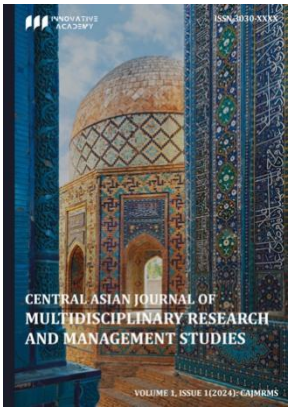


# COMPLEX EVALUATION OF QUALITY INDICATORS OF TWO-LAYER M KNITTED FABRICS FROM PAN YARN .

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ABSTRACT

*In the scientific work, research was conducted on a comprehensive evaluation of two-layer knitted fabrics made of cotton yarn, with the aim of effectively using local raw materials.*

Comprehensive measures aimed at organizing the production of a wide range of high-quality textile and sewing-knitting products, localizing its production, and increasing the export potential of local producers are being implemented in the republic [1].

In the textile industry, issues such as increasing and improving the quality indicators of knitted products, expanding the assortment of types are of urgent importance. From this point of view, in our country, the development of the theory of knitted fabrics, the creation of knitted fabrics with a new structure, and the achievement of optimal performance characteristics are solved through high-quality production methods.

It is known that the evaluation of the quality of knitted fabrics and products is based on the evaluation of the results of the determination of quality indicators and the comparison with standard and regulatory documents. Because the methods of determining product properties, mainly standards, regulatory documents are given in detail. There are several methods of evaluating the quality of textile materials, including experimental, organoleptic, expert, sociological, calculated, differential, complex and mixed.

A comprehensive assessment of the quality indicators of fabrics determines whether the knitwear is suitable for further processing or in which direction it is recommended for use. The characteristics that determine quality are established in standards, based on consumer requirements.

To determine the best option for knitted fabrics, it is recommended to use methods of assessment that take into account a number of factors that shape the structure and properties of the fabric . According to the results of the analysis, the quality indicators of the manufactured samples have priority in different options. As a result, there was a need to identify the optimal option among the samples with the lowest raw material consumption and the best quality indicators. Therefore, in order to compare statistical data and the obtained experimental results, a method of complex assessment of the quality indicators of two-layer

knitted fabrics from pan yarn was used. The obtained samples were compared in terms of quality indicators such as bulk density, air permeability, breaking strength, elongation at break, recovery and shrinkage. Pan yarn with a linear density of 31 tex x 2 was used as the raw material. Option 1 was produced as the main fabric.

For this purpose, a complex evaluation diagram was built, which combines quality indicators in one place and has a quality limit. Values of technological indicators and physical-mechanical properties of knitted fabrics woven from pan threads were placed on each axis of the complex diagram.

Based on the analysis of technological indicators and physical and mechanical properties of two-layer knitted fabrics made of pan yarn, research was conducted to identify high-quality options. The method of constructing a complex assessment diagram of quality indicators was used to process statistical data.

Polygons that provide a comprehensive assessment of the quality indicators of two-layer knitted fabrics are formed by sequentially connecting points located on radius vectors.

In order to compare the obtained experimental results, the method of constructing a comprehensive evaluation chart and a comparative comparison histogram of the quality indicators of two-layer knitted fabrics woven from pan yarn was selected.

In order to construct the diagrams and calculate the area of the polygons, the results obtained from the technological indicators and physical-mechanical properties of the two-layer knitted fabric woven from the pan thread presented in Table 1 were used.

