

**ENHANCEMENT OF THE MANUFACTURING TECHNOLOGY FOR NEW
STRUCTURAL FIRE-RESISTANT MATERIALS**

Yusupova Dilfuza Ubaydulloyevna

Doctoral student at fergana state technical university.

Email: Yusupovadilfuza1993@gmail.com

Phone: +99893 980 04 54

orcid: 0000-0002-0934-0007

fergana, uzbekistan

Maqsudov Nabijon Baxodirovich

Phd, associate professor

Department of industrial engineering

Namagan state technical university.

Email: Maqsudovnabijon@mail.ru

Phone: +99894 307 39 47

fergana, uzbekistan

Abstract: This article highlights the issues related to improving the production technology of new structural fire-resistant materials. The study investigated the composition of raw materials, the microstructure of the materials, and their influence on heat resistance properties. Based on the experimental results, the optimal technological parameters were determined, demonstrating the possibility of producing fire-resistant materials with high mechanical strength and thermal stability using cotton and basalt fibers. In addition, the economic efficiency, environmental safety, and the role of these materials in innovative development were also evaluated.

Keywords: Fire-resistant materials, local raw materials, cotton, basalt, microstructure, technological parameters, thermal stability, composite.

Introduction. At present, one of the pressing tasks is to expand the range of products manufactured from local raw materials and to broaden the capabilities of production equipment. Particular attention is paid to increasing work efficiency and energy resource savings, improving and strengthening the raw material base of the sector, establishing new capacities for the production of high-quality fire-resistant fabrics, and modernizing existing ones. In addition, it is important to develop deep processing, increase the volume and improve the quality of finished products, master the production of the most in-demand types, and expand the export volume of finished fire-resistant products. [1]

The development of theoretical solutions for the production technology of fabrics made from natural cotton and basalt fibers, the determination of their optimal parameters, and the creation and improvement of highly efficient, competitive, and resource-saving technologies for producing high-quality fabrics remain among the most important and urgent tasks today. Figure 1 presents the technological system for the production of fire-resistant fabrics. [2]

Before weaving a fabric from textile yarns, it is necessary to prepare the technical calculation of the fabric to be produced. The technical calculation is carried out based on the

technological system intended for the production of the fabric. The technological system for developing a new fire-resistant fabric from a mixture of cotton and basalt yarns should include all technological processes — from the selection of cotton yarns to the production of the woven fabric itself.[3] thus, the technological system encompasses all processes from the selection of cotton yarns to the chemical treatment and finishing of the produced fire-resistant fabric. Figure 2 illustrates the technological system for the production of new fire-resistant raw fabrics in the updated product range.

