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COMPREHENSIVE ASSESSMENT OF THE QUALITY OF DERIVATIVE INTERLOCK KNITWEAR

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Abstract
In order to study the influence of structure on the quality characteristics of two-layer knitwear and to maximize the use of technological capabilities of flat knitting machines, structures and methods for obtaining new variants of derivative interlock knitwear have been developed. It has been established that the lowest material consumption and the best quality indicators of the produced knitted fabrics of derivative interlock weave are possessed by the IV-variant.

Keywords: Knitted fabric, derivative interlock, tensile strength, elongation at break, abrasion resistance, breathability.

Introduction

World experience shows that in the presence of favorable conditions, the development of the textile industry can be explosive. At the same time, due to the deep processing of raw materials, there is a significant increase in added value, which allows increasing the incomes of the population, enterprises and the state, as well as ensuring high export growth rates and reducing imports (finished garments). It is no coincidence that the government of the country has set the task to ensure in the near future that the processing of cotton fiber reaches 50% of its production volume. The state is pursuing an active policy aimed at the development of the industry. However, a number of serious problems continue to exist in the industry, related both to the insufficient depth of processing of cotton fiber and to the low competitiveness of products of the final stages of production - fabrics and garments. Cotton fiber and yarn continue to be the main export items, which means the supply of low-value-added products to foreign markets [1]. Knitwear is often used to make coats. This is a great alternative to the usual materials, which allows you to experiment with shape and design. Overcoat knitwear is used to make products for any time of the year. Depending on the density of the fabric, such coats can be worn both in

summer and winter. The fabrics of the knitted weave derivative have a number of characteristic features: wear resistance, long service life, the ability to stretch and return to their original shape [2].

Canvases made using a derivative weave have a number of positive characteristics. The main ones are: fabrics with a derivative weave do not twist at the edges, the canvases are characterized by good resistance, due to the special structure of the weave, the materials are not inclined to dissolve, the derivative weave is endowed with good tear resistance [3].

In this regard, research works devoted to the development of new structures and methods for obtaining a derivative of interlock knitwear with improved technological, physico-mechanical and consumer properties using natural silk and cotton yarn are an urgent problem of the knitting industry.

In order to study the influence of the knitwear structure on the technological parameters and physico-mechanical properties of the interlock knitwear derivative and expand the range of knitted fabrics, as well as maximize the technological capabilities of flat knitting machines, structures and methods for obtaining 4 variants of the interlock knitwear derivative have been developed.

Samples of the interlock knitwear derivative were developed on a two-contour flat-panel machine from Stoll CMS 502 HP plus (Germany) and, which differed from each other in the structure of the weave. Polyacrylonitrile yarn with a linear density of 28 tex x 2 was used as a raw material.

Among the indicators characterizing the physical and mechanical properties of knitted fabrics, the following are accepted: strength and elongation at break, extensibility under loads less than tensile, resistance to single and multiple sprains, resistance to crumpling and abrasion, shrinkage during wet-heat treatment, and others [4-6].

The physico-mechanical properties of new variants of the interlock knitwear derivative were determined according to the standard procedure [7-9] in the CentexUz laboratory at TITLI, the results obtained are shown in the table. 1.

Table 1. Physico-mechanical properties of the interlock knitwear derivative

Indicators		Variants			
		I	II	III	IV
Yarn composition		Acrylic 28*2 tex	Acrylic 28*2 tex	Acrylic 28*2 tex	Acrylic 28*2 tex
Thermal conductivity R, %		49	48	41	31
Thickness T, mm		1,65	1,85	1,9	2,15
Volumetric density δ, mg/sm^3		580,2	548,8	540,7	509
Breathability B, sm^3/sm^2•sek		79,5	65,4	65,1	61,9
Abrasion resistance И, thousand turns		37	38	39	45
Breaking load P, N	by length	690	610	650	755
	by width	590	630	602	830
Breaking elongation L, %	by length	22	23	22	20
	by width	54	60	62	66
Irreversible deformation Ен, %	by length	16	20	10	12,5
	by width	15	16,7	13	8,8
Reversible deformation Eo, %	by length	84	80	90	87,5
	by width	85	83,3	87	91,2
Shrinkage У, %	by length	0	0	0	-1
	by width	-1	-1	-2	-1

The analysis of the research results shows that changes in the structure of the derivative interlock knitwear contribute to a decrease in volume density, an increase in the strength of the knitwear in length and width, a decrease in the stretchability and shrinkage of the knitwear, as a result of which the shape stability improves, which positively affects the consumer properties of the developed samples of the derivative interlock knitwear.

To identify the best options for a derivative of interlock knitwear having different weave structures, it is necessary to take into account a large number of factors that form the structure and properties of the canvases. To compare the quality of knitted fabrics, a comprehensive assessment was carried out, which is a graphical representation of the results of the analysis of the quality of knitted fabrics.

Therefore, to process the test results obtained, a method was chosen for constructing a complex diagram and histogram for evaluating the quality indicators [10-12] of the interlock knitwear derivative (Fig. 1, 2).