**Table 1**

**Physico-mechanical properties of two-layer knitted fabrics.**

| Indicators \ Options | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Surface density of knitwear $M_s$, g / $m^2$** | | 484.4 | 450 | 565.6 | 541.6 | 551.0 | 541.8 | 444.5 | 418.2 | 380.2 | 553.6 | GOST 28554-9028554-90 |
| **Knitting thickness , T mm** | | 1.9 | 2 | 2.31 | 2.2 | 2.18 | 2.84 | 2.2 | 1.88 | 1.9 | 2.48 | |
| **Knitting thickness d , mg/$cm^3$** | | 255 | 2 50 | 245 | 246 | 253 | 190.8 | 202 | 222.4 | 200.1 | 223.2 | |
| **Air permeability , Vr cm3 / cm2 sec** | | 44.46 | 29.52 | 51.83 | 37.35 | 49.90 | 52.8 | 93.1 | 100.8 | 89.9 | 48.3 | GOST 1228-2014 100 ($dm^3/m^2 \cdot sec$) not less |
| **Breaking strength , Rr, N** | **By height** | 417 | 572 | 378 | 443 | 601 | 366 | 599 | 449 | 460 | 374 | GOST 28554-90 not less than 80 N |
| | **Across the width** | 330 | 466 | 657 | 721 | 818 | 359.5 | 548.5 | 439.5 | 419.5 | 968 | |
| **Elongation at break , L , %** | **By height** | 126 | 145 | 117 | 119 | 116 | 132.5 | 117.5 | 110 | 116 | 122 | GOST 28554-90 I-0-40% . II-41-100% is less than III-100%. |
| | **Across the width** | 127 | 70 | 111 | 131 | 120 | 137.5 | 111.5 | 138 | 131.5 | 94 | GOST 28554-90 I-0-40%.II-41-100% III- less than 100%. |
| **Irreversible deformation , $e_n$,%** | **By height** | 18 | 20 | 14 | 20 | 20 | 20 | 19 | 16 | 16 | 17 | GOST 28882-90 5-20% more it's not |
| | **Across the width** | 17 | 18 | 15 | 19 | 18 | 19 | 22 | 29 | 25 | 14 | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Return deformation , e $_o$, %** | **By height** | 8 2 | 80 | 86 | 8 0 | 80 | 80 | 81 | 84 | 84 | 83 | |
| | **Across the width** | 83 | 8 2 | 85 | 81 | 82 | 81 | 78 | 71 | 75 | 86 | |
| **Elongation , %** | **Across the width** | 5 | 4 | 6 | 5 | 10 | 18 | 12 | 24 | 21 | 19 | |
| **Friction resistance, thousand. ail** | | 25 | 25 | 25 | 25 | 25 | 26.5 | 25 | 23.8 | 28.5 | 29.5 | |
| **Thermal conductivity %** | | 4.6 | 10.8 | 11 | 9.6 | 6 | 45.9 | 45.9 | 45 | 47.2 | 38.6 | |
| **Income, %** | **By height** | +1.2 | +3.1 | +1.8 | +1.2 | +1.2 | 0 | 0 | +4.3 | +2.5 | +1.7 | |
| | **Across the width** | +1.2 | -1.25 | +2.5 | +1.2 | +1.2 | +2.5 | +1.9 | 0 | 0 | 0 | |

Where: M - surface density of knitted fabric, g/m $^2$ ; δ - bulk density, mg/cm $^3$ ; B - air permeability, cm $^3$ /cm $^2$ ·sec; I - resistance to friction, thousand.rpm; R - tensile strength (in length and width), N; L - elongation at break (in length and width), %; ε $_{qs}$ - irreversible deformation (in length and width), %; ε $_{qt}$ - reversible deformation (in length and width), %; K - fabric penetration (in length and width), %. A comprehensive assessment of the quality indicators of fabrics determines the suitability of knitted fabric for further processing or the direction in which it is recommended to use it. The characteristics that determine quality are established in standards, based on consumer requirements [2-10] .

Based on the analysis of technological indicators and physical and mechanical properties of two-layer knitted fabrics woven from PAN yarn, research was conducted to identify high-quality options. To identify high-quality options, it is necessary to take into account many factors that shape the structure and properties of two-layer knitted fabrics. The method of constructing a complex evaluation diagram of quality indicators was used to process statistical data. This method allows you to determine the most qualitative option from the total area of the constructed polygons.