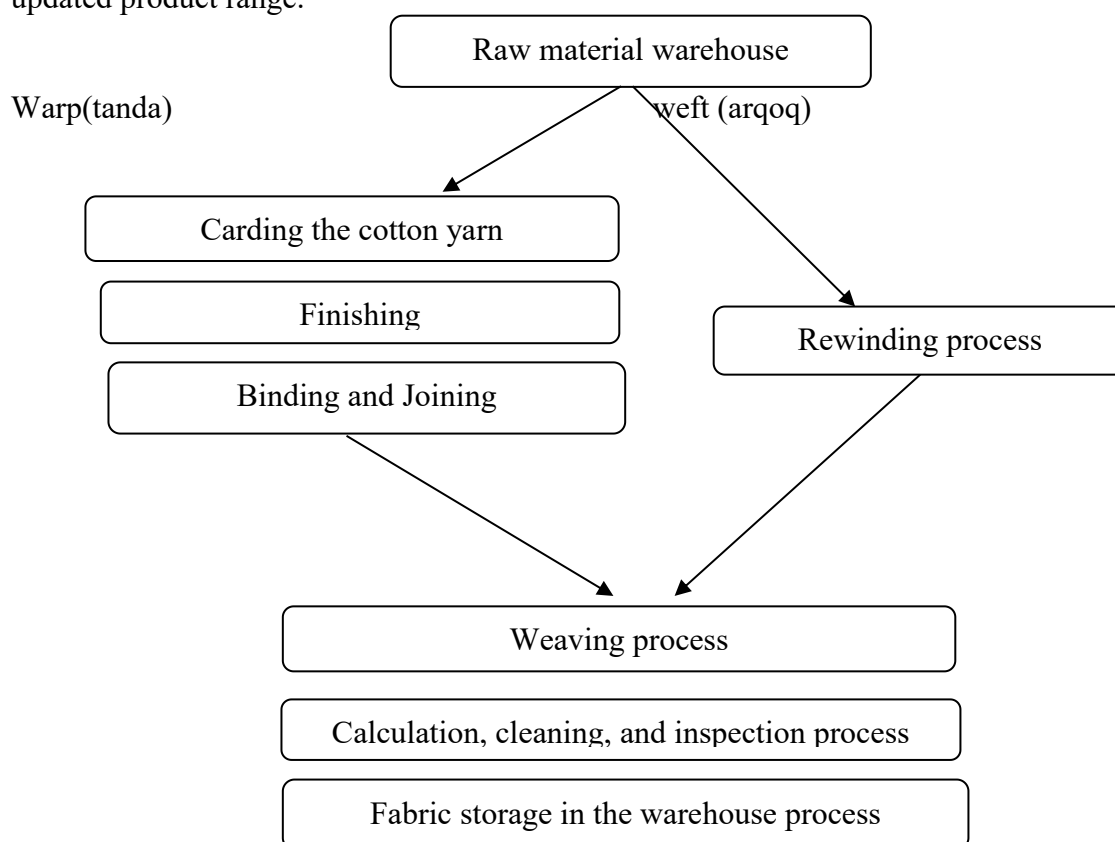


Figure 1 – technology of fire-resistant fabric production

The analysis of the technological system for weaving new fire-resistant fabrics from cotton and basalt yarns, shown in figure 2, indicates that the weaving process for this product range is carried out on the equipment at mutex llc. Therefore, the technological system was developed taking into account the technological capabilities of the machines available at the production site. Cotton yarn with a linear density of 23×2 tex and basalt yarn of 75 tex were used for the production of the fabric. [4]

Before weaving the new fabric, the technical calculation of the new range of fire-resistant fabrics is developed based on the technological system indicators of the existing fire-resistant material. The technical calculation includes all quantitative parameters of the new fabric. All weaving processes must be specified with precise numerical values, taking into account the production waste generated during the weaving process. Additionally, the consumption of raw

materials required for weaving must be calculated and clearly presented. Furthermore, all technological indicators of the new fabric, including its width and surface density, should also be provided. [5]

After completing the technical calculation for the new range of fire-resistant fabrics, the fabric was produced at mutex llc. The production facility is equipped with specialized mechanical weaving machines, the yj737d rapier towel looms, manufactured in china, designed for the production of fabrics. Using the improved method, fire-resistant fabrics prepared for weaving can be processed on these looms. Taking this into account, it was recommended that the new range of fabrics be produced on the yj737d rapier towel looms manufactured in china.[6]

