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INVESTIGATION OF HAIRINESS OF FABRIC BY WEIGHT METHOD

Purpose. *Determine the possibility of carrying out hairiness of fabric by weight method.*

Originality. *An algorithm for determining the parameters of hairiness of fabric by weight method was developed for the first time*

Practical value. *The use of the proposed method allows expanding the possibilities of textile materials in the direction of the study of the surface properties of textile fabrics and threads.*

Keywords: *hairiness index, weight method, surface properties.*

Objectives. The property of fibers to protrude from the body of a textile product in the form of tips or loops is called hairiness [1]. Hairiness is an integral structural quality of any textile, which determines its surface properties (including aesthetic) and affects the speed modes of weaving and finishing processes, especially in the manufacture of technical fabrics. This determines the relevance of the invention to the methods of quantitative determination of hairiness of fabric [2] and it is the objective of this study.

Methodology. **S**ystem analysis method, experimental research methods, namely microscopic and weighing method were used in this work

Findings. The overwhelming number of publications on the subject of hairiness is devoted to determining its parameters for yarn. Hairiness is an undesirable property of yarn; it may lead to surface fraction and geometric roughness, uneven dyeing and color effect, interlocking of warp yarns during sizing and weaving, and a higher propensity to pill formation in the finished fabric. Therefore, hairiness must be measured and controlled. There are the following methods of determining the hairiness: optical, photoelectric and weight, which determine the various indicators. The following indicators are used to evaluate the hairiness: the number of fiber per unit length; average length of pile (mm); total length of the pile (mm); the total area of the pile (mm^2); specific linear hairiness (represents the total length of the pile per unit length of yarn). Most often use the first two, which are expressed by the hairiness index H [3].

In the field of the study of hairiness of fabric investigation and publications are few. Optical methods are the most widespread among the

methods for the study of hairiness of fabric. Their main disadvantages are the complexity and the lack of a numerical indicator. Therefore, it was necessary to attempt to use the weighing method to determine the hairiness of the fabric, using the hairiness index used mainly for yarn. The technique described in [4] was used. In this study, yarns were selected to conduct singeing treatment. COMBIWINDER GSX-12 singeing machine was applied to conduct singeing treatment. Then hairiness index were tested and compared with those of untreated yarns.

The experiment was conducted in the laboratory of the Department of Expertise, Technology and Textile Design of Kherson National Technical University. The fabric from the range of LLC "Vladi" (Kharkiv), consisting of wool (80%) and polyamide (20%) fibers and made by plain weave was selected as object of this study. All tests were conducted under standard conditions (65 ± 2 % RH and 20 ± 2 ℃) [6]. 100 × 100 mm prototypes were cut from the fabric. Their number is calculated from the results of a previous experiment, which provides a 95% confidence level that is accepted for the textile industry. At the beginning of the experiment, the mass of tissue samples was measured to an accuracy of 0.001 g. The samples were then heat treated (800 ° C, exposure time 3 seconds). This procedure simulates singeing treatment [5].

The snoots were carefully removed with a soft brush. It should be noted that after the heating process, the fabric surface is subjectively smoother to the touch. This is due to the greatly decreased number of hairs of fabric after singeing treatment. Mass loss (i.e. the mass of the removed hairiness) was determined after weighing the treated fabric samples. The appearance of tissue samples before and after heating is presented in Fig. 1.

In order to obtain the indexes of the tissue hairiness, it is necessary to go from the mass indexes to the indexes of the amount of pile and fiber, namely to determine the total length of the hairiness [7].

The calculation of the total length of the hairiness is finding the linear density of the each pile. Linear density can be determined by two methods:

1. Standard technique for determining the linear density of fibers by cutting the middle part of the staple [8].

2. Calculation of the linear density of fibers by its diameter, which is determined by direct measurement using the tools of the ToupView computer program [9].

The total length of the pile is calculated by the known formula for determining the text of the yarn or fibers [7]:

$$L = \frac{m}{T}$$

where m – the mass of the removed pile, mg;
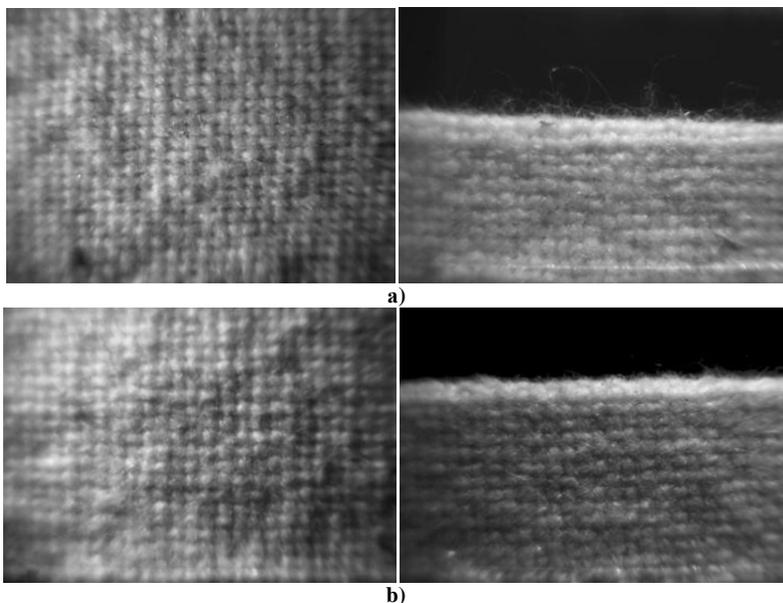
T – linear density of pile, mtex.

Fig. 1. Fabric samples: a) treated sample; b) untreated sample

Knowing the total length of the pile, it is possible to calculate other indicators of hairiness, for example, the number of protruding pile per unit area of tissue, the total hairiness area, etc.

Conclusions.

1.   On the basis of the analysis of existing methods for determining the hairiness of textile materials, the choice of a weighting method for the study of hairiness of fabric is substantiated.

2.   For the first time, an algorithm for determining the rates of hairiness fabric using a weighting method is proposed. This method is based on the principle of determining the mass of the removed pile and the subsequent analytical calculation of indices of the tissue pile.

3.   3. Information on the quantitative characteristics of textile fabric pile can be used to optimize the process of designing fabrics with specified surface

properties, and can also be included in the list of standard characteristics of textile materials.

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