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Method of Reduction of Flat Irregularity Obtained During the Process of Filling

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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 a method was developed to reduce the unevenness of the obtained braids during the braiding process.

Keywords: minimum distance from the center of the formation to the condensing process, the point of pinning the comb, the combined flow phase push, interpellation, and the funnel.

I. INTRODUCTION

With the development of scientific and technical progress in the world, the volume of production of various materials increases, and the amount of secondary material resources also increases. At the same time, as a result of the creation of waste-free technology in the textile industry, the consumer demand for raw materials will increase. As a result of effective use of such raw materials in production, the cost of the finished product will decrease.

When knitting production scraps are taken as yarn count, sock knitting scraps are up to 7%, underwear production scraps are 12-20%, outerwear production scraps are 15-20%.

Globally, fibers obtained from waste and secondary material resources from the sewing process make up 25% of all textile raw materials.

This is a huge stock that can be used for production. However, only 10% of these scraps are used. Basically, they are processed into materials that cannot be used for various purposes, or they are made into simpler, lower-cost ropes, furniture and technical fabrics, for wiping and other purposes.

In our republic, comprehensive measures are currently being taken to develop resource-saving techniques and technologies that allow effective use of secondary material resources, and certain results are being achieved.

On the development strategy of the new Uzbekistan for 2022-2026, among other things, important tasks have been defined as "improving techniques and technologies in the production of new types of competitive products through the effective use of secondary material resources." In the implementation of these tasks, including the production of a new assortment of finished products from a mixture of various fibers and secondary material resources, as well as the high-quality processing necessary for their export, it is important to create technically and technologically modernized machines that perform in the prescribed manner.

Increasing the competitiveness of textile products, optimizing the assortment and structural characteristics, as well as reducing the consumption of materials and the cost of raw materials, cannot be imagined. The rational and efficient use of textile and garment scraps and secondary material resources (IMR) received from the population and enterprises has a direct impact on the development and recovery of the local textile industry. Universal technologies and equipment developed on the basis of newly created or modernized existing aggregates and mechanisms used in textile production are of particular importance.

The increase in the standard of living of the population is achieved by the exponential growth of the gross domestic product at the expense of non-renewable natural resources. Only 2% of them are used as finished products, and the remaining 98% pollutes the environment in the form of secondary material resources. Therefore, it is necessary to take urgent and drastic measures to reduce the consumption of non-renewable resources and pollution of the environment repeatedly.

The most important direction in this regard is the reuse of secondary material resources in production, which means obtaining a finished product that significantly reduces the use of natural resources and, as a result, environmental pollution. Because the amount of work and energy spent on processing secondary material resources is 2-3 times less than on primary production.

Modern technological equipment of light industry minimizes the release of harmful substances into the atmosphere during use, and some of them completely dispose of and recover production waste.

However, these environmentally friendly technologies are very expensive (sometimes the price of cleaning devices is up to 25% of the product price), because. these networks have many additional devices, which require a lot of human, material and energy costs and cannot fundamentally solve environmental problems.

The rational use of raw materials and material resources in the sewing and knitting industry is one of the main problems, and in solving them, not only enterprises, but also higher education sciences, scientists and specialists should actively participate in the creation of waste-free and low-waste technologies.

A large amount of waste is generated in the production of fabrics and products in the sewing and knitting industry. It depends on the assortment, the equipment used in weaving the canvas, the type of location and the organization of work on the normalization of fabric consumption.

As a result of equipment malfunctions, insufficient care and skilled maintenance of machines, defects such as distortion of the pattern, the formation of piles of loops or enlarged loops, crooked rows of loops, defects such as wrong-colored weaving loop rows in jacquard fabrics, shift of rapport, formation of unaligned folds in combination woven fabrics appears.

II. METHODOLOGY

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The braiding process is widely used in spinning technology. The purpose of addition is to equalize the structure and mass of the product. If the linear density of the collected products is characterized by random functions, then the probability characteristics of the resulting product can be determined by formulas. In practice, it is often the case that products to be combined have a periodic component of suitable phase, in which case the Fourier series coefficient for the component is the same for any product being combined.

The straightening efficiency can be achieved even though the stretching device associated with the previous machine combines the product coming from different paths to the exit point of the stretching device by different paths.

In this case, the process uniting n products can be interpellated as a signal passing through the system n of the elements inserted in parallel from the transfer $e^{s\tau}$ function. where τ - is equal to the magnitude of the shift, which is equal to the path of the product to the point of attachment

If a non-uniform shift is acceptable, the harmonic numbers can be reduced. If n is an even number, then the n/2 products must be combined so that they reduce to the first harmonic, and the two products reduce to the second harmonic after the second combination. Short wavelength and large amount of additives clearly limit the efficiency of alignment in splicing, thereby achieving optimal displacement of the splicing products.