The complex diagram is constructed in such a way that the results of the qualitative indicators of knitted fabrics are presented on each of the axes. Moreover, to ensure the specificity of each of the analyzed indicators, its best indicators are applied to the outer contour: the highest for positive indicators and the lowest for negative indicators. [13]

Therefore, the most economical technology that allows you to produce high-quality products will have the maximum area. The areas of polygons are calculated as the sum of the areas of triangles into which the radius vectors divide the polygon. The area of each triangle is determined by the formula:

$$S = \frac{1}{2} \cdot a \cdot b \cdot \sin \alpha \quad (1)$$

where a, b are the radius vectors forming a triangle, α is the angle between the radius vectors.

To determine the optimal variants of the developed samples of double-layer knitwear according to its technological parameters and physical properties, a complex diagram of the quality of knitted fabrics was constructed (Fig. 1).

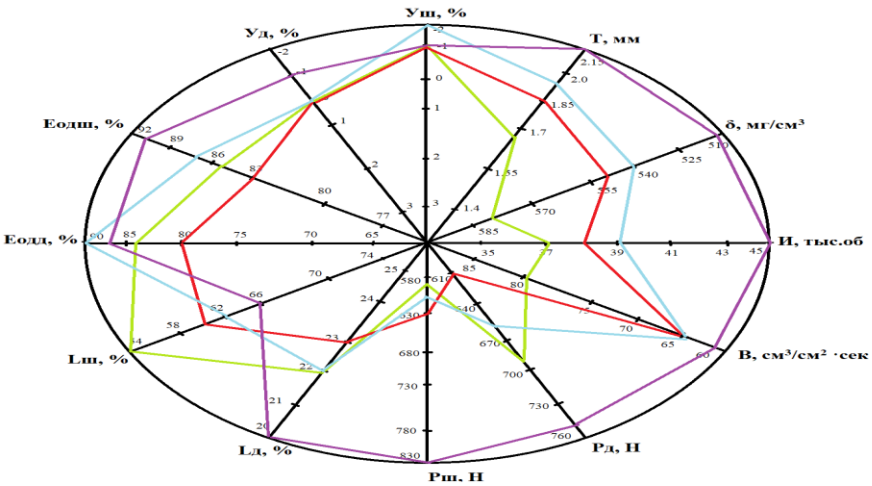

Fig. 1. Complex diagram of the quality of the derivative interlock knitwear

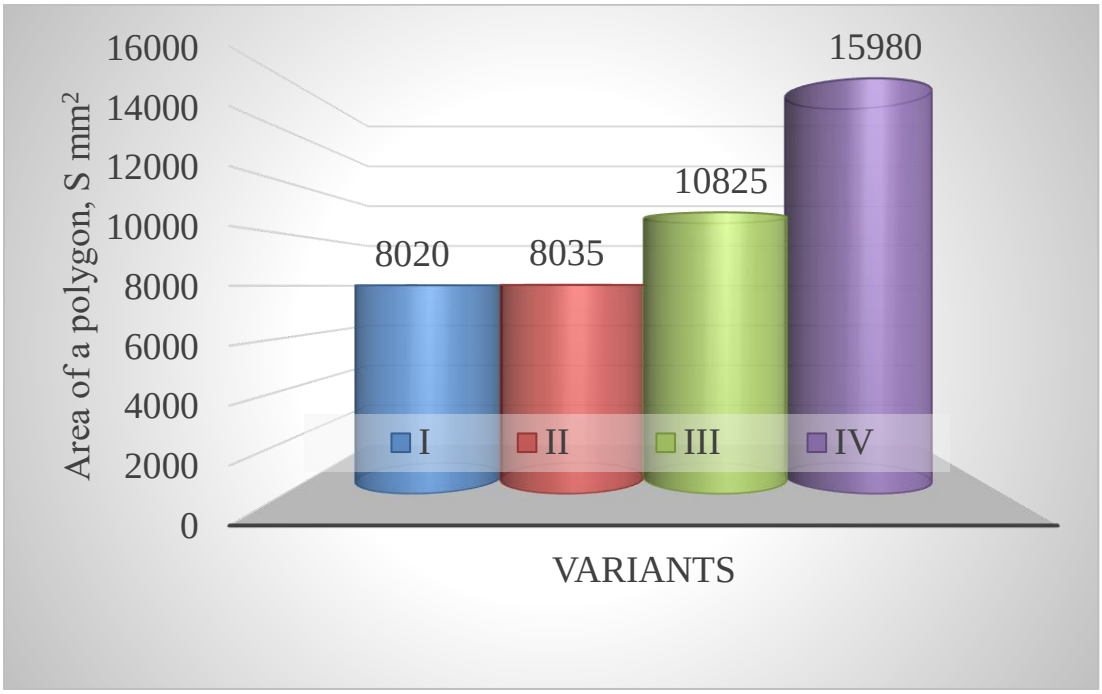

Fig. 2. Histograms of evaluation of qualitative indicators of the derivative interlock knitwear

The resulting histogram shows that the IV variant has the lowest material consumption and the best quality indicators of the produced knitted fabrics of the interlock weave derivative (Fig. 2). When analyzing the results obtained by constructing a complex diagram of qualitative characteristics and comparative histograms, it can be seen that the IV variant of polyacrylonitrile yarn with a linear density of 28 tex x 2, which corresponds to the results of the comparative histogram shown in Fig.2 (17,982 mm2) is the best option with the best quality indicators.

It is advisable to use it for children's and adult knitwear products, since knitwear with such a composition of raw materials has high shape stability, efficiency, and thermal protection properties.

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