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Changes in Ergonomic Properties of Non-Woven Fabrics

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ABSTRACT: The article describes the samples of cotton fiber and silk waste from the carding machine at the spinning mill were taken 100% cotton fiber, 50% cotton fiber, 30% silk, 20% mulberry bark waste, 70% cotton fiber, 15% silk, 15% mulberry bark waste, 75 % cotton fiber, 10% silk, 15% mulberry bark was obtained from waste fiber mixtures on the AChV-3 equipment by non-woven fabrics by the weaving method and ergonomic properties were determined.

KEY WORDS: surface density, breaking load, elongation at break, the coefficient of variation.

I.INTRODUCTION

Among the types of non-woven fabrics produced in the textile industry, fabrics made from natural fibers have a special place. However, nowadays, along with them, non-woven fabrics made from cotton fiber, which is a mixture of chemical fibers, such as viscose, lavsan, nitron fibers are also common [1].

Non-wovens are made from natural fibers, blends of natural and chemical fibers, as well as fiber waste. Non-woven fabrics are often used in technical fields.

One of the important factors for the development of the industry is the fact that the production of non-woven fabrics which does not require a lot of high-quality fibers, and the possibility of greater involvement of secondary raw materials and waste. On the other hand, the efficiency of the equipment used is also very high. Productivity in the production of textile products is 3-10 times higher, while in the production of carpets this ratio is up to 40 times [2].

The mechanical properties of non-woven fabrics indicate their response to the effects of various forces. These forces, on the other hand, are different, they can be large or small, and they can act once or repeatedly. The forces can act on the length, width, or angle of the nonwoven fabrics to a certain extent. As a result, bending, elongation, twisting and other deformations occur in non-woven fabrics.

The tensile strength of non-woven fabrics depends on their fiber content, the structure of the forming yarns and the linear density, weave, density, type of finishing. The thicker and denser the threads, the stronger it is. Finishing processes such as pressing, appretting increase the tensile strength of non-woven fabrics, while bleaching, dyeing processes slightly reduce the strength [3].

Simultaneously with the determination of the tensile strength, the elongation at this process of the specimens is also determined. The amount of energy expended to break the samples is the actual amount of work done in breaking them.

To compare the mechanical properties of non-wovens derived from different fibrous wastes are used indicators such as relative tensile strength and the specific amount of work performed in the tensile [4].

The quality of non-wovens depends primarily on the fibers they contain.

II. SIGNIFICANCE OF THE SYSTEM

Researches were conducted to study the mechanical properties of nonwovens. For this were studied 100% cotton fiber waste, 50% cotton fiber, 30% silk 20%, mulberry bark fiber, 70% cotton fiber 15%, silk 15% mulberry bark fiber, 75% cotton fiber, 10% silk, 15% non-woven fabrics were produced by weaving from fiber obtained from mulberry bark and their mechanical properties.

The results of the study are presented in table 1.

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Table 1
Changes in the mechanical properties of non-wovens depending on the composition of the secondary raw material

n	Secondary raw material composition in non-woven fabric	Nonwoven cloth surface density, g / m2	Nonwoven tensile strength of fabric, H	Nonwoven cloth elongation at break in %	Coefficient of variation of surface density of nonwoven fabric in %	Coefficient of variation in tensile strength of nonwoven fabric in %
1.	100% cotton fiber waste	131,9	52,6	30	14,4	14,0
2.	50% cotton fiber, 30% silk, 20% waste from mulberry bark	148,7	80,2	27	10,4	7,8
3.	70% cotton fiber, 15% silk, 15% mulberry waste	118,7	68,1	27	9,9	8,34
4.	75% cotton fiber, 10% silk, 15% mulberry bark waste	174,6	62,8	30	7,84	5,79

III. LITERATURE SURVEY

Comparing the research with the indexes of non-woven fabric obtained from 100% cotton fiber waste, 50% cotton fiber, 30% silk, 20% mulberry bark extract increased non-woven fabric surface density by 11.3%, tensile strength by 34.5%, elongation by 10.0%, the coefficient of variation in the surface density of non-woven fabric decreased by 27.7%, the coefficient of variation in the tensile strength of non-woven fabric decreased by 44.2%, 70% cotton fiber 15%, silk 15%, mulberry bark surface density decreased by 9.8%, the tensile strength increased by 22.7%, the elongation at break increased by 10.0%, the coefficient of variation in surface density of nonwovens decreased by 31.2%, the coefficient of variation by tensile strength of nonwovens decreased by 40.4%, 75% cotton fiber by 10% silk 15% mulberry bark bark non-woven fabric surface density increased by 24.5%, tensile strength increased by 16.2%, elongation at break did not change, non-woven fabric variation coefficient by 45.5%, non-woven fabric by tensile strength the coefficient decreased by 58.6%.

