NOVATEUR PUBLICATIONS
JournalNX- A Multidisciplinary Peer Reviewed Journal
ISSN No: 2581 - 4230
VOLUME 7, ISSUE 2, Feb. -2021

ANALYSIS OF PHYSICAL-MECHANICAL PERFORMANCE OF HIGH- KNITTED PATTERN FABRICS FOR SHAPE STORAGE

RAHMATOVA SADOKAT UMARJONOVNA
Researcher, Namangan Institute of engineering and technology
E-mail: sadoqat.ziynat@gmail.com, Phone: +998949055228

KHOLIKOV KURBONALI MADAMINOVICH
Professor. Namangan Institute of engineering and technology
E-mail: qurbonalixoliqov@gmail.com, Phone: +998944620173

ABSTRACT:

In the article results of analyses of physical-mechanical parameters of the - types knitted fabrics, worked out with purpose effective using of locals raw materials and produced from

KEYWORDS: knitwear, polyacrylonitrile knitted yarn. physical-mechanical parameters.

INTRODUCTION:

The shape retention feature allows the production of new structures of high-quality knitted fabrics to solve a number of pressing issues facing the knitting industry of the Republic.

In order to solve a number of the above-mentioned problems, 3 samples of knitted knitted fabric structures were produced on a flat needle 12-class LONG-XING SM 252 knitting machine.

The shape retention feature consists of high-knit knitted fabric rapporti glad and press rows. Knitted knitted fabrics differ from each other by changing the type of raw material and the sequence of fabric reports. Patterns of knitted knitwear were obtained using a polyacryl nitrile yarn with a linear density of 35 tex x 2.

Among the indicators characterizing the physical and mechanical properties of knitted fabrics are the following: strength and elongation at break, elongation under stress less than tensile strength, resistance to single and repeated elongation, resistance to shrinkage and abrasion, resistance to heat and wet processing [1].

In order to study the effect of polyacrylonitrol and polyester yarns on the physical and mechanical properties of woven knitted fabrics, the physical and mechanical properties of 3 variants of samples of knitted knitted fabrics were determined experimentally on modern equipment installed in the test laboratory NIET and the results are given in Table 1. [2].

Air permeability is the permeability of the materials themselves. Air permeability is characterized by a coefficient indicating the amount of air passing through 1 sm^2 of fabric in 1 second at a given pressure difference on both sides of the material.

Table 1Physical and mechanical characteristics of high viscosity knitted fabric with shape retention function

Indicators		Options		
		I	II	III
Yarn type, linear densities and % of fabric	Back layer	PAN 35 tex x2	PAN 35 tex x2	PAN 35 tex x2
	Front layer	PAN 35tex x2	PAN 35tex x2	PAN 35tex x2
Knitted surface density Ms (g / m^2)		436	425	402
Knitting thickness T (mm)		2.6	2.4	2.8
Dimensional density δ (mg/sm3)		168	161	144
Air permeability B (sm^3/sm^2-sek)		31.2	35.1	41.01
Breaking force P (H)	In height	308	219	377
	In width	178	160	172
Stretching to break L (%)	In height	12.6	24.35	24.8
	In width	43.5	41.2	38.8
Irreversible deformation ε_n (%)	In height	7	5.8	15
	In width	10	7.1	16
Back deformation ε_e (%)	In height	93	94.2	85
	In width	90	92.8	84
Fabric shrinkage K (%)	In height	4	2	1
	In width	6	4	3
Friction resistance H		59.4	57.3	60.1

Air permeability coefficient B (sм^3/sм^2·sek) determined by the following formula.

$$B=V/(S\cdot^*\cdot T),\ sm^3/sm^2\cdot sek \quad (1)$$

Here : V - the amount of air passing through the fabric at a given pressure difference ΔP, sm^3;

S - fabric area, sm^2;

T` - the time of passage of air through the fabric, sek.

Air permeability properties of woven knitted fabrics will be changing from 31.2 up to 41.02 sm^3/sm^2·sek

The lowest air permeability was observed in variant I of the knitted fabric, and its volume was 31.2 sm^3/sm^2·sek. The highest air permeability was observed in variant III of the knitted fabric samples and its volume was 41.01 sm^3/sm^2·sek, which is 31% more than in the fabric (version I) (Table 1, Fig. 1).The highest air permeability was observed in verosions III of the knitted fabric samples and its volume was 41.01 sm^3/sm^2·sek, which is 31% more than in the fabric (version I) (Table 1, Fig. 1).

