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INFLUENCE OF STRUCTURAL PARAMETERS OF BED LINEN FABRICS ON PHYSICAL AND MECHANICAL PROPERTIES

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The article presents a comparative analysis of bed linen fabrics made from cotton yarn, but of different product groups with different structural parameters, as well as the results of studies of the influence of structural indicators on the physical and mechanical properties of fabrics.

Key words: fabric, surface density, breaking load, resistance to abrasion, number of threads per 10 cm, abrasion, hygienic properties .

The main quality characteristics that were determined for bed linen fabric samples were surface density, breaking load, resistance to abrasion on the plane, the number of threads per 10 cm, color fastness to dimensional changes after wet processing, abrasion, and hygienic properties. Based on the results of the experimental work, a comparative analysis of bed linen fabrics made from cotton yarn, but of different product groups with different structural parameters, was carried out. Before testing, the samples were kept in normal climatic conditions according to GOST ISO 139-2014. Comparative characteristics of the test results for fabric samples are provided in Table 1 and graphically shown in Figures 1-6.

The results of determining the physical and mechanical characteristics are presented in Table 1.

The first indicator that determines the quality of the fabric is the surface density. This indicator directly determines how durable and long-lasting the bed linen will be. According to GOST 31307-2005 "Bed linen. General specifications" this indicator must be at least 110 g / m ^{2} . All the selected fabrics comply with the standard. As can be seen from Table 12, Sample IV has the highest warp strength , which is 484 N, which is 29.5% more than Sample I , 5.78% more than Sample II and 10.95% more than Sample III ; Sample I has a higher weft strength and is 623 N, which is 41.89% more than Sample II , 41.25% more than Sample III and 40.45% more than Sample IV .

Table 1

Physical and mechanical properties of fabrics

No.	Name of indicators	Unit of measurement	Fibrous composition			
			I	II	III	IV
1	Fibrous composition	100% cotton				
2	Surface density	g/ m2	127.2	126.5	129.5	130.6

3	Thickness	Mm	2.8	2.0	2.0	2.0
4	Number of threads Warp Weft	Pcs.	 460 340	 480 400	 380 240	 400 260
5	Linear density, Warp Weft	Tex	 18 20	 20 20	 23 20	 25 34
6	Breathability	dm3 / m2 * sec	40,9	39 , 53	72.6	58.3
7	Hygroscopicity	%	8.96	9.3	9.12	9.23
8	Electrification	V	55	64	68	60
9	Breaking load of a 50x200 mm fabric strip Warp Weft	N	 341 623	 456 362	 431 366	 484 371
10	Abrasion	Cycle	16800	15500	14500	16000
11	Change in linear dimensions after wet processing based on by duck	%	 -1.5 -1.0	 -1.5 -1	 -2.5 -1.0	 -2.0 -1.0
12	Colour fastness Dry friction	Score	5	5	5	5

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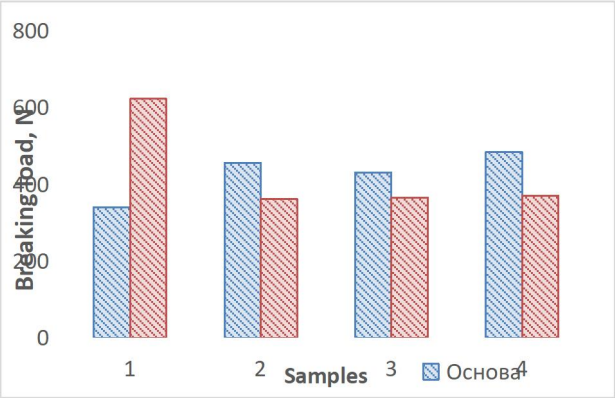