Sometimes the products to be folded are out of phase, for example, braids can be obtained from fibers of different staple lengths. A mixture of 90% secondary material resources and 10% nitron fiber was obtained in a 6000 tex pelt formation on a sintering machine.

A lot of research work has been carried out on the reduction of product unevenness in the process of braid formation.

For the approximate solution of the equation describing the process of forming a coil from a product with different input parameters, we assume the following. The speed of the desired product elements is constant during the formation process.

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III. RESULTS AND DISCUSSION. Sometimes the products to be folded are out of phase, for example, braids can be obtained from fibers of different staple lengths. A mixture of 90% secondary material resources and 10% nitron fiber was obtained in a 6000 tex braid formation on a braiding machine.

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For the approximate solution of equation describing the process of forming a braid from a product with different input parameters, we assume the following. Speed of desired product elements is constant during the formation process.

In Figure 2, we present X, Y rectangular coordinate system.

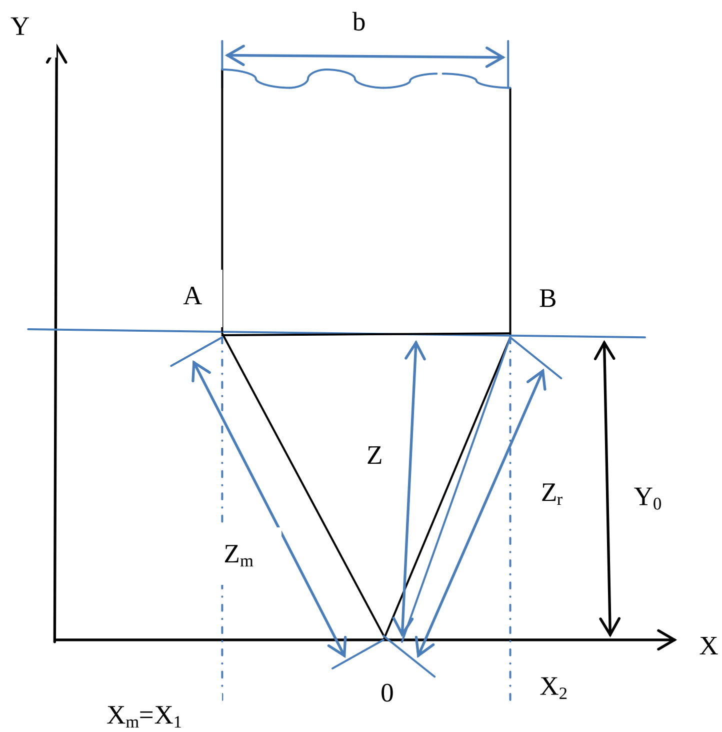

Fig.2. Scheme for braid formation in the braiding machine.

Abscissa axis of X is parallel to the stretching tool, and is the point of clamping the bolt. Initial product width *b*. Let's think of the dU as sum of an infinite number of equal-width braids. If the parameters of initial product change according to the law $y_1(x)\frac{dU}{b}$. In the braiding formed as a result of the formation process, the currents move relative to each other by a value equal to the difference in the distances traveled by the currents during the formation process.

The displacement determined in this way is equal to ε

$$\varepsilon = z - z_m \text{ or } \varepsilon = \sqrt{X^2 + Y_m^2} - \sqrt{X_m^2 + Y_0^2} \qquad (1)$$

Here - z is crossing distance of the braiding in the process of formation; z_m - minimum distance from the center of formation to the funnel to the densification process; Y_0 - distance from the center of the funnels to the clamp line; X_m -AB intersection point coordinate.

After the formation process, the change of the parameter along the flow is equal to $y_2(x)dX$:

$$y_2(x)dX = y_1(x-\varepsilon)\frac{dX}{b} \quad (2)$$

Obviously, is equal to $\varepsilon \geq 0$.

Output is the total sum of the fibers coming out of the stretching tool. Therefore, change in parameters of the output product $y_2(x)$ is determined as follows.

$$y_2(x) = \frac{1}{b}\int_{x_1}^{x_2} y(x-e)dX \quad (3)$$

Here x_1, x_2 - coordinate points A and B on the clamp line.

Based on Laplace's theory of integration with respect to images and theorems on the displacement of the region of the originals, we find the transfer function of the generation process:

$$W(s) = \frac{1}{b}\int_{x_1}^{x_2} e^{-s\varepsilon} dX \quad (4)$$

$W(s)$ we proceed to the calculation of the function. If we put the value ε to formula (1) we will obtain an expression (3.4);

$$W(s) = e^{s}\sqrt{X_m^1 + Y_0^2}\,\frac{1}{b}\int_{x_1}^{x_2} e^{-s\sqrt{X^2+Y_0^2}} dX \quad (5)$$

$Z = \sqrt{X^2 + Y_0^2}$ gives the change.

$$W(s) = \frac{e^{sz_m}}{b}\int_{z_1}^{z_2} F(z)e^{-sz} dz \quad (6)$$

This formula is true when the X AB cross-section has the same sign if the former has shifted to the longitudinal axis of the product entering the center of the funnel by a distance equal to or greater than half of the product width.

