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Research of Raw Material Preparation Technology for Knitted Products from Spun Silk Yarns

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Abstract: The article presents research on the process of obtaining spun silk obtained from the processing of silk waste and the properties of raw materials for silk-cotton embroidery products, and provides information on the yarns made from 15 tex and 20 tex cotton raw materials. By applying modern technologies in the production of silk thread, 15 tex spun silk thread was obtained on a semi-mechanical spinning machine and mixed with 20 tex cotton thread, raw materials for embroidery were prepared, and the results were obtained and research was conducted.

Keywords: silk, spun silk yarn, cotton, tex, air permeability, elasticity, spinning method, yarn quality indicators.

Enter. Today, the textile, sewing and knitting industry in our country is one of the strategically important and rapidly developing sectors of the national economy. Expanding the assortment of knitted fabrics with composite content, fully using the technological capabilities of knitting machines, saving raw material consumption and improving the quality indicators of knitted fabrics are among the urgent problems facing the scientists of the textile industry today.

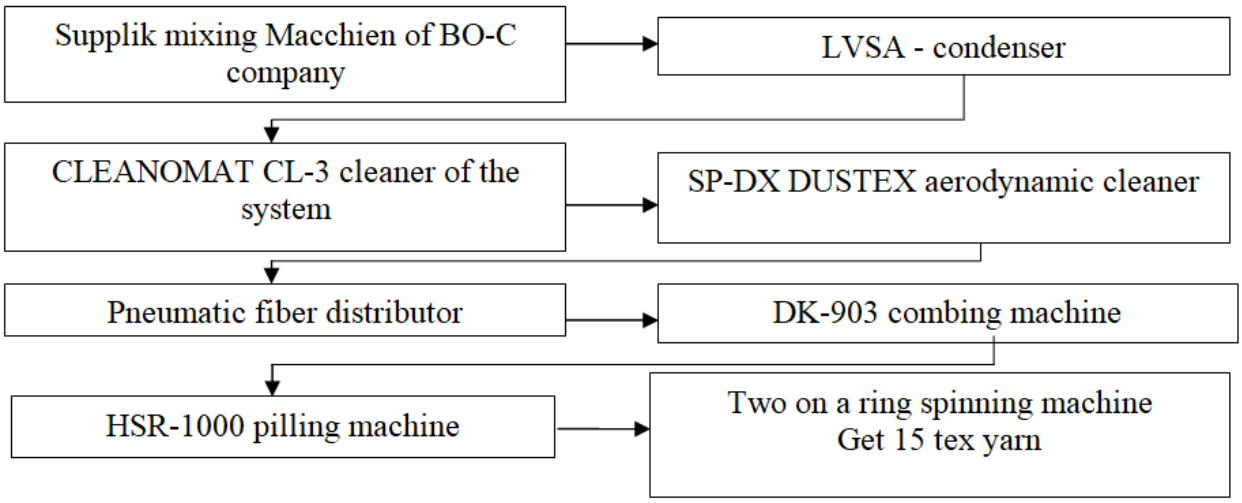
Based on the information of a number of international associations, as well as the application of the Internet, the balance of the world's textile raw materials was compiled with the forecast of textile raw materials from 2010 to 2050. Mainly, it will be up to 75 thousand tons in 2010 and up to 131 thousand tons in 2050 [1-2].

Research object and method. The production of knitted fabrics from spun silk yarn using local raw materials effectively creates the basis for the production of knitted silk yarns with low consumption of raw materials, as well as air permeability, hygroscopicity, permeability, as well as low stretchability and high shape retention properties.

In the production of patterned knitted fabric samples by spun silk thread, it is recommended to use spun silk threads with a linear density of 15.0 tex as raw materials.

In order to expand the assortment of knitted fabrics from spun silk threads, it is necessary to reveal such properties of fabrics, which directly affect the improvement of the quality indicators of the knitted fabric [3-4]. As a result, in order to expand the types of knitted products in the future, the importance of production of knitted fabrics made of silk threads with low consumption of raw materials, high hygiene, strength and shape retention properties has increased.

Technological processes for obtaining spun silk thread are presented below



Results obtained and analysis. The quality parameters of the produced spun silk thread samples were tested in the standard method [5-7] in the modern equipment available in the CentexUz test laboratory at TTYESI, and the obtained results are presented in the table.

№	Indicator name	Option-1	Option-2
1	2	3	4
1	Average linear density, tex	15.0	15,0
2	Coefficient of variation in linear density CV, %	3,58	4,54
3	Average number of turns, t/m	650	650
4	Coefficient of variation CV of twists, %	4,8	9
5	Relative creep to break, %	7,1	6,68
6	Coefficient of variation of relative creep before break, %	7,22	9,02
7	Breaking strength, sN	422,53	392,74

The above table - 3 shows that the production of the same assortments at 7.14 x 2 line density has the most improvement in unevenness by re-combing by 4.56% and the least unevenness is the product produced in the classic system. Such an indicator also shows proportionality in the unevenness of the twists of the yarn, i.e. it is 9% in the improved re-combing method and 3.9% in the classic method.

