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ANALYSIS OF MECHANICAL PROPERTIES OF HIGH ELASTIC KNITTED FABRICS FOR SPORTSWEAR DESIGN

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Abstract: The article considers the most important factors in the analysis of modern assortments of materials with compression properties. For the design of compression sports garments, fabric samples were selected, their mechanical properties were analyzed, and experimental test results were conducted using standard methods. To evaluate the compressive strength of fabrics, it was tested on the YG026T equipment. The YG026A-III brand equipment was used to determine the deformation characteristics. The elasticity of the experimental samples was studied and the elongation diagram of the results of the evaluation of the one-cycle deformation characteristics is presented.

Keywords: elastic fabrics, compression sportswear, compressive strength, compression pressure, deformation.

Introduction. Body-tight clothes help to restore body muscles after sports training and achieve high results in sports. The use of sportswear is evident in sports focused on strength and power. [1]

To achieve and maintain optimal athletic form, athletes often use a variety of strategies to aid in recovery and performance. In recent years, compression sports clothes that cover the whole body are used during popular trainings or competitions in various sports. These sports products are proposed to improve sports performance and recovery after high-intensity physical activity. Some of these types of products also benefit from the use of compression stockings to increase venous blood flow and reduce swelling in patients with post-surgery or vascular disease. Athletes involved in high-intensity, continuous running sports, as well as high-impact contact sports (including rugby), to improve training performance and between training sessions compression sports clothes are used as a method of restoring strength. [2]

Active participation in sports is an important part of a healthy lifestyle. Various injuries of the musculoskeletal system (muscles, joints, tendons, muscles) are possible during physical exertion. Therefore, all kinds of protective equipment are widely used to protect the human musculoskeletal system from overload during sports, excessive tension and sudden movements. According to sports medicine, the main types of sports injuries are bruises, ligament injuries, muscle and tendon sprains and strains, more severe injuries, joint dislocations and bone fractures [3].

In turn, it is very important to choose elastic materials suitable for the type of sport when designing such sports clothes. It is necessary to take into account a number of characteristics of elastic materials.

Clothing materials can be identified and classified based on information about the elastic properties of materials, and information about the deformation properties of the material is required to calculate it in a specific situation. It is important for body compression garments to maintain their dimensions and properties over the life of their use due to the elastic stretch of the material. Therefore, in addition to testing materials in accordance with the established standards, scientific studies should be carried out to ensure the stability of the elastic properties of the materials, and to maintain the shape of the clothes during their use. [4]

Methods. Among the parameters of the elastic-elastic property of stretching in textile materials, the most important for a clothing project are:

1. Elongation, which is defined as the relative change in the length of the sample under the influence of a given load.

2. Elasticity is equal to the ratio of the shares of total deformation, expressed as a percentage. During fast, high-amplitude movements in active sports, the dimensions of the material must recover at the same rate to maintain contact with the body surface.

3. Deformation, which determines the relative increase in the size of the material after the removal of the load.

In the design of body compression products, materials should be selected, ordered and used taking into account the deformation characteristics of the material used.

The Namangan Institute of Textile Industry has sufficient laboratory equipment for studying the physical and mechanical properties of highly elastic knitted materials in the educational-scientific laboratory under the Department of "Construction and Technology of Light Industrial Products" and "Knitting Technology".

Results. Thus, the selected materials for the study of the fiber content, surface density and structure of knitted fabrics were selected. In order to determine the deformation characteristics of elastic materials, research was conducted on 10 types of material samples. The characteristics of the analyzed fabrics are presented in Table 1.

YG026A-III equipment was used to evaluate the deformation properties of fabrics (Fig. 1).

Figure 1. YG026A-III equipment.

Table 1.

№	Samples	Appearance of the fabric	Fiber content of fabrics (%)	Surface density, g/m2	A group of items
1	Sample 1		Cotton-95, PU-5	201,5	*t-shirt and underwear*
2	Sample 2		Cotton-92, PU-8	203,1	*t-shirt and underwear*
3	Sample 3		Cotton-95, PU-5	232,2	*t-shirt and underwear*
4	Sample 4		Cotton-97, PU-3	179,9	*t-shirt and underwear*
5	Sample 5		Cotton-90, PU-10	227,7	*t-shirt and underwear*
6	Sample 6		Cotton-95, PU-5	185,3	*sports underwear*
7	Sample 7		Viscose-90, PU-10	216,5	*t-shirt and underwear*
8	Sample 8		Cotton-95, PU-5	433,3	sports suit
9	Sample 9		Cotton-92, PU-8	192,9	*sports underwear*
10	Sample 10		Cotton-95, PU-5	181,1	*sports underwear*

Note: Abbreviations used in the table: PL-polyester fiber, PU-polyurethane fiber.

Discussions. The tensile strength of the experimental samples was measured on the YG026T device. Table 2 shows the results of the evaluation of the tensile strength of the samples. When determining the deformation characteristics of knitted fabrics in terms of width and length, 5% of the breaking force was carried out under the influence of force.

