8$. In the correlogram (Fig. 4), it should be noted that randomness, not periodicity, is distinguished in the correlative function.

IV. CONCLUSION

It can be confirmed that there is a strong inverse relationship between the results of the unevenness $r < 0{,}5$ indicators of the piles, and that they are within the limits of experimental reliability according to the criterion that the calculations are performed correctly $\frac{r}{m_r} \geq 3$.

In addition, the diagram of the location of the fibers in the pile was studied (Fig. 5).



1- 10% nitron, 60% cotton and 30% secondary fiber wicking; according to option 2-1; according to option 3-2; According to option 4-3.

Figure 5. Diagram of the arrangement of fibers in the skeins taken from the sliver.

As can be seen from the diagram of the location of fibers in the braiding machine in different options, it was seen that the distribution of the location of the fibers in the braid according to option 1 is uniform compared to other options.

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