Polygons that provide a comprehensive assessment of the quality indicators of two-layer knitted fabrics are formed by sequentially connecting points located on radius vectors.

In order to compare the obtained experimental results, the method of constructing a comprehensive evaluation chart of indicators of two-layer knitted fabric woven from pan yarn and a comparative comparison histogram of quality indicators was chosen.

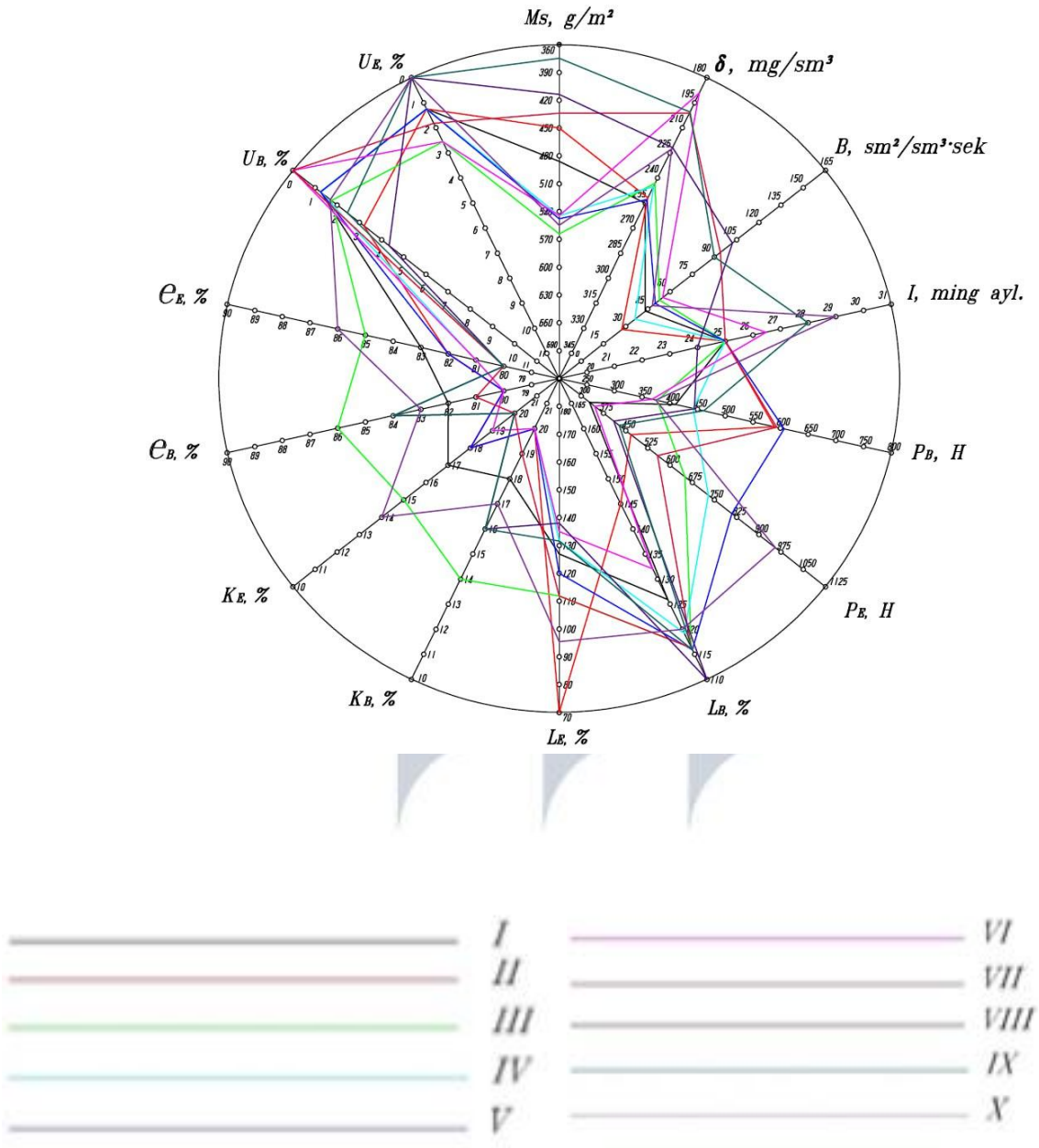


**Figure 1. A comprehensive evaluation diagram of the quality indicators of two-layer knitted fabrics woven from pan yarn.**