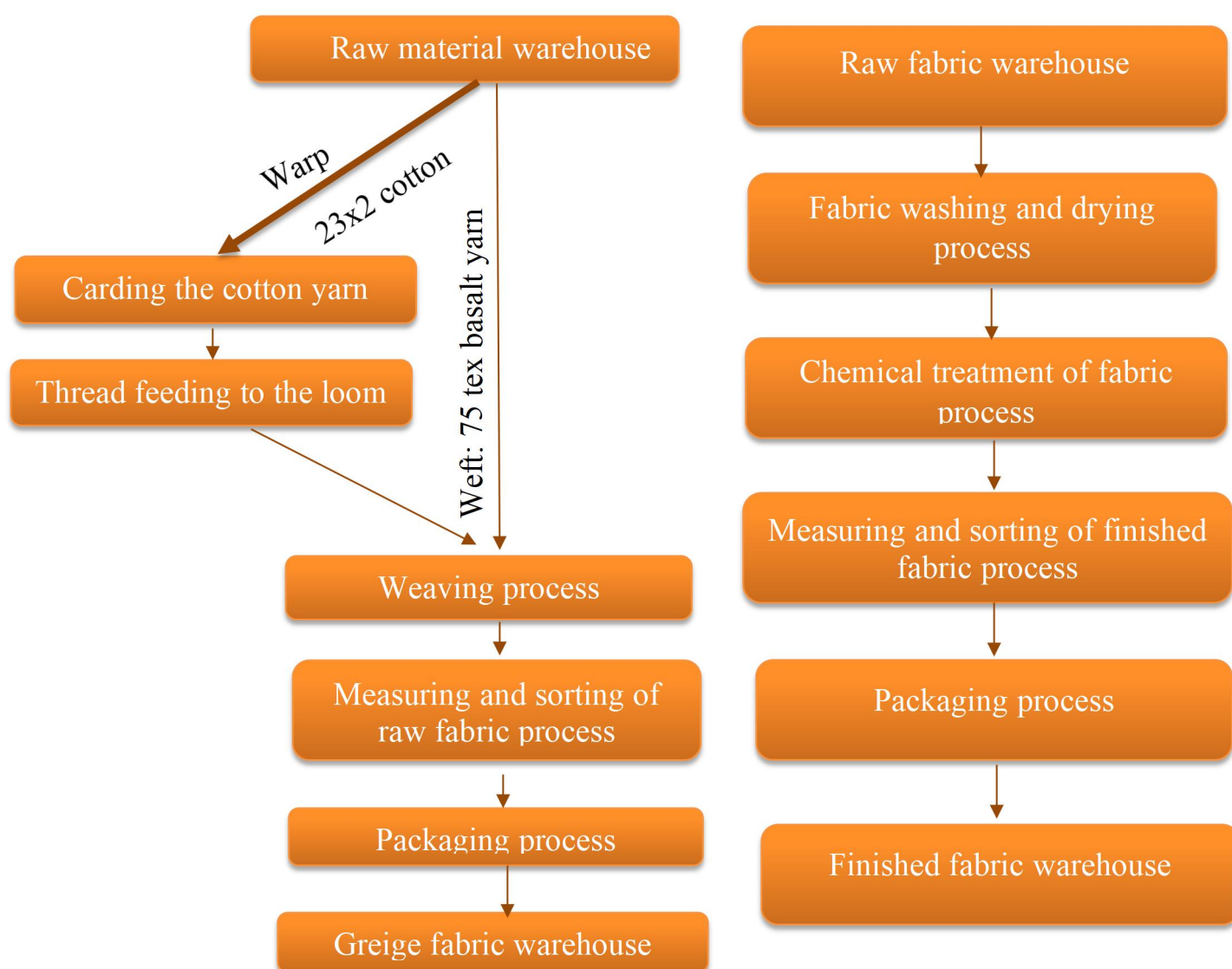


Figure 4. Production technology of fire-resistant raw fabric

Figure 5. Chemical treatment technology of fire-resistant raw fabric

Conclusion: Based on the analysis of the physical and mechanical properties of the above-mentioned fire-resistant fabrics, it was found that modifications in the structure of fire-resistant materials positively influence the air permeability, firmness, tensile strength, and abrasion resistance of the fire-resistant fabric.

Feeding cotton yarn to the warp and basalt yarn to the weft of fire-resistant fabrics allows obtaining fire-resistant products with improved fabric structure, enhanced hygienic and shape-retention properties, and an attractive appearance.

References:

1. Fayzullayeva, n. (2021). Textile materials science. Tashkent: National university of uzbekistan.
2. Yusupova, d.u. (2023). Analysis of special clothing materials for workers in metallurgical industry enterprises. Scientific-technical journal of fergana polytechnic institute, 15, 61–64.
3. Maqsudov, n.b., & yusupova, d.u. (2024). Analysis of special clothing for metallurgical industry workers. In conceptual analyses and innovative solutions in creating modern designs of textile and light industry products (pp. 484–489). Namangan: International scientific-practical conference, may 29–30.
4. Maqsudov, n.b., & yusupova, d.u. (2025). Requirements for materials used in the production of special protective clothing under high temperature exposure. In research on priority directions of uzbekistan's development strategy. Proceedings of the i republican scientific-practical conference (vol. 1, no. 1, pp. 9–11). September 18, 2025.
5. Maqsudov, n.b., & yusupova, d.u. (2025). Analysis of materials for high-temperature resistant protective clothing. Journal of science, technology, and innovations in textile and fashion industry, 3, 79–82.
6. Maqsudov, n.b., & yusupova, d.u. (2025). Development of new assortment fire-resistant materials using local raw materials. In modern technologies and sustainable development: Problems and solutions. Proceedings of the republican scientific-practical conference (pp. 300–303). Fergana, september 18–19, 2025.