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UDC 677.025

**ANALYSYS OF TECHNOLOGICAL PARAMETERS OF  
PATTERN KNITTED FABRIC**

**АНАЛИЗ ТЕХНОЛОГИЧЕСКИХ ПАРАМЕТРОВ  
РИСУНЧАТЫХ ТРИКОТАЖНЫХ ПОЛОТЕН**

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*Keywords: knitting, cotton, silk, technological parameters, thickness, surface density, volume density.*

*Ключевые слова: трикотаж, хлопок, шелк, технологические параметры, толщина, поверхностная плотность, объемная плотность.*

*Abstract. The study and expansion of the technological capabilities of modern knitting machines, the development of new models of knitted fabric from local raw materials on the above machines and the subsequent expansion of the range of knitwear with improved consumer properties is an urgent task today. The article presents the results of the analysis of the technological parameters of patterned knitted fabrics, developed for the effective use of local raw materials and those made from silk*

and cotton yarn. The samples of investigated cotton-silk knitted fabric were produced on a Mayer knitting machine.

*Аннотация. Изучение и расширение технологических возможностей современных трикотажных машин, разработка новых моделей трикотажа из местного сырья на вышеуказанных машинах и последующее расширение ассортимента трикотажных изделий с улучшенными потребительскими свойствами, является актуальной задачей на сегодняшний день. В статье приведены результаты анализа технологических параметров рисунчатых трикотажных полотен, разработанных с целью эффективного использования местного сырья и изготовленных из шелковой и хлопчатобумажной пряжи. Образцы исследуемых хлопково-шелковых трикотажных полотен были выработаны на трикотажной машине Mayer.*

The production of linen and lightweight knitwear made from cotton yarn in combination with natural fibers, namely natural silk, helps to improve consumer properties, such as breathability, hygroscopicity, as well as hygienic properties, which allows their use in regions with a hot climate [1, 2].

Studying and expanding the technological capabilities of modern knitting machines, developing new knitting patterns from local raw materials on the above machines and subsequently expanding the range of knitted products with improved consumer properties are an urgent problem today. In order to expand the range of knitted fabrics and to study the effect of the size of the pattern on the technological parameters and the physical-and-mechanical properties of the patterned cotton-silk knitted fabrics on the Mayer 18 gauge double circular knitting machine, 5 variants of patterned cotton-silk knitted fabrics were developed, varying the size of the pattern on the surface of the canvas. The pattern on the surface of the canvas is formed by knitting an elastic series against the background of smooth weaving. Cotton yarn with a linear density of 25 tex and silk yarn with a linear density of 14.3 tex were used as raw materials. The structure of a new structured cotton-silk knitted fabric is presented in Fig. 1 [3].

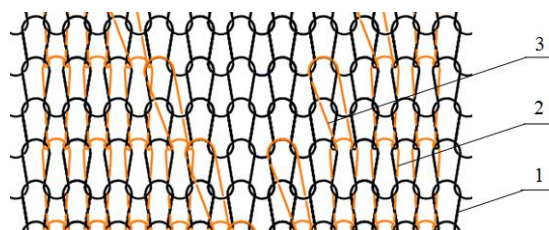


Figure 1 – New structured cotton-silk knitted fabric:  
here: 1 – suprem loops formed from cotton thread;  
2 – rib loops formed from silk thread; 3 – transferred loops

Based on the results of the analysis, technological parameters such as the loop step, the height of the loop row, the horizontal and vertical density, the length of the thread in the loop are determined. An analysis of the results of studies conducted by many scientists showed that a decrease in the surface density of knitted fabric wear is the

least dangerous for its strength properties, since the absolute value of the strength of knitted fabric is high, during operation, the products are subjected to loads not exceeding 20 % of breaking [4–5].

The decrease in surface density causes damage to the hygienic and heat-shielding properties of the canvas. Therefore, it seems rational to introduce an indicator that would simultaneously characterize both the material consumption of the canvas and its qualitative indicators [6]. Since knitwear is a three-dimensional structure characterized by length, width and thickness, the lightness of this structure should be determined not by a two-dimensional criterion (surface density), but by three-dimensional (volume density).

The surface density of the proposed variants for cotton-silk patterned knitted fabric varies from 110.2 to 139.1 g/m<sup>2</sup>, the lowest surface density in variant IV of knitted fabric is 110.2 g/m<sup>2</sup>. The volume density of the patterned cotton-silk knitted fabric variants from 237 to 358.8 mg/sm<sup>3</sup>, the lowest volume density for variant V of knitted fabrics is 237 mg/sm<sup>3</sup>. The results of the study showed that the volume density of the developed fabrics of cotton-silk patterned knitted fabric is less compared to the basic fabric (variant I), (Figure 2).