The value of the area surfaces obtained from the complex evaluation diagram is expressed in a comparative histogram of the quality indicators of knitted fabrics, and the optimal variants of knitted fabric samples are determined using the best results obtained according to the histogram indicators.

complex evaluation diagram is expressed by the comparative histogram of the quality indicators of knitted fabrics.

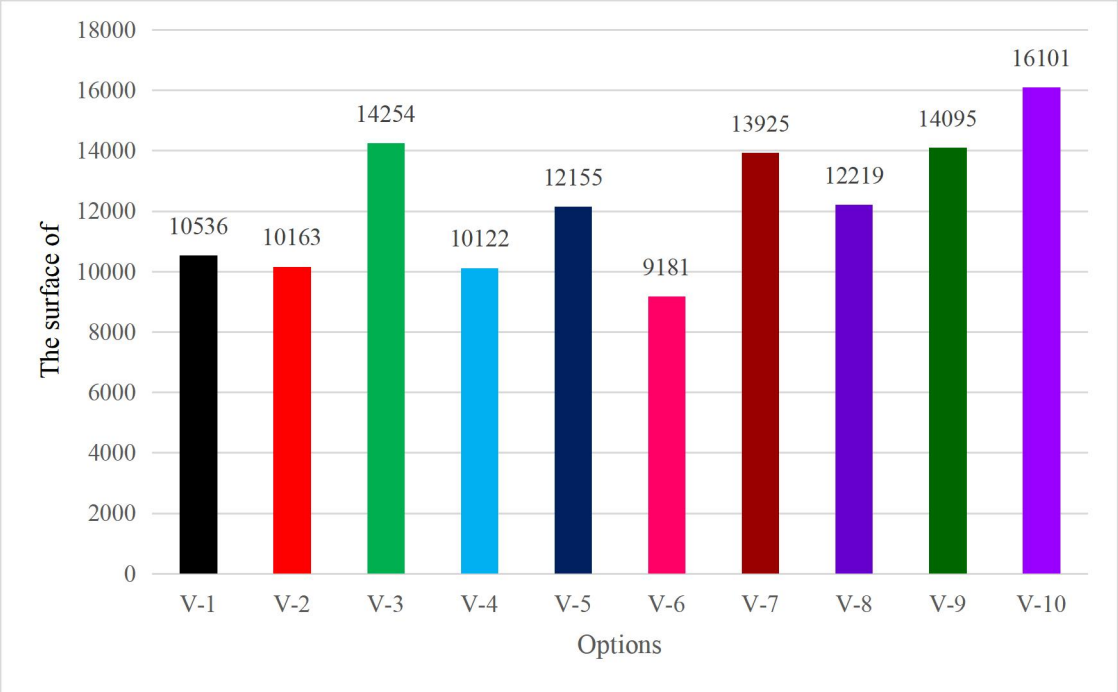


**Figure 2. Comprehensive assessment of quality indicators of double-layer knitted fabrics histogram.**

## Conclusion

The results of the comprehensive evaluation diagram and comparative evaluation histogram of the quality indicators of the new structured two- layer knitted fabrics show that the 10th variant of the knitted fabric has the highest score in terms of evaluation histogram indicators. It was found that the best option was $^{14254}$ mm $^{2}$, option $^{9}$ 14095 mm $^{2}$, option 8 12219 mm $^{2}$ and option 5 12155 mm $^{2}$, with a surface area greater than option 1 10155 mm $^{2}$

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