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RESEARCH OF PHYSICAL-MECHANICAL PROPERTIES OF COMPRESSION STOCKINGS

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Abstract. *In this article, five variants of high elastic knitted stockings hosiery by using of different kind of yarn in necessary parts of products on the base of fleecy structures were investigated in order to determine the physical and mechanical properties of the samples. The variants differ in the rapports of the structure and feeding of the fleecy yarn.*

Keywords. knitwear, products, structure, rapport, physical and mechanical properties, breaking strength, elongation.

The knitting industry is an important branch of the textile industry. The range of products manufactured in this industry is diverse and includes outerwear, underwear, hosiery products, etc. Knitting products are mainly made according to the kind of product. For example, in the knitting industry, there are many kinds of products, and for warm underwear and outerwear products, the main kinds of fleece, plush-fleece products are used. Compression fleecy knitting product is widely used not only in our country, but also abroad. Therefore, scientific research was conducted to create new kinds of compression foot product. Physical-mechanical properties compression stockings samples of the new structure have been investigated and were determined in the CentexUz test laboratory at TITLI according to the standard method, and the obtained results are presented in Table 1.

Table 1 – Physical-mechanical properties of compression fleecy knitting product

Parameters		Variants				
		I	II	III	IV	V
1		2	3	4	5	6
Air permeability *B*, $sm^3/sm^2 * sek$		29,52	28,12	42,69	42,69	48,26
Abrasion resistance *И*, thousand/cycle		More than 30	More than 30	26,5	More than 30	28
Breaking strength *P*, H	By length	355	325	268	321	272
	By width	394	394	320	380	387

End table 1

1	2	3	4	5	6	7
Breaking elongation *L*, %	By length	152	262	150	160	170
	By width	304	106	357	340	330
Tensile in 6 *N*, 1 %	By length	10,04	6,98	12	12,61	13,35
	By width	24,49	17,14	28,16	26,94	25,96
Elastic deformation, ε_O, %	By length	90	95	92	91	92
	By width	96	98	98	99	99
Plastic deformation, ε_H, %	By length	10	5	8	9	8
	By width	4	2	2	1	1
Shrinkage *У*, %	By length	11	8	17	15	10
	By width	1	5	10	9	5

Air permeability is of great importance for knitting products when evaluating clothes from a hygienic point of view, because the air permeability ensures air exchange from the bottom of the garment, and the heat retention property of the product also depends on it [1–5].

Air permeability refers to how well the product allows air to pass through. The coefficient of air permeability shows how much air can pass through 1 cm^2 of product in 1 minute under a specified pressure. The air permeability coefficient of the knitting product intended for outer products depends on the thickness of the knitting product, texture and density and is measured in cm^3 /(cm^2 •sec).

For all kinds of yarn on woolen products 5,0–40,0
For coat 20,0–60,0
For product woven on a flat fang machine 40,0–90,0
For product on a circular needle machine 40,0–110,0

The porosity of the knitting product, the number and value of the holes, as well as the thickness of the knitting product are of great importance for the air permeability of the textile product.

The greater the porosity of the product, the lighter its weight and the higher the air permeability. High air permeability depends not only on the number of pores, but also on their shape and size. The smaller the pores, the greater the friction resistance and the lower the air permeability.

