

## Технологии разработки продуктов на основе переработки шерсти

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**Аннотация.** В последние годы текстильная и легкая промышленность считается одной из важнейших сфер производства новых материалов и готовых изделий, а использование энерго-ресурсосберегающих технологий и оборудования для развития этой отрасли занимает одно из ведущих мест. «Общий объем мирового рынка швейных полуфабрикатов по всему миру в настоящее время составляет около 1,4 трлн долларов по данным MarketLine (около 2 % мирового ВВП), и, по прогнозам, его рост составит 4–5 %», что, в свою очередь, требует проведения современных исследований с целью расширения ассортимента продукции и улучшения их качества, а также снижает затраты на производство. В связи с этим легкая промышленность в настоящее время имеет стратегическое значение для развивающихся стран, и широкое использование различных видов одежды считается важным.

В результате проводимых в мире экономических реформ проводятся научно-исследовательские работы, направленные на модернизацию предприятий легкой промышленности и оснащение их новым оборудованием и технологиями, вопросы дальнейшего развития и финансовой поддержки предприятий, а также развитие предприятий легкой промышленности. В связи с этим особое внимание уделяется актуальности проблем, связанных с развитием предприятий легкой промышленности, и разработке научных предложений и рекомендаций по их устранению.

**Ключевые слова:** экологически чистый, без отходов, сухой, рисунок, художественный дизайн, промышленность, ткани, слои.

## Technologies for Developing Products Based on Wool Processing

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**Annotation.** In recent years, textile and light industry has been considered one of the most important fields of production of new materials and ready-made products, and the use of energy-resource-efficient technologies and equipment for the development of this field occupies one of the leading positions. "The total global market for semi-finished garments worldwide is currently approximately \$1.4 trillion according to MarketLine (about 2 % of global GDP), and is projected to grow will grow by 4–5 %", in turn, requires the implementation of modern research in order to expand the range of products and improve their quality, as well as reduce production costs. In this regard, light industry is currently of strategic importance for developing countries, and wide use of clothing types is considered important.

As a result of the economic reforms implemented in the world, scientific and research work is being carried out aimed at the modernization of light industrial enterprises and equipping them with new equipment and technologies, the issues of further development and financial support of enterprises, and the development of light industrial enterprises. In this regard, special attention is paid to the relevance of problems related to the development of light industrial enterprises and to the development of scientific proposals and recommendations for their elimination.

**Key word:** environmentally friendly, without waste, dry, pattern, artistic design, industry, fabrics, layers.

The felting technique is used in the development technologies of non-woven fabrics based on wool processing.

Felting is a special technique, a combination of optimal properties, selection of a wide range of non-

woven fabrics with fine wool, improvement of the aesthetic properties of clothes thanks to new technologies of non-woven fabric production. This production technique is considered ecologically clean, waste-free and economical, and occupies an important place in the

modern world economy[1–3].

Felting is the profession of making felt. It has been widespread since ancient times, mainly among peoples engaged in animal husbandry. In Central Asia and Kazakhstan, including the territory of Uzbekistan (Surkhandarya, Karakalpakstan, Khorezm, Fergana

Valley), flowery, expressive, colorful patterns of felt are made [4].

There are two types of felting technique - dry and wet.

Dry processing technique is a process using special needles, this technique is used to create large objects (jewelry, toys) (Fig. 1).



Figure 1 – The process of making garments using the dry felting method

It can also be used as a decoration when a pattern is applied to the fabric using the dry processing technique. To ease the labor-intensive process, a household needle felting machine with a single needle or needle block can be used [5].

The technique of wet processing is felting with soap and water. This method is used in the production of flat products (pictures, clothes), shoes (Fig. 2) [6–7]. Traditional methods of decoration in the felting technique, or in other words, the artistic design of items, are directly related to the characteristic properties of the material.

Recently, the felting technique has been enriched with new work methods that allow the creation of previously unused textures and three-dimensional forms.

In industry, technical felt made of wool is used in construction, as an effective heat insulator, padding material, and filters for residential and industrial buildings. In addition to being used for sound insulation and mitigating dynamic loads, technical felt has also

been found to be used in the production of efficient fuel and air filters.

The analysis of the existing researches on wool processing techniques and technology shows that the machines and equipment in the technological system are complex, require a lot of power, and are not very efficient. One of the necessary operations in the production of woolen non-woven fabric using the TOTAL TF1301826 vibration press device is to press the fiber to form a fabric. As a result of this process, the quality indicator level of non-woven fabric increases (Fig. 3).



Figure 3 – TOTAL TF1301826 vibrating press unit



Figure 2 – The process of making clothes using the method of wet felting

The issue of special importance for the development of the sewing industry is to increase the quality of products with the rational use of materials. More than two-thirds of textile and clothing fabrics can be produced using lasers to create different patterns [8].

Due to the CNC laser irradiation, the dyes on the surface of wool fiber non-woven fabrics are vaporized, creating non-fading image patterns, gradient patterns of flowers and trees, and creating a new look on the wool fiber non-woven fabric. Laser processing of woolen non-woven fabric is a growing processing method with a large profit and market area (Fig. 4).



**Figure 4 – CNC laser engraving machine LM 1390 PRO NEW 130W**

Although laser processing is also a heat treatment method, it is ideal for cutting textile fibers due to the laser's high focus, fine spot and small thermal diffusion zone. It allows for a wide range of processed fabrics, smoothness of cutting and no splitting of edges, automatic closing, prevention of deformation, design and output of graphics on the computer at will. This makes laser processing a recognized alternative in the industry.

