RESEARCH PARKS

INTERNATIONAL JOURNAL ON HUMAN COMPUTING STUDIES

www.journalsresearchparks.org/index.php/IJHCS e-ISSN: 2615-8159|p-ISSN: 2615-1898

Volume: 03 Issue: 1 January-February 2021

Physical-mechanical analysis of performance pattern knitted fabrics

Shogofurov Shaxboz Shokirjon ugli

Researcher, *Namangan Institute of engineering and technology*

E-mail: shogofurov@mail.ru

Rahmatova Sadokat Umarjonovna

Researcher, *Namangan Institute of engineering and technology*

E-mail: sadoqat.ziynat@gmail.com

Uralov Lazizbek Saidnazar ugli

Researcher,*Namangan Institute of engineering and technology*

E-mail: lazizbekoralov012@gmail.com

Kholikov Kurbonali Madaminovich

Professor. *Namangan Institute of engineering and technology*

E-mail: qurbonalixoliqov@gmail.com

---***---

Abstract: *In the article presents the results of the analysis of physical and mechanical properties of 3 variants of pattern knitted fabric. The samples were developed on a 12-class LONG-XING LXA 252 knitting machine with a flat needle with modern high capacity. Physical and mechanical properties of the obtained samples were determined experimentally on modern equipment installed in the testing laboratory of the Namangan Institute of Engineering Technology.*

Key words: *knitwear, polyacrylonitrile, air permeability, deformation, tensile strength, glad, press, tire, pattern, experiment, density*

1. Introduction

At present, the development of knitwear production is planned at a rapid pace. The knitwear industry is one of the most promising sectors of the textile industry due to the fact that the products have a number of advantages and high efficiency of production technology. In terms of growth rates, the knitwear industry is much more advanced than the textile, clothing and footwear industries.

Reducing the consumption of raw materials for the product is one of the important tasks facing the industry and research organizations. At the current stage of development of the production of knitted goods, the creation of technological developments in the field of efficient use of raw materials is urgent.

The production of new structures of knitted fabrics will allow solving a number of pressing issues facing the knitting industry of the Republic.

2. Main part

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

The report of knitted knitted fabric consists of rows of glad, press and tire. Knitted knitted fabrics differ from each other by changing the structure of the fabric and the sequence of fabric reports.

Patterns of knitted knitted fabrics were obtained using polyacrylonitrile yarn with a linear density of 35x2 tex.

Among the indicators characterizing the physico-mechanical properties of knitted fabrics

INTERNATIONAL JOURNAL ON HUMAN COMPUTING STUDIES
www.journalsresearchparks.org/index.php/IJHCS e-ISSN: 2615-8159|p-ISSN: 2615-1898
Volume: 03 Issue: 1 January-February 2021

are the following: strength and elongation at elongation, elongation under stress under tensile strength, resistance to single and repeated elongation, resistance to shrinkage and abrasion, resistance to heat and wet processing.

In order to study the effect of polyacrylonitrile yarn on the physical and mechanical properties of the fabric, the physical and mechanical properties of 3 variants of gladdle knitted fabric samples were determined experimentally on modern equipment installed in the testing laboratory of the Namangan Institute of Engineering Technology and shown on Table 1. Air permeability is the permeability of the materials themselves. Air permeability is characterized by a coefficient indicating the amount of air passing through 1 cm^2 of fabric in 1 second at a given pressure difference on both sides of the material.

Table 1

Physical and mechanical properties of knitted fabrics

INDICATORS		Versions		
		Sample 1	Sample 2	Sample 3
Type of threads, linear densities	back	PAN 35tex x2	PAN 35tex x2	PAN 35tex x2
	front	PAN 35tex x2	PAN 35tex x2	PAN 35tex x2
Surface density Ms (gr / m^2)		425	436	402
Fabric thickness T (mm)		2,4	2,6	2,8
Dimensional density δ (mg/$sм^3$)		177	167	144
Air permeability B($sм^3$/$sм^2$·sek)		43,5	40,4	41,8
Breaking force P (N)	In height	544	543	425
	In width	233	181	169
Stretching to break L (%)	In height	56.8	29.15	39.8
	In width	63.7	49.4	27.6
Irreversible deformation $\varepsilon_н$(%)	In height	13.7	12.5	9.9
	In width	17.8	16.8	14.9
Back deformation ε_o(%)	In height	86.3	87.5	90.1
	In width	82.8	83.2	85.1
shrinking K (%)	In height	2	3	4
	In width	5	6	5
Friction resistance I (thousandth circle)		38.3	41.1	37.8

