



STUDY OF THE DEFORMATION AND STRENGTH CHARACTERISTICS OF THREAD CONNECTIONS IN THE MANUFACTURE OF PRODUCTS FROM FUR WASTE

*associate professor (PhD), N.D. Ergasheva, prof. F.U. Nigmatova,
Tashkent Institute of Textile and Light Industry*

Abstract: The use of an expensive semi-finished product and manufacturing methods, a large variability of physical and mechanical properties, determined by the natural and biological characteristics of animals, require comprehensive research to develop and form the principles of domestic design of fur products. As input factors were taken: the number of stitches in 1 cm., Thread thickness, needle diameter. The features of the behavior of the strength model of this thread connection are revealed.

Key words: combining fur with various materials, furrier's flap of valuable types of furs, astrakhan fur, astrakhan fur and broadtail.

INTRODUCTION

The technological features of the thread connection of the cut skins and flap are associated with the properties of the PMF, and mainly with the thickness, density, plasticity, elasticity and strength characteristics of the leather tissue of the skins. The level of performance of both furrier and sewing work is largely determined by the quality of machine and manual operations, which is formed at the stages of selection of sewing needles, threads and setting the parameters of thread connection of skins and sewing parts.

EXPERIMENTAL PART

For the processing of fur waste, a flap of highly valuable parts of the skins of fur-bearing animals: mink, muskrat, astrakhan and broadtail were taken.

Consequently, the improvement of the technology of obtaining fur plates from a flap makes it possible to improve the quality of the use of fur semi-finished products, expand the range of products, produce products that are in demand on the modern market and have a wide range of applications.

The aim of the study is to increase the efficiency of using waste of fur semi-finished products formed during cutting of the main products. The object of research is a fur flap of various sizes from especially valuable types of semi-finished products.

This article presents materials for the manufacture of fur clothing from furrier's waste. The collection of information was carried out through an analytical review of



the literature and search in electronic databases, including PubMed, Web of Science [1].

- paws of karakul, smushka, yachobab skins with a length of more than 16 and a width of at least 2 cm; lamb with a length of more than 14 cm; minks more than 7 cm long, at least 2 cm wide; foxes of all varieties more than 15 cm long and at least 2 cm wide;

- paws of a cone-shaped shape and paws, the sizes of which are less than those indicated above, are referred to as semi-paws, paws of mink skins less than 7 cm long - to a flap;

- half-paws of karakul, smushka and jacobab skins from 8 to 16 in length and at least 2 cm wide; lamb with a length of 6 to 14 cm; foxes of all varieties from 9 to 15 cm long;

- half-legs, the length of which is less than those indicated above, are referred to as a flap;

- barrels of rabbit, fox skins, sheared and dyed with an area of at least 20 cm² and a width of at least 2 cm.

The rest of the skins are not subdivided by area. It is allowed to double the size of the furrier's flap in the presence of defects in the hair and skin tissue [1].

Manufacturing of plates. Currently, there are various methods of making fur skins and plates [2,8]. The selection of the flap into the plates was made from homogeneous groups of fur, taking into account the requirements for fur clothing [2,3,4].

In fig. 1 shows the process of the stage-by-stage manufacture of plates from the fur waste of the astrakhan-merlushk group. In this case, the size of the waste in width can be different - from 2 cm to 10 ... 15 cm. In total, 2 types of plates were prepared for the experiment: plates made of a fur flap, plates in combination with natural leather, made by the «jointing» method (Table 1).

The selection and preparation of samples for the experiment was carried out in accordance with [5]. The thickness, density and weight of the samples were measured at 3 points and the average was taken in accordance with GOST.

The flap was joined on a single-thread chain overcasting machine using sewing needles, the selection of which is determined by the thickness and density of the leather fabric. For sewing, a 10-B class furrier machine (Russia), JT-4-5A from JATI (China) was used. The strength and appearance of the seam also depend on the linear density (trade number) of the sewing thread.



To make machine stitches on furrier machines, the selection of the needle and sewing thread was made in accordance with [6]. For sewing the flap, furrier's threads for sewing fur products «COATS Gral» No. 180 were used.

The number of stitches per 10 mm of a line varies from 6-7 stitches for a semi-finished product with a thin leather fabric to 4-5 and even 3-4 for a FSP with a thick leather fabric. When joining a flap made of small and medium sized skins, fine and medium sized skins, the furrier suture height did not exceed 1.0 mm, and for large and thick skins it did not exceed 2.0 mm. The number of stitches per 10 mm of a line varies from 6-7 stitches for a semi-finished product with a thin leather fabric to 4-5 and even 3-4 for a FSP with a thick leather fabric.