The number of layers of non-woven fabric is important when creating a pattern by engraving wool fiber with the CNC laser engraving machine LM 1390 PRO NEW 130W. The large number of layers and the thickness of the fabric lead to unpleasant odors and overheating during the operation of the device. For this reason, during the research, a type of low-thickness fabric consisting of 3 layers of non-woven fabric with wool fibers was used.

Ancient woolen cloths are described by archaeologists as the work of proto-Iranian tribes and belong to the 3rd millennium BC, the first felt clothing was found in Asia Minor. The wool technique has survived to this day, and it is characteristic of the peoples of the Caucasus, Asia Minor, Iran and Central Asia [9].

We will consider the products of the ancient peoples from the point of view of identifying the decorative techniques characteristic of the various cultures of the peoples of Central Asia and developing the historical traditions of felt weaving.

There are three main felting traditions today:

1. Iranian traditions. Turkmens continue this tradition.
2. Pazyrik tradition (name from a famous veil found on one of the hills of Pazyrik). The main technique is application. Kazakhs continue this tradition.
3. Juan's tradition of wearing clothes. The main technique is mosaic, which is fixed with fine sutures with tendon threads. Kyrgyz continue this tradition.

There are several technical methods for making fabric decorated with wool fiber patterns. The traditional technique consists of making semi-slanted colored canvases (taldirma), from which patterns are cut and wrapped in a layer of wool.

Later, the production of embroidered fabrics turned into embroidered appliqué. Contour linear patterns are sewn on wool fiber fabric from dukhoba, sukno fabric, and cotton fibers. Such tekemets are called "ayuli tekemet", i.e. "trimmed fabrics" (Fig. 5 a, b). Decoration was dominated by zoomorphic patterns. One of them is ram horns made in the "kos muiz" style.



a



b

**Figure 5 – Fabric decorated with wool fiber patterns – tekemet (an example of Kazakh ethnography)**

Another type of patterned fabric is sirmak, which differs from tekemet in that it takes several months to make sirmak. The edges of the skirt are always sewn in several directions. Due to the lining, the felt rubs and wears less [10].

Often, two felt panels of contrasting colors are made for the syrmaq. They are made in black and white, then both canvases are laid down, and on top of them are placed decorative patterns cut from thick paper, cardboard or smooth leather, and outlined with sharp chalk. Then the drawn lines of the decoration are cut with a special sharp knife. One part of the scarf is made of white felt with a black pattern, and the other half is sewn in black with a white pattern. This method is called mosaic. The added ornaments are combined and sewn in two directions: top and bottom.

After combining all the elements of the decoration, a bright additional decoration is sewn on the seam. The process of assembling the ornaments of Sirmak is called "jiekteu" – which means "stitching along a row". After sewing the decoration along the contour, the lining is sewn to the skirt.

Another type of Uzbek felt fabric – tuskiz – decorated only the walls of the house. They are made of thin felt with the help of mosaic, appliqué and embroidery. Tuskiz ornament is sewn in the traditional P-shape [11].

It is distinguished from the patterned mosaic by its composite solution and decoration technology. Embroidery is made on any material (fabric, velvet, cotton fabric) and then sewn with a felt base.

In the past, houses were filled with felt cloths, wooden containers, hanging felt bags for storing felt. All these products are cut from flat pieces of thick felt and decorated in a unique way.

During the research, the general characteristics of ethnic and modern products made on the basis of felting technique, that is, felting, clothing formation, shape preservation method, canvas construction, additional fabrics and production techniques are included (Fig. 6).

Over the centuries, great resources have been spent on developing synthetic fibers with wool-like properties, but until now, no one has succeeded in replicating this

natural material. Due to its specific and unique properties, wool is widely used for carpets, women's and men's outerwear, shoes, insulating materials and other types of non-woven fabrics. The heat-retaining and moisture-absorbing properties of the fiber make woolen products very comfortable to wear.

The structure and properties of wool fibers largely determine its use in production, variety and quality of wool products.

The analysis of the assortment of modern products made of wool fiber non-woven fabric showed their diversity and uniqueness, and the increase in the range of products. From them, shoes, household items, decorative interior elements, hats, warming layers in clothes, gloves and special clothes, bags, toys, panels and other accessories are produced.

Non-woven fabrics are widely used not only in industrial production, but also in everyday life. These are shoulder wear, waist wear, corsetry, hats, socks, gloves and scarves, as well as non-wearable items, special clothing and footwear. When classifying clothes from non-woven woolen fabrics, the expediency of the clothing assortment was studied and the types of products were determined. Taking into account the characteristics of local woolen non-woven fabrics, the types of models that are not complex in terms of construction were selected and offered in the classification process [12].

Representatives of the leading trends in modern design lead the creation of multifunctional clothes. Minimalism in fashion design is the concept of a wardrobe consisting of minimal multifunctional clothes, which, according to designers, are universal multifunctional clothes (for example, American designers K. Klein, D. Karan, German model J. Sander) should have the following indicators: simplicity of form; lack of makeup; neutral color; using the highest quality materials.

To sum up, based on the analysis of research on non-woven fabrics made on the basis of wool fibers, techniques and technology of processing wool in traditional production enterprises and methods of making non-woven fabrics from it were studied.



Figure 6 – Fabric decorated with wool fiber patterns - tekemet (an example of Kazakh ethnography)

The methods of increasing the production efficiency of the use of equipment in the processes of processing wool, making non-woven fabric, and creating clothes from it were analyzed and the use of modern methods was determined.

During the research, a modern classification was developed, in which the household, heat storage, healing functions were studied, and the functions of the scope of use were determined.

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