The analysis of the research results showed that the quality of non-woven fabric extracted from 50% cotton fiber 30% silk 20% mulberry bark was higher than that of other non-woven fabrics. The group of physical properties of non-woven fabrics includes hygroscopicity, air and vapor permeability, dust absorption, electrification, optical and heat retention properties.

Non-woven fabrics have the ability to absorb various substances in liquid, gaseous or vapor state. In this case, the mass, dimensions, tensile strength, stiffness and other properties of fabrics change. During the production and use of non-woven fabrics, they are always exposed to water or steam.

Non-woven fabrics have several properties that characterize their ability to absorb water or steam. These include moisture hygroscopicity, water absorption (capillary), water absorption and so on.Air permeability is the process of the sample itself, which is measured by the air permeability coefficient. The air permeability coefficient indicates the amount of air passing through 1square meter of surface in one second under known conditions of air pressure on both sides of the sample. When non-woven fabrics are exposed to heat energy, they have a number of properties: the ability to conduct heat, the ability to absorb heat, the ability to change or retain their properties under the influence of heat [4].

The air and thermal conductivity properties of non-wovens with different composition of secondary raw materials were studied.

Based on the study results, histograms of the coefficient of variation in air permeability, thermal conductivity, and air permeability of non-woven fabrics in

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Figures 1 and 2 were constructed.

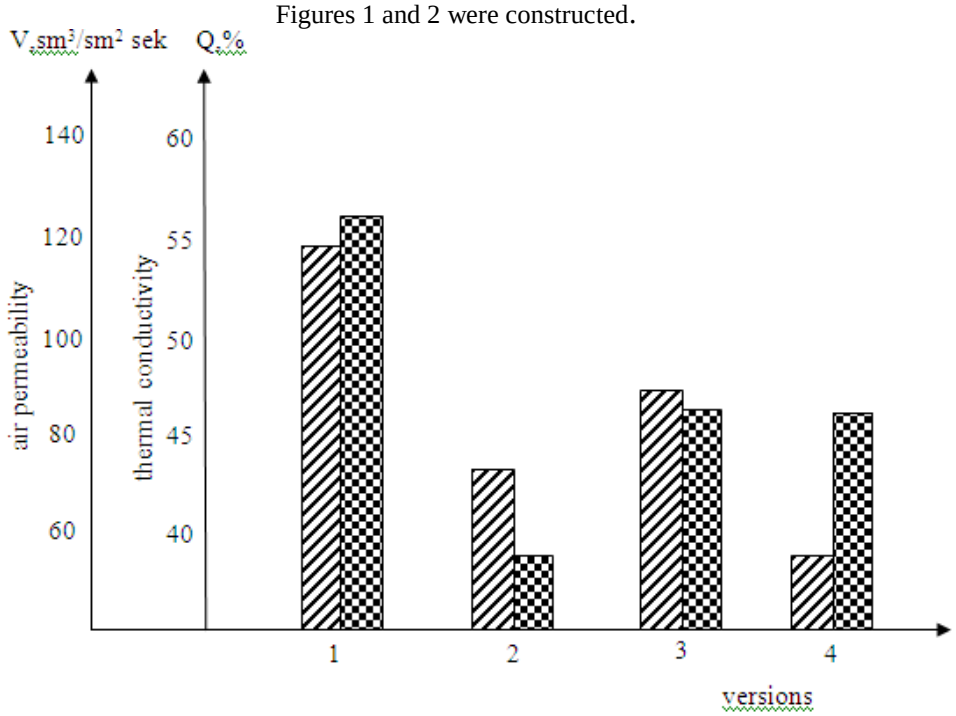

Figure 1. Air and heat of non-woven fabrics' change in conductivity.