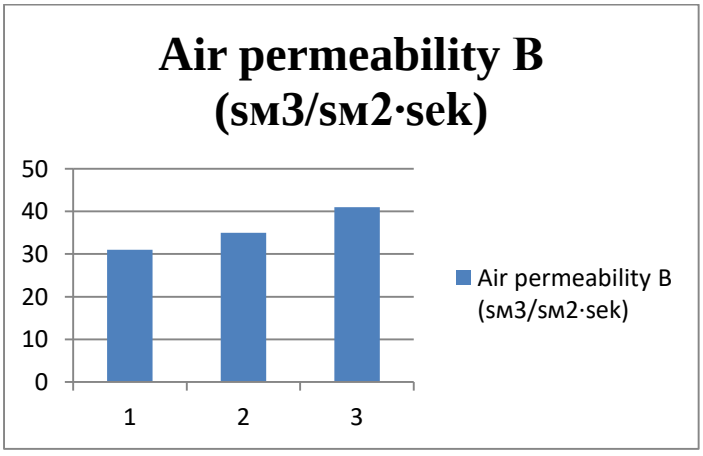

Figure 1. The shape retention feature is an air permeability histogram of high-knit knitted fabric

The description of the cut is an acceptable key indicator for assessing the quality of knitted fabrics. All GOST and TSH applicable to knitted fabrics include normative indicators on elongation n and tensile strength. Tensile strength is the force required to break a specimen at a given size and speed. The breaking force is expressed in Newtonian units. The breaking strength of the submitted samples was determined using the standard method using a dynamometer YG-026T.

The strength of the fabric, that is, the analysis of tensile strength, shows that the most mature tissue in variant III in height with an index of 377 N, as it was found, had a viscosity 22% higher than in variant I (table 1, fig. 2). Fabric width maturity was also observed in variant I, which had a tensile strength of 178 N, which is 3% higher than variant III.

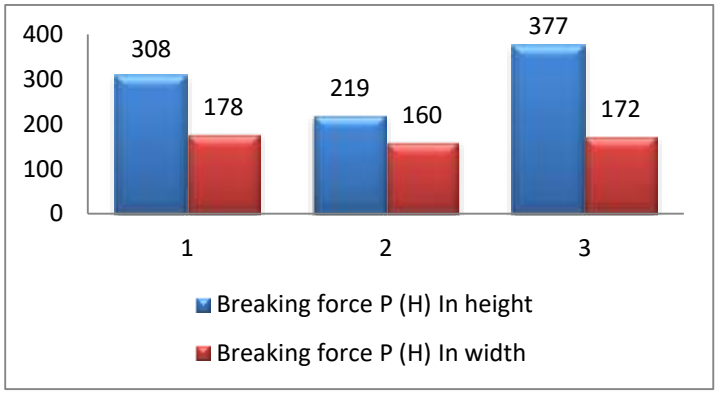

Figure 2. Bar graph of the change in tensile strength of high-form knitted fabric

Elongation of a knitted fabric is understood to mean its elongation under the action of an applied force. Elongation is characterized by the elongation of the test specimen. Elongation is expressed in absolute or relative units. When knitted fabrics with a length of 100 mm clamped to the tool are tested, their absolute and relative sizes are the same. The elongation of the length of knitted fabrics is from 12.6% to 24.8%. The greatest elongation was observed in variant III of knitted fabric and amounted to 24.8% (Table 1). The knitted fabric was 97% longer than option III (option I).

The elongation of the knitted fabric in variant I was the lowest - 12.6%. The width of the knitted fabric varied from 43.5% to 38.8%. Option I of knitwear had the greatest width, accounting for 43.5%. The most stable width was observed in the third version of knitwear, which accounted for 38.8%. Elongation of the width of option III of the knitted fabric is 12%

less than that of the main fabric (option I), option II of the knitted fabric is closer to the width of option III - 41.2%. In conclusion, the length and width of the knitted fabric depends on the structure of the knitted fabric and the type of yarn in it. When developing products, it is important to know the elastic properties of knitted fabrics. [3].The total deformation ε consists of the following parts: the elastic part ε returns at a high speed after removing the loads from the test specimens; elastic deformation ε_e develops at a low rate associated with the relaxation process; plastic deformation does not return after removing loads from the samples.

$$\varepsilon = \varepsilon_K + \varepsilon_Э + \varepsilon_n, \%$$

(2)

The deformation of the knitted fabric varies with the elasticity of the yarn, the stiffness and the number of loops. Not only the description of the deformation, but also the state of the knitwear is determined by two main internal forces: the elastic force of the thread bending towards the loop tends to straighten and change the shape of the thread.