In the same situation, the elongation to break of the spun silk thread produced in different systems is subject to the same law, i.e., the improved re-combing system was 9.2%, while it was 6.66% in the classical method. In the classical method, the tensile strength of the threads is opposite to this law. The breaking strength of the improved retreading system was 392.74 cN, while it was 422.53 in the classical system.

According to the normative document GOST 1025-48, the number of turns of the 7.14 x 2 tex assortment is required to be 660 ± 40 bur/m. The results showed that the number of twists of silk threads spun in three systems meets the requirements of the normative document. Also, in GOST 1025-48, the unevenness of the windings of 7.14 x 2 assortments should not be more than 5.5%. From the obtained result, it can be seen that the thread obtained by the classical method and carded re-combing method meets the normative document. The reason for the warping unevenness is proportional to the coefficient of variation in the linear density of the spun silk yarn produced.

The results of the analysis show that the classic system with complex technology and manual labor produced a better quality product than the other two improved carding and carding carding systems.

It is possible to produce embroidered knitted fabric from the obtained raw materials, therefore, embroidered knitted fabric was produced from threads obtained from cotton and spun silk threads.

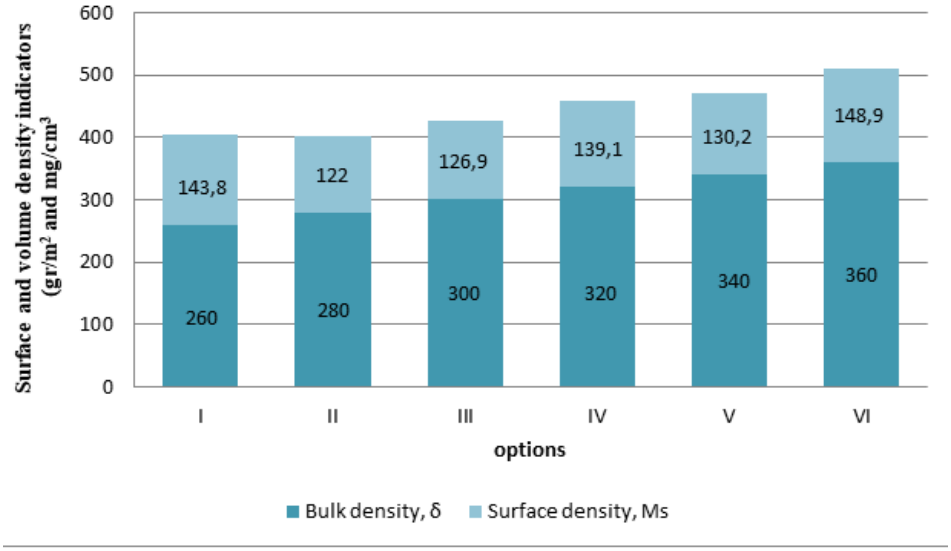
The technological parameters and physical-mechanical properties of the knitted fabric samples with composite composition were compared to the basis fabric of option I, produced from 100% cotton raw materials. The surface density indicators of the knitted fabric samples with the proposed new

composite composition varied from 110.2 to 203.6 gr/m2. The lowest surface density indicator was observed in option V and it was 110.2 g/m2 (Table 1, Figure 1).

Characteristics of knitted fabrics with silk and cotton content

Indicators		Вариантлар					
		I	II	III	IV	V	VI
Yarn type, linear density and % amount in the fabric	cotton thread, 20,0- tex	100	54	58	56	60	56
	Spun silk thread, 15.0- tex						
Knitted surface density ms, gr/m2		260	280	300	320	340	360
Thickness T, mm		0,5	0,34	0,44	0,46	0,4	0,5
Volume density of knitted fabric d, mg/cm^3		407,2	358,8	292,7	302,4	295,6	237
Air permeability V (cm^3/cm^2·sec)		290,5	355,8	379,7	336,7	367,2	386,0
Abrasion resistance I (thousand cycles)		8,0	8,5	11	11	10,6	8,8
Hygroscopicity E (%)		5,7	7,8	6,9	7,1	6,5	7,4

The volume densities of knitted fabric samples with silk and cotton content varied from 260 to 360 mg/cm3, and the lowest volume density index was observed in variant VI, which consisted of spun silk thread, and it was 320 mg/cm3 (Fig. 1). Air permeability is one of the properties of knitwear that create comfortable conditions for consumers when using knitted products. The air permeability values of the knitted fabrics with composite content varied from 290.5 to 386.0 cm^3/cm^2·s.



indicators (gr/m^2 and mg/cm^3

1. Histogram of changes in surface and volume densities of knitted fabrics with silk and cotton content.

Conclusion: It can be concluded from the results of the research of patterned knitted fabrics with the proposed composition that, due to the use of spun silk thread in the fabric, the consumption of raw materials of the III, V, VI options is less compared to the basic option, and also due to the change in the fabric structure and rapport, the samples are broken. strength, air permeability, amount of return deformation, abrasion resistance indicators have increased. The elongation at break, permeability and hygroscopicity of the knitted fabric decreased compared to the base knitted fabric. As a result of the conducted scientific research work, it was possible to expand the range of knitted fabrics and products with composite content, with high quality indicators and low consumption of raw materials.

The proposed composite composition patterned knitted fabric samples are recommended for the production of women's and children's lightweight outerwear and product ranges.

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