To increase the dimensional stability, the finished fur flap plates were preliminarily duplicated with thin cotton coarse calico. At the same time, the coarse calico was pre-decotated, the connection of the gasket into the package was made using a thread method.

To assess the quality of the plates harvested from waste fur skins, experimental studies were carried out on various semi-finished products of the FSP. It is known that the quality of FSP is determined on the basis of the properties of the hair, leather tissue and skins in general. In the case of determining the quality of the manufactured plates, we determined the integral indicators of the quality of the plates.

- thickness; [3].
- density; [5].
- heat retention; [5].
- vapor permeability; [9].
- elastic-plastic properties; [12].
- strength; [6].

Experimental studies were carried out in the TITLI certification laboratory according to standard methods. The results of experimental studies are given in table. 2 and 3.

Table 1

Characteristics of experimental samples of fur flap plates

№	Type of fur	Density , kg/m ³	Fur thickness, mm			Weight, gr		
			Thick- ness, mm	Root- mean- square devia- tion	The coefficie nt of varia- tion, V	Avera- ge mass, gr	Root- mean- square devia- tion	The coefficie nt of variation ,V
1	Astrakhan	0,972	1,54	0,27	17,5	1,49	0,07	4,7



2	Karakul+ lining	1,037	1,84	0,21	11,4	0,17	0,04	23,5
3	Broadtail	0,414	0,39	0,04	10,2	0,046	0,001	3,9
4	Broadtail + lining	0,530	0,64	0,05	7,8	0,067	0,004	6,0
5	Nutria	0,974	2,10	0,23	11,0	0,163	0,04	21,5
6	Nutria + lining	1,044	1,93	0,07	3,7	0,168	0,03	18,7
7	Mink	0,485	1,84	0,10	5,3	1,09	0,09	8,3
8	Mink + lining	0,556	1,93	0,07	3,7	0,193	0,02	10,4

Methods for determining vapor permeability. The determination of the vapor permeability of the leather fabric of a fur semi-finished product is based on the creation of different elasticity of water vapor on both sides of the test sample and the establishment of the amount of water vapor passing through the unit area of the sample and the establishment of the amount of water vapor passed through the unit of time. Technical scales, desiccators, special metal cups 45 mm high and 55 mm in diameter, distilled water, concentrated sulfuric acid (density 1.84). Sampling was carried out in accordance with GOST R 52958-2008. From each sample, 2 samples were cut out, in the form of a circle with a diameter of 55 mm (with a diameter of the working part of the sample 36 mm).

III. RESULTS AND DISCUSSION

According to the data obtained (Table 2), the thickness of the fur plates varies depending on the type of flap and overlap with lining, and becomes larger in samples with lining. It is known that the uniformity in thickness and weight of leather and fur samples varies considerably - up to 40% [8,16]. The measurement data for the thickness of the samples show a large scatter of values, which is explained by the fact that the skin scraps were collected from various topographic areas of the fur.

The main indicators of the physical and mechanical properties of fur skins are the strength and elongation of the skin tissue to break, which depend on the histological structure, thickness, density, as well as the processes of canning, dressing and dyeing, and largely determine the quality of furrier work.

A feature of natural fur is a significant anisotropy of properties in the area of skins and in thickness [11], suggesting a high variability of changes in thickness and breaking characteristics in topographic areas. The deformation properties of skins depend on the type of stretching of the material during the dressing process (uniaxial, biaxial, planar or spatial), and a sharp difference in properties in mutually



perpendicular directions under uniaxial stretching indicates anisotropy of the properties of leather tissue.

IV. CONCLUSIONS

Thus, an important reserve for increasing the profitability and efficiency of leather and fur production, reducing losses from cutting expensive fur raw materials and expanding the range of products is the targeted use of fur waste by applying innovative design methods [18, 19] and improving the technology of obtaining plates from a flap. To increase the strength of the waste connection, when selecting a flap, one should take into account the height of the hairline and the thickness of the fur skin. In order for the obtained plates to have a set of useful properties and to be in equilibrium in terms of plasticity and strength, it is better to duplicate them with a thin hot-melt knitted fabric. This will improve the elastic properties of fur plates, increase the degree of their use not only for flat, but also molded, requiring a certain shape of clothing parts. [20]

- half-legs, the length of which is less than those indicated above, are referred to as a flap;

- barrels of rabbit, fox skins, sheared and dyed with an area of at least 20 cm² and a width of at least 2 cm.

The rest of the skins are not subdivided by area. It is allowed to double the size of the furrier's flap in the presence of defects in the hair and skin tissue [4].

A foot flap includes a flap whose area and width are less than the above dimensions. Cutting from the skins of astrakhan, broadtail, as well as a furrier's flap, which has defects in the hairline and skin tissue, is referred to the foot

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