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Change of Fiber Length and Qualitative Characteristics of Yarns Depending on the Maturity of Cotton

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ABSTRACT: In this article, the length of fibers was determined from the selected samples by technological transitions of the spinning process, degree of maturity, and the physicomechanical properties of the yarn produced from them. For this purpose, a special designated area of 10x10 meters was chosen, from which cotton fiber was harvested during the initial opening of the box, when opening the box in 6 days, 10 days, 14 days and 18 days, which were manually separated from the seeds.

KEY WORDS: Cotton fiber, length, Machine Learning, staple mass-length, degree of maturity, mechanical properties, quality control.

I.INTRODUCTION

One of the important indicators for cotton fibers is the length, which determines the choice of spinning system. The longer the fiber, the thinner and stronger the yarn produced from it, since the long fibers in the composition of the yarn have greater adhesion. As a result, the friction force between the fibers increases, which contributes to an increase in strength.

Thus, a smaller amount of fibers is used to produce fine yarn, which contributes to achieving economic efficiency.

From the results of research works it is known that an increase in the length of cotton fiber by 1 mm leads to an increase in the rate of breaking load of yarn by 3-4%. Therefore, the preservation of the true length of cotton fiber in the process is significant technological and economic importance.

Pinning factories produce yarn for various purposes. For the manufacture of yarn with certain properties and quality characteristics choose a specific spinning system, i.e. the sequence of transformation of fibrous material into yarn. Spinning systems are distinguished by the method of pulling (thinning) the product and by the method of combing the fibers. Currently, there are 4 systems of spinning cotton in its pure form and mixed with other staple fibers: carded, combed, hardware and melange. Therefore, technical control, depending on the spinning system operating at the spinning mill, will include various operations.

II.ANALYSIS OF EXISTING FILTERING MATERIALS AND RESEARCH RESULTS

For this reason, the change in length is investigated depending on the degree of maturity of the fiber raw materials, semi-finished products and finished products on technological transitions of cotton spinning processes.

The results of the research work are given in table 1.

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Table 1
The effect of fiber maturity on product quality characteristics

Box opening period	spinning products			
	fiber	tape	roving	down
reopened box	33,6	33,8	33,8	32,1
box with a disclosure of 3 days	33,6	33,8	33,8	32,3
box with a disclosure of 7 days	33,6	33,9	33,9	32,5
box with a disclosure of 10 days	33,6	34,1	34,1	32,7
box with a disclosure of 12 days	33,6	34,3	34,3	33,1

On the basis of the results of table 1, a graph of the change in the length of fibers in the products and semi-finished products of the cotton spinning process depending on the degree of maturity of the fiber, shown in Fig.1.

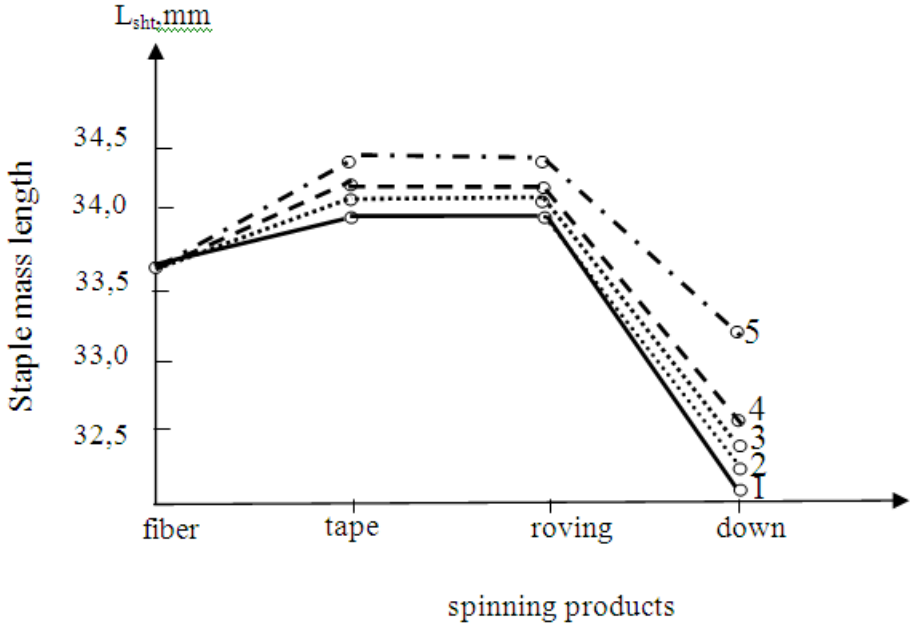

Fig.1. Change of staple mass-length of cotton spinning products by technological transitions.
1- reopened box;
2- box with a disclosure of 3 days;
3- box with a disclosure of 7 days;
4- box with a disclosure of 10 days;
5- box with a disclosure of 12 days.

When analyzing the obtained test results, it is clear that the length of the fibers in the newly opened box after the tape and roving process increased 0.2 mm, after the spinning process decreased by 1.5 mm, the length of the fibers with opening of the box 3 days after the ribbon and roving process increased 0.2 mm, after the spinning process decreased by 1.3 mm, the length of the fibers with opening of the box 7 days after the tape and roving process increased 0.3 mm, after the spinning process decreased by 1.1 mm, the length of the opening fibers 10 days after the ribbon and roving processes increased 0.5 mm, after the spinning process decreased by 0.9 mm, the fiber length with opening of the box 12 days after the ribbon and roving processes increased 0.7 mm, after the spinning process decreased by 0.5 mm. Thus, the long-term finding of the cotton boll in the opened state contributes to the achievement of the necessary maturity of the fiber and does not lead to a decrease in the indicator of the staple mass fold in the transitions of the spinning process.