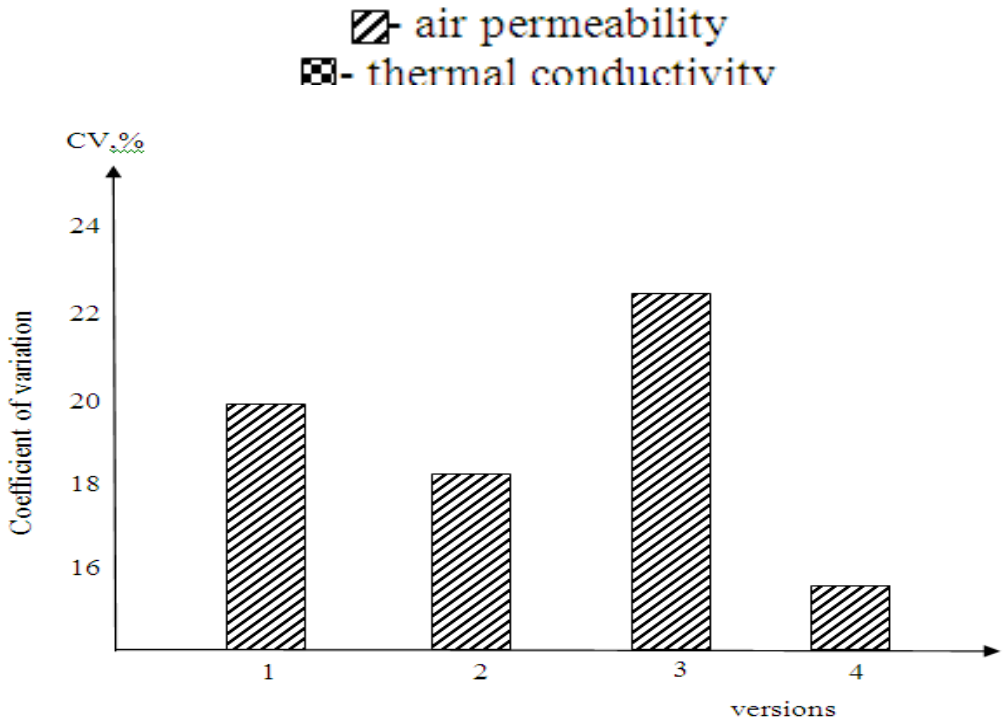

Figure 2. Variation of the coefficient of variation in air permeability of non-woven fabrics.

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Comparing the results of the research with the indexes of non-woven fabric obtained from 100% cotton fiber waste, 50% cotton fiber, 30% silk, 20% mulberry tree bark non-woven fabric has an air permeability of 33.8%, thermal conductivity of 29.1%, air permeability. The coefficient of variation on thermal conductivity decreased by 13.5%, coefficient of variation in air permeability increased by 15.5%, 75% cotton fiber, 10% silk 15% mulberry tree bark non-woven fabric air permeability 49.4%, thermal conductivity 14.5 %, the coefficient of variation in air permeability decreased by 16.8%.

The results of the study show that the air permeability of non-woven fabric is higher than that of non-woven fabric obtained from 100% cotton fiber waste and the heat retention property is higher than non-woven fabric separated from 50% cotton fiber, 30% silk, 20% mulberry bark.

If the waste composition of the non-woven fabric consists of 50% cotton fiber, 30% silk, 20% secondary raw material extracted from mulberry bark, this non-woven fabric has a high thermal conductivity. These non-woven fabrics are used as layers on the inner layers of young children's clothing.

IV. EXPERIMENTAL RESULTS

1. Analysis of the test results showed that the mechanical properties of non-woven fabric separated from the bark of 50% cotton fiber 30% silk 20% mulberry bark, so the tensile strength increased by 34.5%, elongation at break compared to non-woven fabrics with different secondary raw material composition. It was found that the coefficient of variation in the surface density of non-wovens decreased by 10.0%, the coefficient of variation in the tensile strength of non-wovens decreased by 44.2%.

2. Analyzing the test results, depending on the composition of the fiber waste, the air permeability of non-woven fabric is from 20.9% to 49.4%, thermal conductivity is from 13.5% to 29.1%, the coefficient of variation in air permeability is from 6.6% decreased from 16.8%.

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