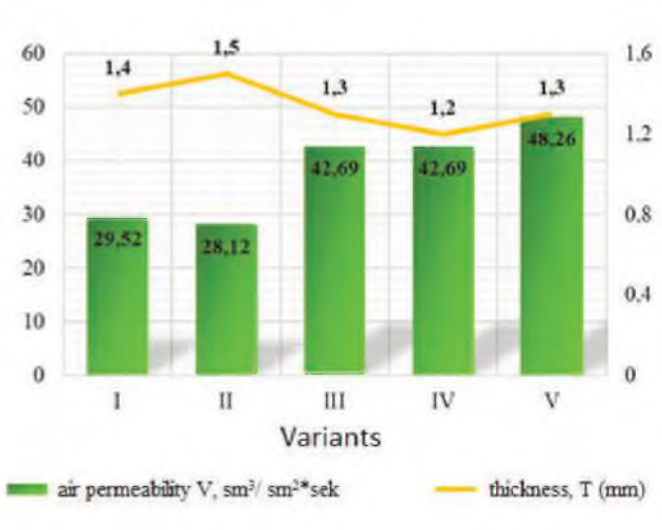

Figure 1 – Histogram of the relationship between the air permeability and the thickness of the compression fleecy knitting product

The air permeability of knitting product samples was determined experimentally on the "AR-360 SM" machine in the unit cm^3 / cm^2 s at 20°C 1 atm. A diagram of the relationship between air permeability and the thickness of the knitting product is presented in figure1.

The air permeability of the obtained compression fleecy knitting product samples varied from 28.12 to 48.26 cm^3/(cm^2 •sec) and the change was 41.7% (Table 1, Figure 1). Compared to the base fabric, variant II has a minimum air permeability of 28.12 cm^3/ (cm^2 •sec), which is 5 % less than the base fabric (variant I). The highest air permeability of 48.26 cm^3/ (cm^2•sec) was observed in variant *V*, which is 38.8 % more than the base fabric (variant I).

The parameter of abrasion resistance of knitting products varies in a significantly large range from 20 to 500 thousand at the limits of the tool circle that determines the abrasion resistance. In terms of quality evaluation, the abrasion resistance of the knitting product is measured by the number of rotations on the loom until the product of the sample is worn. The results of the analysis show that the abrasion resistance of compression fleecy knitting product is 26.5 thousand/cycle from 30 thousand/cycle changed from to a higher parameter. This, in turn, means that the compression fleecy knitting product has a high level of resistance to friction.

The extensibility parameter (in percent) of the compression fleecy knitting product is characterized by its elongation under the influence of a tensile constant tension of 600gs (6N). The size of the seam allowance is set according to the elasticity parameters, the product laying mode is determined during the cutting process, the machines are selected in order to prevent the deformation and stretching of the seams that occur during sewing and wet-heating processing.

According to the experimental results, it was clear that the product has the least elasticity in both length and width when two layers of spun cotton yarn are used in the composition of the compression fleecy knitting product, and when a force of 6N is applied (Table 1).

Stretchability is characteristic of knitting products, and the amount of elastic deformation is understood, that is, the stretchability of knitting products ensures the comfort of knitting products, and the percentage of elastic deformation indicates that knitting products have the property of returning to their initial state during use.

Compression fleecy knitting products are subjected to a load for a short period of time during knitting, inspection of defects, heat-moisture treatment, shealoop, as well as use of products obtained from them, during the wealoop process, and then rest. As a result, bending, stretching, etc. in compression fleecy knitting products. deformations appear. The deformation of the compression fleecy knitting changes with changes in the yarn thickness, singleness, and number of loops.

Based on the above, using the formula the elastic deformation percentage of the researched compression fleecy knitting samples was determined.

Parameters of the percentage of elastic deformation represent the properties of flexibility and shape retention of knitting products. The higher the elastic deformation rate of knitting products, the better the shape retention properties of the product made from it.

The above-mentioned parameters of the recovery deformation rate indicate that the investigated compression fleecy knitting product samples immediately return to their original size after stretching.

Determining the quality of the product during the period of use varies depending on the level of demand. Therefore, the quality value for one or another kind of product, especially for multi-purpose products, is not constant. For example, light coveloops and special clothes are made from linen woven fabric, but their quality parameters are different.

Value of the quality of textile materials and other kinds of products is based on the results of determination and measurement of its quality parameters, as well as the value of comparison with standards and regulatory documents. Because the methods of determining product properties are mainly detailed in standards and other regulatory documents.

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