The air permeability of woven knitted fabrics was tested on equipment YG461E based on GB / 5453 (ISO 9237) standard. According to GB / 5453 (ISO 9237), the pressure for ready-made garments was tested under normal conditions with a pressure of 100 Pa and a range of Ø 8.0 mm.

The air permeability coefficient V ($см^3$/$см^2$·сек)) is determined by the following formula.

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

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

S - fabric area, sm^2

T` is the time of passage of air through the fabric, sec.

The air permeability properties of woven knitted fabrics vary from 40.4 to 43.5$sм^3$/$sм^2$·sek The lowest air permeability was observed in variant II of the knitted fabric and its volume was 40.4 sm^3 / sm^2.sec. This is 3.1 sm3 / sm^2 sek more than option I tissue. The highest air permeability was observed in variant I of the knitted fabric samples and its volume was 43.5 sm3 / sm^2 sec. (Table 1, Figure 1).

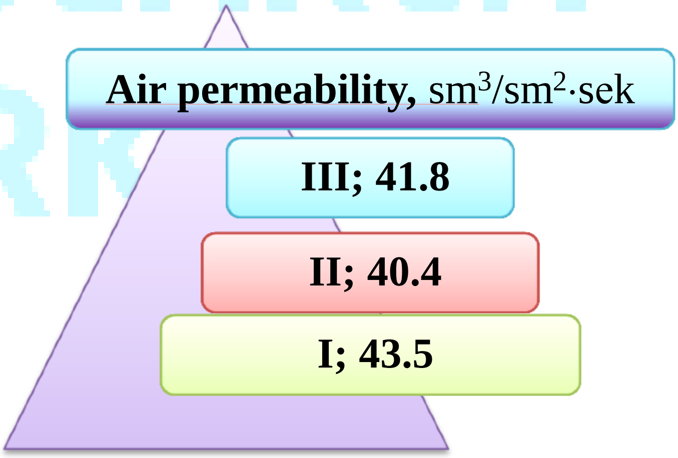


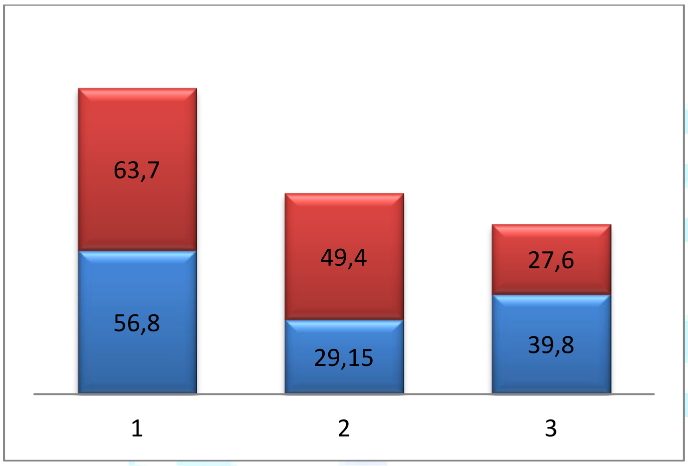
Figure 1. Air permeability histogram of knitted fabric

The tensile strength characteristic 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 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 Newton units.

INTERNATIONAL JOURNAL ON HUMAN COMPUTING STUDIES
www.journalsresearchparks.org/index.php/IJHCS e-ISSN: 2615-8159|p-ISSN: 2615-1898
Volume: 03 Issue: 1 January-February 2021

The tensile strength of the submitted samples was determined using a standard method using a dynamometer YG-026T.