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The quality control of all transitions of the spinning process is carried out by the Quality Control Department - the main task of which is to control the quality of products at all stages of production from entering the enterprises of raw materials, materials, semi-finished products to the production of finished products, ie, yarn, its storage, packaging, labeling. As well as performing the most important operations, in its work, the Quality Control Department applies various methods of control, including selective quality control.

A progressive method is the statistical control of product quality in the production process, which makes it possible to assess the condition and adjust the technological process. This method of control is based on the theory of probability and mathematical statistics and allows you to extend the results of the survey of products to all products. The shelf life of a production batch is judged by the statistical characteristics of the distribution of control parameters. The methods of statistical control are applicable to any sign of product quality, if it is possible to quantify it. Such features are geometric, mechanical properties of the product.

III. LITERATURE SURVEY

Methods of statistical control have many options, the choice of the optimal determines the effectiveness of the control. Most modern methods of statistical control are designed to obtain reliable results with minimal labor costs for measurement and testing, as well as for computational work. The most developed and commonly used method is the arithmetic mean and range, in which two statistical characteristics, the arithmetic average and the variation range of the monitored product quality parameter, are determined on the basis of a sample measurement or test. Identified values are entered in control charts. If the first and second diagrams of the quality parameters are located outside the control limits, this signals a change in technological processes for the worse. Then the controller is obliged to warn technologists about the need to improve the process, and check the entire batch of products.

OTC evaluates the results of the work of technological processes in accordance with the control technology, the results of statistical control and determines the main measures to ensure product quality.

Thickness unevenness is one of the main indicators that determine the quality of yarn.

The coefficient of variation is the main indicator of unevenness, the numerical value of which is standardized, but it does not reveal the nature of unevenness.

The quality of textile products largely depends on the uniformity in terms of quality indicators of the yarn produced. High irregularity of yarn leads to a decrease in the relative breaking load of the yarn, thus, for fabrics produced from these yarns, the indicator for breaking load will not meet the regulatory requirements of the standard.

One of the causes of unevenness is the inconstant quantitative ratio of the constituent components and their uneven mixing.

The increased non-uniformity of the yarn reduces the use of the strength of the fibers in the yarn, as a result of which the mechanical properties of the yarn are deteriorated and their breakage is increased in weaving and knitting.

IV. EXPERIMENTAL RESULTS

The unevenness of spinning products by linear density is their main negative indicator, affecting the non-uniformity and the level of various properties of the yarn. Control of unevenness of various products is carried out: by the mass of segments of constant length; according to the mass of pieces coming out of the car and products of various lengths entering it (proportional to the hood) and determining the deterioration rate of unevenness; by continuous measurement of the thickness of the product, fixed on various devices; on discrete measurement of tape thickness using an instrument.

For this reason, with the help of modern laboratory equipment, the qualitative characteristics of the yarns produced from fibers with different degrees of maturity were determined.

The results of the research work are given in table 2

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Table 2
Changes in yarn quality indicators depending on the degree of maturity of cotton fiber

Box opening period	Linear yarn density, tex	Quadratic irregularity in linear density,%	Twist	Quadratic twist irregularity,%	Yarn class
reopened box	29,59	6,5	716	15,6	A
box with a disclosure of 3 days	29,10	5,8	732	13,0	A
box with a disclosure of 7 days	29,68	2,7	728	11,8	A
box with a disclosure of 10 days	29,17	4,5	724	9,2	A
box with a disclosure of 12 days	29,63	6,2	730	14,2	A

According to the obtained test results, it can be seen that in comparison with the quality indicators of the yarn produced from the fibers obtained from the newly opened bolls, the yarn produced from the fibers obtained with the opening of the box in 3 days is quadratic non-linear linear density of 10.8% , quadratic twist unevenness by 16.7%, for yarn produced from fibers obtained with opening of the box in 7 days, quadratic unevenness in linear density by 58.5%, quadratic unevenness in twisting by 24.4%, for yarn, developed from curl, obtained with the opening of the box in 10 days, quadratic unevenness in linear density by 30.8%, quadratic unevenness in linear density by 41.0%, in yarn produced from the fibers obtained with opening the box in 12 days, quadratic unevenness in linear density by 4.6%, quadratic irregularity in linear density by 9.0% decreased.

Depending on the degree of influence of each of these factors and their interactions over time, deviations of the parameters of technological processes occur, which leads to fluctuations in the quality indicators of semi-finished products, i.e. the occurrence of uneven spinning products.

Many factors leading to the occurrence of unevenness are considered, for example, unevenness of raw materials, in the majority of violation of the technological process and operating mode, as well as a result of incorrect adjustment of machines and their improper maintenance by the working personnel.

V. CONCLUSION AND FUTURE WORK

1. Rolonged finding of the cotton boll in the opened state contributes to the achievement of the required maturity of the fiber and does not lead to a decrease in the staple mass length indicator by transitions of the spinning process.

2. From the test results it can be seen that the yarn produced from the fibers obtained from the boxes with a disclosure of 7 days, the indices of quadratic non-uniformity in linear density and twist less.

REFERENCES

1. Barbu I., Sabo M., Fogorasi M.S. High quality yarn - the first condition for high-quality textiles // IOP Conference Series: Materials Science and Engineering 400 (6), 062004, 2018.
2. Arch N.V. Malakane P.B. , Cadole, P.V. Studies on Fiber Migration in the Spinning Process // Artificial Textiles in India 46 (4), p. 123-126, 2018.
3. Gunaydin G.K. , Soydan A.S. , Palamutsu S. Evaluation of the properties of cotton fiber in spinning processes of compact yarn and the study of the properties of fiber and yarn // Fibers and Textiles in Eastern Europe 26 (3), p. 23-34, 2018.