Fig.1 Influence of structural parameters on the breaking load of fabric

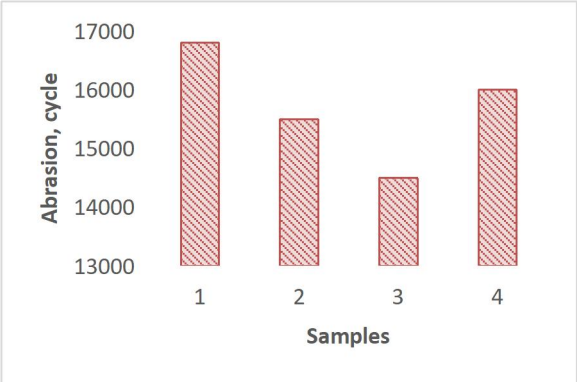

Fig.2 Influence of structural parameters on fabric abrasion

Service life is one of the most important indicators of the quality of bed linen, characterized by such a complex indicator as wear resistance. One of the factors affecting the wear resistance of fabrics is abrasion, that is, the resistance of fabrics to abrasion. The sample withstands the greatest number of cycles by the time of destruction I (16800), which is 7.74% more than sample II , 13.69% more than sample III and 4.76% more than sample IV .

Pilling characterizes the ability of fabrics to form small balls (pillies) on the surface from rolled ends and individual sections of fibers during use or processing . In this case, no pillies were formed in the selected samples of fabrics for bed linen.

Cotton and linen fabrics have the best hygroscopicity. The highest hygroscopicity index is for sample II , which is 9.3 %, which is 3.65% more than for sample I , 1.93% more than for sample III and 0.75% more than for sample IV .

Many people sweat in their sleep , and to prevent this from causing discomfort and to prevent sweat from irritating the skin, you should give preference to such types of fabrics for bed linen that are made of hygroscopic and air-permeable fabrics. Air permeability of fabrics depends on the presence of pores, which are more in thin, low-density and unfinished fabrics , and less in thick, dense, finished fabrics. According to GOST 31307-2005 “Bed linen. General specifications ” this indicator should be at least 100 dm^3 / m^2 * sec . Of the selected samples of fabrics for bed linen, sample III has the highest air permeability indicator, which is 72.6 dm^3 / m^2 * sec , which is 43.7% more than sample I , 45.6% more than sample II and 19.7% more than sample IV.

Electrification – the ability of a material to form and accumulate static electricity. This quality is dangerous to human health. It is believed that negative charges formed due to friction of fabric cause headaches and sleep disorders. Therefore, for fabrics used for bed linen, electrification is a significant characteristic that ensures optimal sleep quality, since the constant impact of electric current on the body has a negative effect on the nervous system, worsens metabolism, and causes a chronic feeling of fatigue. Among the selected fabric samples , sample III as the highest electrification , which is68 V , which is 19.1% more than sample I , 5.8% more than sample II and 11.7% more than sample IV .

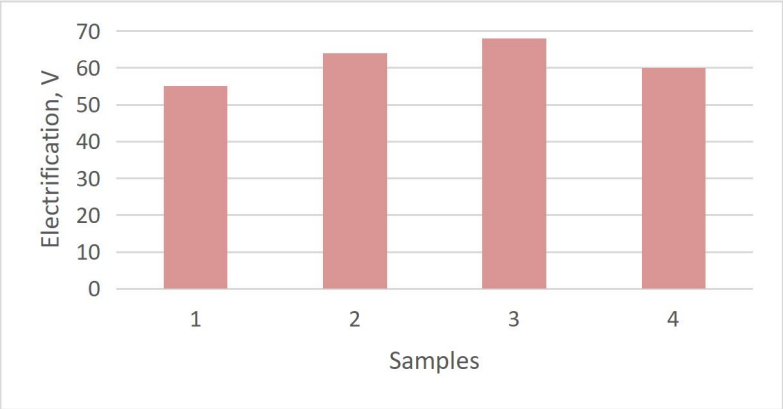

Fig.3 Influence of structural parameters on fabric electrification

Shrinkage is a negative property, that is, a reduction in the size of the fabric when soaked, washed or subjected to wet-heat treatment.

In this work, the greatest shrinkage in the warp is exhibited by fabric sample III , while in the weft, the shrinkage in all selected samples is -1%.

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