Tissue toughness, i.e., tensile strength analysis, showed that the most mature tissue in height was variant 1, with an index of 544 N, with a toughness of 28% higher than variant III (Table 1). This is due to the fact that due to the change in the structure of the fabric, the ring pitch of the knitted fabric changed in options II and III compared to option I. The strength of the tissue across the width was also observed in variant I, where the tensile strength across the width of the tissue was 233 N.



"Length to break height L (%)" Length to break width L (%)"

Figure 2. Histogram of the change in the elongation of the knitted fabric to break

The elongation of a knitted fabric is as its elongation under the influence of the force expended. Elongation is characterized by the elongation of the sample being tested. 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 along the length of knitted knitwear ranges from 29.1% to 56.8%. The highest elongation was observed in variant I of the knitted fabric and it was 56.8% (Table 1, Fig. 2). The elongation of the knitted fabric variant I was found to be 48.8% higher than that of the base fabric (variant II).

The elongation of the knitted fabric in variant II was the lowest, at 29.1%. The elongation across the width of the knitted fabric ranged from 49.4% to 99.55%. The maximum width elongation was observed in option III of the knit and it was 99.55%. The elongation at minimum width was observed in variant II of the knitted fabric and it was 49.4%. The width elongation of option II of knitted fabric is 26.9% less than that of option III. In summary, the amount of elongation along the length and width of a knit will depend on the structure of the knitted fabric and the type of yarn it contains. When designing products, it is important to know what elastic properties knitted fabrics have [3].

The total deformation ε consists of the following parts: the flexible part $\varepsilon_к$ rotates at high speed after the loads are removed from the samples being tested; elastic deformation $\varepsilon_э$ develops at a small rate, associated with the passage of the relaxation process; plastic deformation ep, does not return after removal of loads from samples.

$$\varepsilon = \varepsilon_к + \varepsilon_э + \varepsilon_п, \% \quad (2)$$

The deformation of the knit varies with the elasticity of the yarn, the stiffness, and the change in the number of loops. Not only the description of the deformation, but also the state of the knitting is determined by the internal, two main forces: the elastic force of the yarn bending to the ring tends to straighten the yarn and change its shape. The result is a frictional force between the yarns, which prevents the placement of the yarns in the loop and interferes with the structure of the knitted fabric.

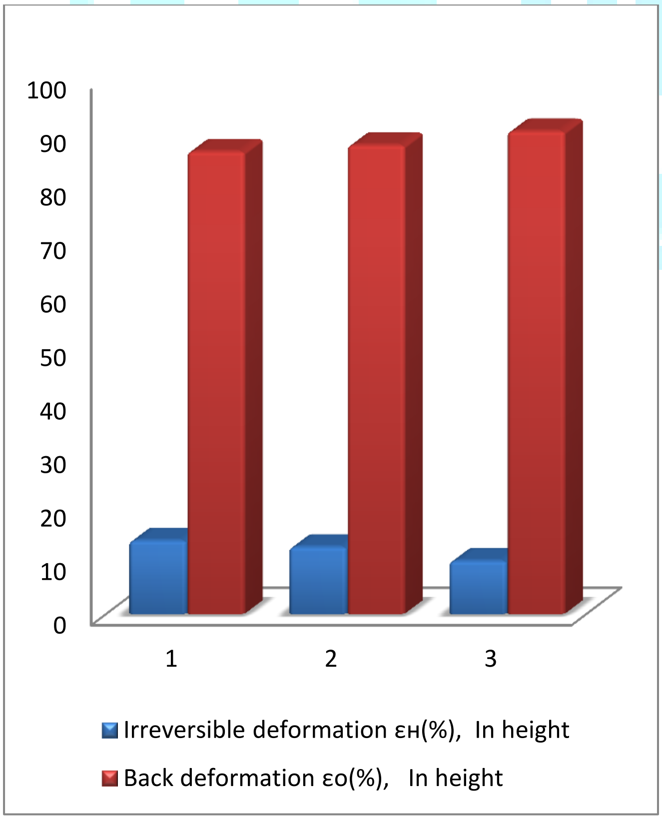
Deformation properties were determined on the model YG026A-III. Samples were prepared 30x5 cm long and subjected to a force of 454 g x 3 (13 N) for 30 min.