Therefore, $X_m = X_1$ is equal to $z_m = z_1$.

Otherwise $(X_1 < X_m < X_2)$

$$W_{(s)} = \frac{e^{sz_m}}{b}\left[\int_{z_m}^{z_1} F(z)e^{-sz} dz + \int_{z_m}^{z_2} F(z)e^{-sz} dz\right] \quad (7)$$

Integrals in the last two equations are not expressed by elementary functions.

Let's study the function under the integral

$$F(z) = \frac{z}{\sqrt{z^2 - V_0^2}} \quad (8)$$

When we divide the X_1; X_2 sections into k sections, we will calculate the constant $F(z)$ and $F(z_0)$ equality for each of t hem. Here z_0 - the distance from the funnel to the center of the section. We define the distance from the funnel to the beginning of the section as z_1.

Then $I = \frac{1}{b}\int_{z_1}^{z_2} F(z)e^{-sz} dz \approx \frac{1}{b}\sum_{i=1}^{k} I_i \quad (9)$

Here $I_i = F(z_{\upsilon i})\frac{e^{-sz_i} - e^{-sz_{i+1}}}{s} \quad (10)$

After solving the joint equations (6), (9) and (10), we obtain the approximate transfer function $W^*(s)$ in the formation process

$$W^*(s) = \frac{e^{sz_1}}{b}\sum_{i=1}^{k} F(z_{\upsilon i})\frac{e^{-sz_i} - e^{-sz_{i+1}}}{s} \quad (11)$$

High accuracy results can be obtained by linear interpolation.

Let us replace the function in each interval $i-м$ with linear function $\overline{F}(z)$ corresponding to $F(z)$, then we consider the corresponding polynomial $F(z)$:

$$F_i(z) - C_i z + d_i$$

Section of C_i and d_i coefficients are found from the condition of equality of the estimated and real functions at the end of the section.

$$C_i = \frac{F(z_{i+1}) - F(z_i)}{z_{i+1} - z_i}$$

$$d_i = F(z_i) - C_i z_i \quad (12)$$

Then $I_i = \int_{z_i}^{z_{i+1}} (C_i z + d_i) e^{-sz} dz = \frac{C_i}{s^2}\left[e^{-sz_i}(sz_i + 1) - e^{-sz_{i+1}}(sz_{i+1} + 1)\right] + \frac{d_i}{s}(e^{-sz_i} - e^{-sz_{i+1}})$ (13)

Equations (7), (9) and (13) yield the following equation

$$W^*(s)_{1,2} = \frac{e^{sz_1}}{b} \sum_{i=1}^{k} I_i \quad (14)$$

(Formula (14) is used to determine a shape of the amount of braiding in the braiding joining machine.

In short, we determine the amplitude characteristics of the braid formation process by the ratio of the amplitude fluctuations of the braid parameters to the amplitude of the initial product of 4 long fibers and 2 short fibers (bundling of the braid in the current.

Amplitude characteristic can be determined by a certain relationship:

$$A_i(\omega) = \sqrt{W^*{}_{(s)_1} \cdot W^*{}_{(s)_2}} \quad (15)$$

Here $W^*(s)_1$ - is characteristic that determines the unevenness of the cotton fiber braiding; $W^*(s)_2$ - characteristic that determines the unevenness of the braid obtained from secondary fibers.

Thus, approximate formation processes are accepted for any character of changes in considered parameter of the initial product-braiding.

(15) the previous determination of the transfer function of the process of adding the formula allows to find the amplitude characteristic of this process.

It is known that parallelization of fibers and correction of linear density of braids is carried out in the process of stretching, using a braiding machine, joining and automatic adjustment of manufactured product. A process of stretching, combining and adjusting linear density will depend on unevenness of the film. Sequential implementation of these processes leads to a change in the unevenness indicator of manufactured product, as a result, spin yarn will have uneven indicators in terms of linear density.

In conclusion, there has been developed a mathematical model to determine the amplitude-frequency characteristics of braiding unevenness produced by the braiding machine, taking into account that the unevenness of combined braiding varying from 6.5% to 3.7%. Based on conducted research, there was recommended a method of reducing the product unevenness indicator by selecting supply scheme of braiding machine.

From the comparative analysis of the results of the theoretical and experimental research, it was found that the unevenness indicators of the obtained braids were found to be within the limits of the allowed values.

IV. CONCLUSION. It was possible to implement the basic principles of product-pill unevenness correction, and it was tested theoretically and practically. As a result of the application of this method in the pelting machine, the consumption of raw materials was reduced, and pelts of high quality were produced.

Recommended method makes it possible to smooth out the unevenness of the braiding and to reduce the deviation limit by a certain amount.

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