Table 2

Sample number	Breaking strength		Elongation in interruption	
	By length (N)	By Width (N)	By length (%)	By Width (%)
Sample 1	332,2	315,2	216,8	265.1
Sample 2	176,8	75,8	67.66	261.74
Sample 3	331,8	174,8	116.8	326.44
Sample 4	247,8	253,8	133.44	225.4
Sample 5	200	275,4	242.12	144.54
Sample 6	432,2	224,2	143.66	323.04
Sample 7	125,2	114	152.12	195.14
Sample 8	206,4	661,2	125.96	84.7
Sample 9	238	215	149.36	276.32
Sample 10	365,8	207	117.78	312.2

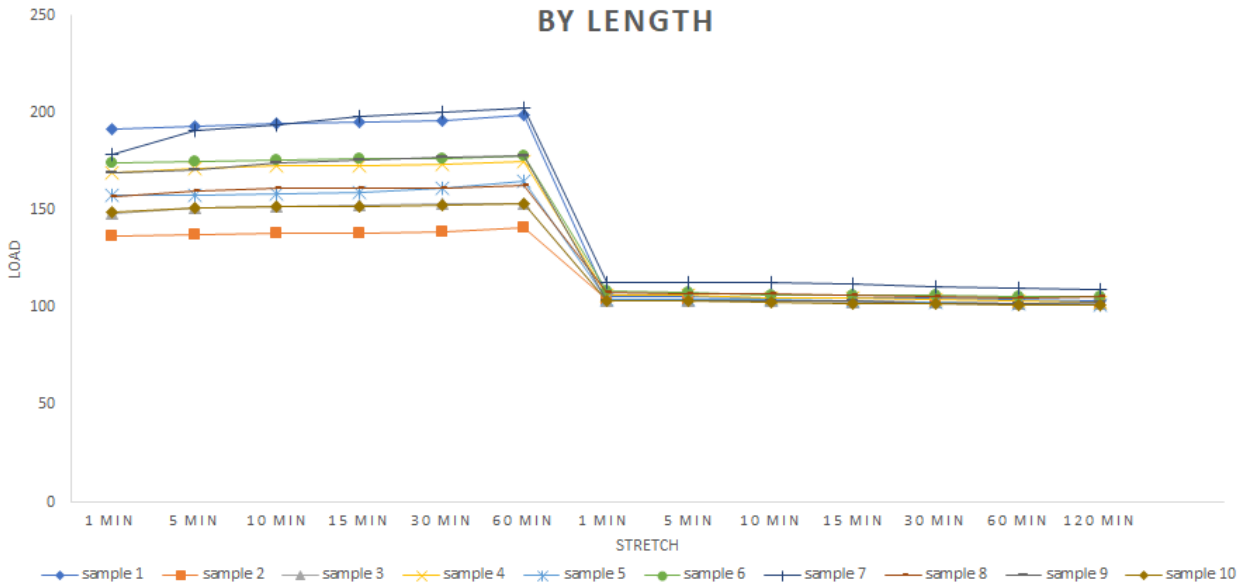

Figure 2. Chart of elongation by length of various woven knitted fabrics.

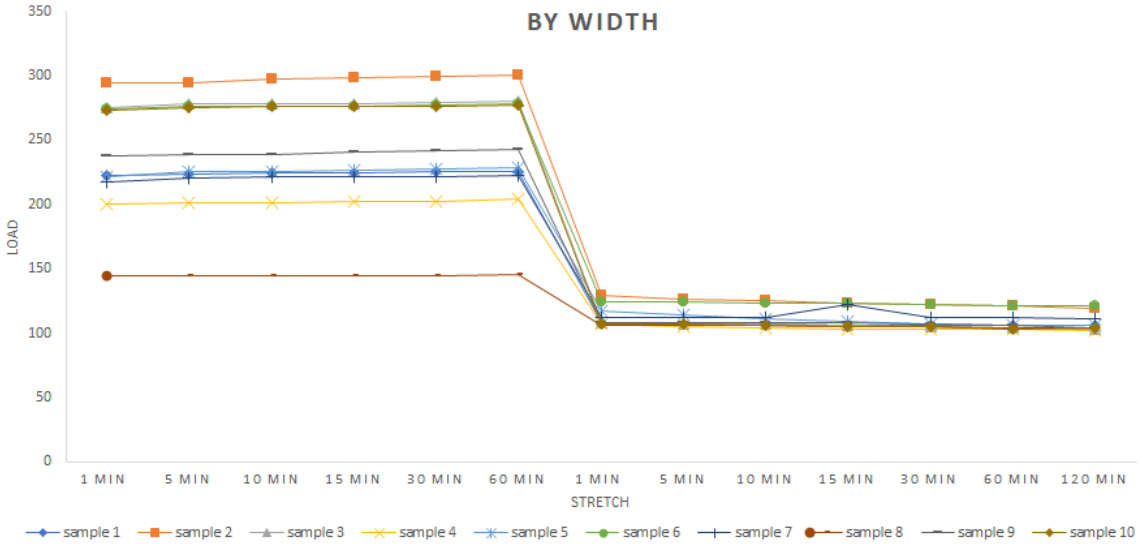

Figure 3. A diagram of the widthwise elongation of various woven knitted fabrics.

Conclusions. The results of the work show that the deformation characteristics of the glad woven material with a fiber content of 95% cotton and 5% polyurethane and a surface density of 181.1 g/m2 using the existing stock of knitting equipment are at the required level. Compression sportswear with good functional parameters can be obtained from this material. In order to increase consumer demand, it is necessary to carry out a wider survey of users and make extensive use of linear density raw materials. The technology used is universal and allows, firstly, the production of a number of compression products, and secondly, this range is in great demand and can compete with imported analogues of seamless new products.

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CONTENTS