As a result, a frictional force arises between the threads, which prevents the threads from spreading in the loop and prevents the formation of knitted fabric. [4,5]. In samples of knitted fabric with a high pattern, the rate of reverse deformation varies from 85% to 94.2%, and the rate of reverse deformation - from 84% to 92.8% (Table 1, Figure 3).

Such indicators of the degree of repeated deformation indicate that the patterned knitted fabric, after stretching, quickly returns to its original state.

In the process of wet processing of knitted fabric (washing, ironing), a decrease in size is called shrinkage, and an increase is called shrinkage. Knitted fabrics have a significantly higher elasticity than textile ones, and even when exposed to light loads, they have high elasticity. The principle of operation of machines for knitting knitted fabrics is practically no different from machines for finishing textile fabrics.

It was noted that one of the main reasons for the high level of penetration is excessive deformation of the knitted fabric during finishing operations. [6,7,8]

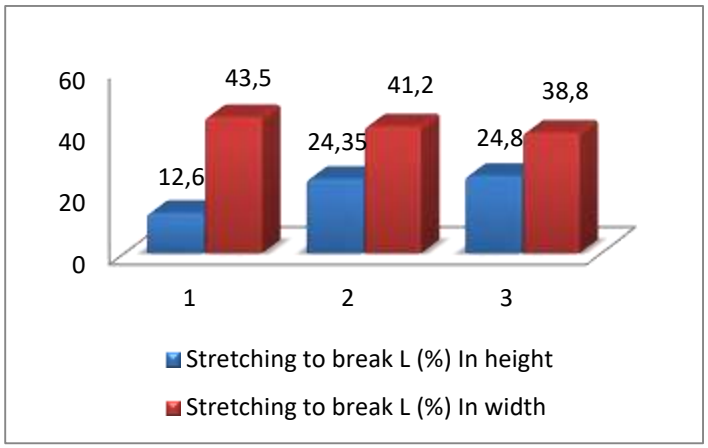

Figure 3. Deformation histogram of high-patterned knitted fabrics with shape-retaining properties

The less knitwear is involved in the processing of knitted fabrics, the higher its shape-retaining properties. Studies have been conducted to study the content of polyacrylonitrol and polyester yarns in knitted fabrics and their effect on the properties of the fabric. The results of the study of the process of introduction of knitted fabric samples showed that the penetration of the length changed from 4% to 1%, and the width from 6% to 3% (Table 1, Figure 4).

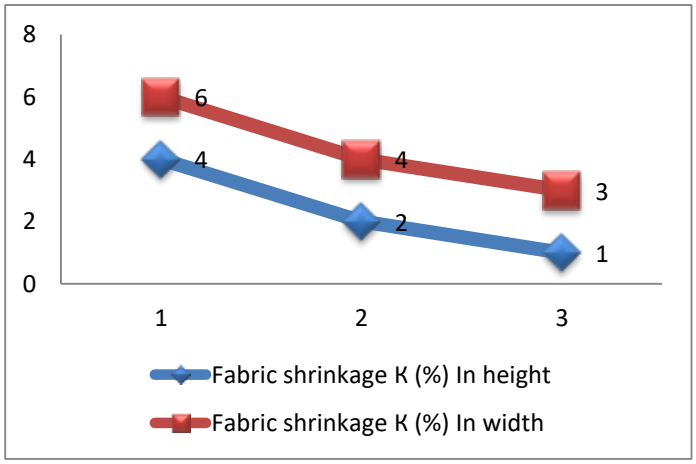

Figure 4. Introduction to knitted fabrics histogram

In the process of using knitted products, the fabrics break down when they come in contact with the surrounding objects, and as a result, some parts of the product become unusable.

These are the I and III options that have the highest resilience to the fabric of the knitted knitted fabrics. The friction resistance of Option I is 59.4 thousand months. The friction resistance of Option III is 60.1 thousand months. The resistance to friction of Option III was found to be 1.1% higher than that of Option II (Table 1).

The analysis of the physical and mechanical properties of the above-mentioned knitted fabrics shows that changes in the structure of the fabric, the properties of the knitted fabric's air permeability, toughness, elongation and abrasion resistance to abrasion.

Knitted fabrics are made of polyacrylonitrile, which allows you to get knitted products with high hygienic and shape-retaining properties, maturity and good appearance.

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