According to the results obtained, the proportion of longitudinal deformation in knitted knitted fabric samples varies from 86.3% to

INTERNATIONAL JOURNAL ON HUMAN COMPUTING STUDIES
www.journalsresearchparks.org/index.php/IJHCS e-ISSN: 2615-8159|p-ISSN: 2615-1898
Volume: 03 Issue: 1 January-February 2021

90.1%, and the proportion of reverse deformation in width varies from 82.8% to 85.2% (Table 1, Fig. 3). Such indicators of the proportion of back deformation indicate that the knitted fabric quickly returns to its original position after stretching. In the process of wet processing of knitted fabrics (washing, drying) the decrease in size is called penetration, and the increase is called tensile.

Knitted fabrics have a significantly higher elongation than woven fabrics and have a highly elastic structure, even under the influence of small stresses. The principle of operation of machines for the finishing of knitted fabrics is almost no different from the machines for the finishing of woven fabrics. It has been noted that one of the main reasons for the high level of penetration is the excessive deformation of knitted fabrics in finishing operations.



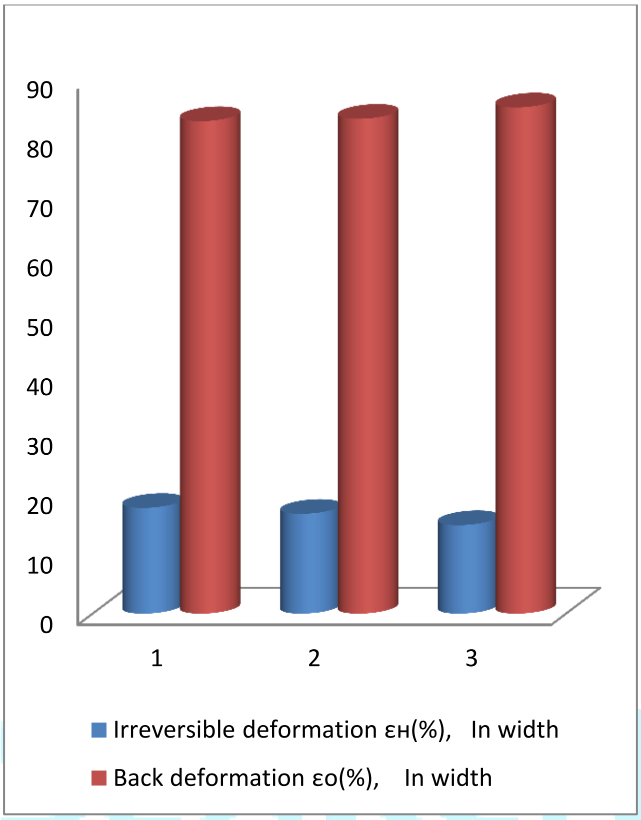


Figure 3. histogram of reversible and irreversible deformation of knitted fabrics

When knitted fabrics are processed, the less the knit enters, the higher its shape-retaining properties. Studies have been conducted to study the effect of the amount of polyacrylonitrol and polyester yarns in the composition of knitted fabrics on the elasticity.

The results of the study of the penetration process of patterned knitted fabric samples showed that the penetration varied from 2% to 5.8% in height and from 2% to 5% in width (Table 1, Fig. 4).