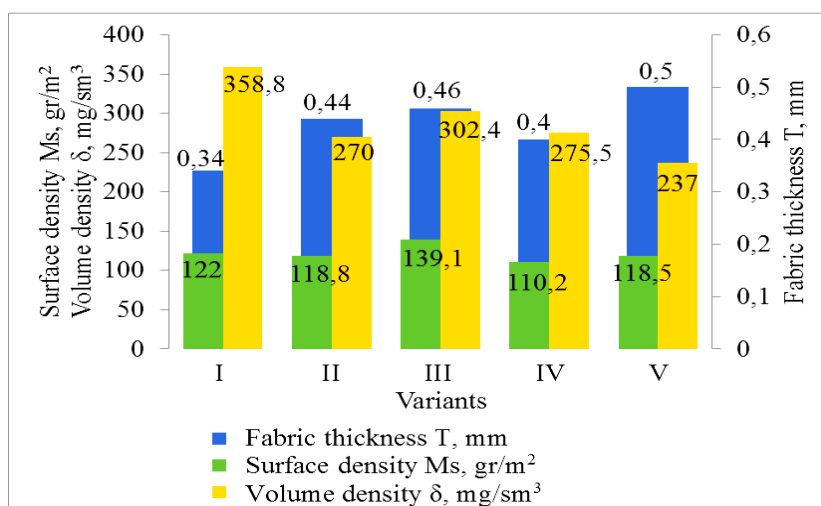


Figure 2 – Histogram of changes in thickness, surface and volume density of cotton-silk patterned knitted fabrics

If the surface density of the base knitting sample is Ms=122 g/m<sup>2</sup> and the thickness T=0.34 mm, its volume density is δ=358.8 mg/sm<sup>3</sup>.

In this case, the absolute volumetric lighthness indicators of the canvases compared to the base sample will be as follows (Fig.2):

$$\Delta\delta = \delta_b - \delta = 358,8 - 270 = 88,8 \text{ mg/sm}^3 \quad (\text{II opt.})$$

Here: Δδ – absolute volumetric lighthness, mg/sm<sup>3</sup>; δ<sub>b</sub> – is the volume density of the base sample, mg/sm<sup>3</sup>; δ – is the volume density of the base sample, mg/sm<sup>3</sup>;

The relative lighthness of the developed patterns of cotton-silk patterned knitted fabrics is as follows:

$$\theta = \left(1 - \frac{\delta}{\delta_b}\right) \cdot 100\% = \left(1 - \frac{270}{358,8}\right) \cdot 100\% = 25\% \quad (\text{II opt.})$$

As can be seen from Fig. 2, 3 the smallest consumption of raw materials in the developed cotton-silk patterned knitted fabrics is required for variant V of knitted fabric, i.e. the volume density of this knitted fabric is the smallest compared to other variants. Reducing the consumption of raw materials in the development of variants II, III, IV, V of cotton-silk patterned knitted fabrics is achieved by reducing the number of rib. knitting loops, since the rapport of cotton-silk patterned knitted fabrics consists of supreme and rib. loops.

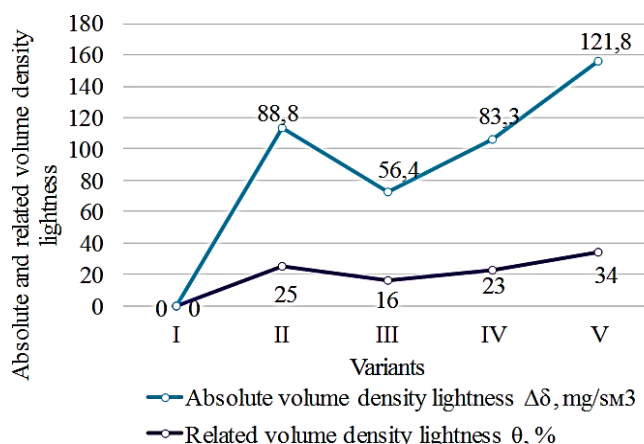


Figure 3 – Graphic lines changes absolute volumetric lightness and relative lightness of cotton-silk patterned knitted fabrics

In conclusion, it can be noted that by changing the size of the pattern on the surface of the cotton-silk patterned knitted fabrics, it is possible to obtain knitwear with desired properties and reduced material consumption.

The developed fabrics of pattern cotton-silk knitted fabrics can be successfully used in the manufacture of lightweight upper products and children's assortment.

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UDC 677.025

**STUDY OF PHYSICAL-MECHANICAL INDICATORS  
OF NEW PATTERN KNITTED FABRICS**

**ИССЛЕДОВАНИЕ ФИЗИКО-МЕХАНИЧЕСКИХ  
ПОКАЗАТЕЛЕЙ НОВЫХ РИСУНЧАТЫХ  
ТРИКОТАЖНЫХ ПОЛОТЕН**

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*Keywords: physical and mechanical properties, breaking load, tensile elongation, air permeability, deformation.*

*Ключевые слова: физико-механические свойства, прочность на разрыв, удлинение, воздухопроницаемость, деформация.*

*Abstract. Today, the textile, clothing and knitting industry is one of the strategically important and rapidly developing sectors of the national economy. Using the technological capabilities of modern double-loop needle knitting machines, the physical and mechanical properties of the newly constructed cotton-silk knitted fabric on the basis of local raw materials were studied. As a result of research work, the range of cotton-silk knitted fabrics and products with high quality and low consumption of raw materials has been expanded.*

*Аннотация. Сегодня текстильная, швейная и трикотажная промышленности являются одними из стратегически важных и динамично развивающихся отраслей народного хозяйства. С использованием технологических возможностей современных двухфонтурных вязальных машин исследованы физико-механические свойства хлопково-шелкового трикотажа на основе местного сырья. В результате научно-исследовательской работы расширен ассортимент хлопково-шелкового трикотажа и изделий с высоким качеством и низким расходом сырья.*

Expanding the range of knitted fabrics, making full use of the technological capabilities of knitting machines, improving the quality of knitted fabrics without