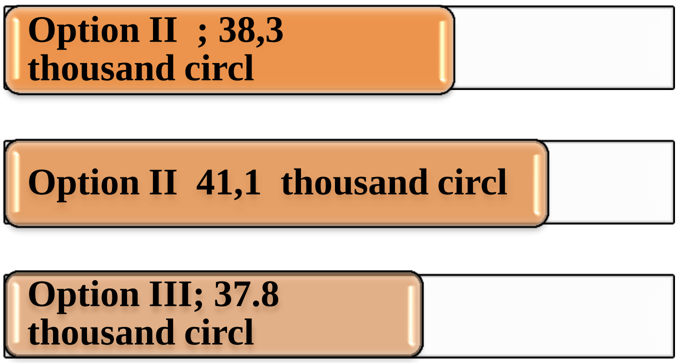
During the use of knitted products, the fabric is subject to abrasion when in contact with surrounding objects, and as a result, some parts of the product become unusable.

The variants with the highest abrasion resistance of the resulting knitted fabric are II and I.

Option II friction resistance 41.1 thousand months. The friction resistance of option I is 38.3

INTERNATIONAL JOURNAL ON HUMAN COMPUTING STUDIES
www.journalsresearchparks.org/index.php/IJHCS e-ISSN: 2615-8159|p-ISSN: 2615-1898
Volume: 03 Issue: 1 January-February 2021

thousand units. It was found that the friction resistance of Option III was
3.3 thousand less than that of Option II (Table 1).



In conclusion, the analysis of the above-mentioned physical and mechanical properties of knitted fabrics shows that changes in the structure of knitted fabrics have a positive effect on the air permeability properties, toughness, elongation and abrasion resistance properties of knitted fabrics. When weaving knitted fabrics from spun polyacrylonitrile yarns, the change in tissue structure allows to obtain knitted products with high hygienic and shape-retaining properties, toughness and beautiful appearance.

References

[1] Shogofurov, Sh.Sh; Kamalova, I.I; Xoliqov, Q.M; Meliboev, U.X. (2020) Structure And Methods For Producing Refined Two-Layer Knitted Sheets. Solid State Technology. Vol. 63 No. 6 (2020). Pages 11798-11807. http://www.solidstatetechnology.us/index.php/JSST/article/view/6183

[2] Juraboev, A.T; Kholiqov, Q.M; Shog'ofurov, Sh. Sh (2020) The study of the technological parameters of double layer knitwear with various methods of connecting layers. ACADEMICIA: An International Multidisciplinary Research Journal. Year:2020, V10.Issue 4. Pages 397-404. https://www.indianjournals.com/ijor.aspx?target=ijor:aca&volume=10&issue=4&article=058

[3] Kholikov, K.M; Zhuraboev, A.T; Shogofurov, Sh.Sh; Abduvaliev, D.M. (2020) Comprehensive assessment of the two-layer knitwear quality. The Way of Science. 2020. № 1 (71). http://scienceway.ru/f/the_way_of_science_no_1_71_january.pdf#page=24

[4]. F.Kh. Sadykova, D.M. Sadykova, N.I. Kudryashova. Textile materials science and the basics of textiles production. M .: Legprombytizdat, 219-225p. (1989).

[5]. A.I.Koblyakov, G.N. Kukin, A.N. Soloviev. Laboratory workshop on textile materials science. 2nd ed. M.: Legprombytizdat, 232-245c. (1986).

[6]. B.F. Mirusmanov. Development of technology for producing cotton silk linen jersey: Diss. Cand. tech. sciences. - T .: TITLP, 140c. (2004).

[7]. K. M. Kholikov, M. M. Mukimov. Cotton-silk knitted fabric Analysis of physical and mechanical parameters-Bulletin of the Scientific and Technical Institute of the Namangan Institute of Engineering Technologies. (Volume 4, special issue # 1 2019) Pages 41-46 nammti

[8] Izatillayev, M.M; Korabayev, Sh.A (2020) "Experimental studies of shirt tissue structure", The American Journal of Applied sciences: Vol. 2 : Iss. 11 https://usajournalshub.com/index.php/tajas/article/view/1353

[9] Korabayev Sh.A; Mardonov B.M; Matismailov S.L; Meliboyev U.X (2019) "Determination of the Law of Motion of the Yarn in the Spin Intensifier", Engineering, 2019, 11, 300-306. https://www.scirp.org/journal/paperinformation.aspx?paperid=92784