METHODS TO PREVENT LOSE FIBERS WHEN SEPARATING THE COTTON FROM THE AIR

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Abstract: The article describes a research work to reduce the amount of free fiber coming out of a separator machine installed in the technological process of cotton gins. To reduce the sticking of cotton to the surface of the separator mesh, trapezoidal guides were proposed, mounted on the separator device and tested in the lengths of the guides 20 cm and 40 cm and the results obtained.

Key words: cotton, seed, fiber, air, separator, free fiber, suction, vacuum valve, mesh surface, guide.

Introduction. Today, as in all industries of the world, special attention is paid to improving the quality of products through the introduction of highly effective innovations in textile clusters, the creation of resource-saving technologies, and the improvement of existing techniques and technologies.

Significant results are achieved at the cotton-cleaning enterprises of the country's textile clusters in obtaining high-quality cotton products while maintaining the initial parameters of raw materials, improving methods and technologies for processing cotton. The relevance of the topic lies in the fact that in textile clusters it is important to preserve its natural properties, starting with the processing of cotton, in order to obtain high-quality yarn, high-quality fabrics and high-quality finished products. For this purpose, the existing design of the separator is being studied and improved to increase the efficiency of air separation of cotton [1].

Methodology. In the process of operation of machines installed in the technological process of ginneries, a certain part of the fibers suitable for production is added to the waste.

Research by scientists in the field has revealed that one of the causes of fiber loss is the transport of cotton in air pipelines, as well as in the process of cotton ginning, ginning, fiber cleaning [2].

The movement of the newly created separator in the working chamber in order to preserve the natural properties of cotton has been studied theoretically [3-4].

The novelty of this design is that a trapezoidal guide mounted on the side wall of the inlet pipe is inserted into the separation chamber and consists of a trapezoidal guide in the form of a trapezoid in the vacuum-valve direction. These guides reduce the movement of air-exposed cotton towards the mesh surface. During operation, a portion of the cotton entering the separator working chamber is captured by these guides and directed to the vacuum valve. The purpose of the experiment was to study the effect of changing the length and shape of the guides in the form of a trapezoid on the efficiency of the separator.

Taking into account the above, a guide separator was selected for practical research in the dissertation. This separator has a distribution chamber with mesh surfaces mounted on the side wall, inlet and outlet pipes, cotton swabs attached to the mesh surfaces, and a vacuum valve. The side walls of the inlet pipe are inserted into the distribution chamber and made in the form of trapezoidal guides bent in the direction of the vacuum valve. the gap between the guide in the form of a trapezoid is 50 mm.

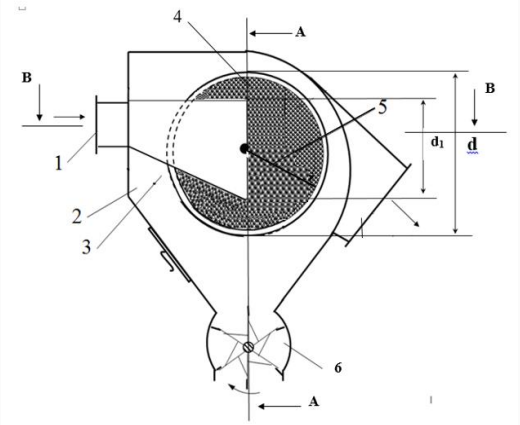

Figure 1. Schematic diagram of the routing separator (№FAP 20190205)
1-inlet pipe; 2-working cameras; 3-trapezoidal guide;
4-mesh surface; 5- suction; 6- air intake pipe; 7- vacuum-valve.

Figure 2. Separator working chamber with a trapezoidal guide.
1- trapezoidal guide; 2 mesh surface; 3-crew, 4-screw shaft.

Figure 1 shows a schematic of the improved separator [5], which includes inlet pipe - 1, a separation chamber - 2, a vacuum valve - 3, a scraper - 4, a guide in the form of a trapezoidal guide - 5, a mesh surface - 6 and an outlet pipe - 7. When the separator unit is operating, the raw material from the inlet pipe - 1 is directed to the separation chamber - 2 through the guides - 5. In this case, the air velocity in the chamber decreases. The main part of the cotton raw material hits the back wall of the separator chamber and under the influence of its own weight falls down to the vacuum-valve - 3. The fine contaminants in the air and its contents escape through the mesh surfaces - 6 and the outlet pipe - 7.

A small part of the raw cotton is glued to the mesh surface - 6 by air flow and scraped using a scraper - 4. The guides for the raw cotton are made in the form of trapezoidal guides. When the guides are installed, their direction is bent towards the vacuum-valve, which directs the bulk of the cotton raw material towards the vacuum-valve, and the efficiency of the process of separating the cotton from the air is increased.

After the installation of the trapezoidal guide, the reduction of the amount of cotton stuck to the surface of the 3-mesh allows the scraper-4 to work efficiently.

An experimental design of this device was developed for practical research (Figure 2) and an experiment was conducted. Determination of the amount of cotton fiber released by air on the mesh surface is carried out in a cyclone connected to a blower pipe next to the separator. The bag in which the bottom of the cyclone is mounted is inspected every hour.

To determine the amount of cotton adhering to the mesh surface, the mesh surfaces on the side of the working chamber were conditionally divided into four equal parts. To stop the scraper, it is necessary to remove the belt located on the pulley mounted on its shaft. As a result, we will be able to determine the amount of cotton stuck to the surface of the net.

Results. Studies have shown that cotton pieces stick mainly to the surface of the net, which is farther away from the inlet pipe. After installing a trapezoidal guide in the working chamber, we see a decrease in the amount of cotton stuck to the surface of the net.

Therefore, in the study, guides were installed in the inlet pipe of the new experimental sample. The following are the results of experiments conducted during the study.

Table 1. Check the efficiency of air separation in the separator

№	Trapezoidal guide width, cm	Amount of various compounds released by dusty air, kg / h	The proportion of raw cotton falling directly into the vacuum valve,%
11	20	3.7	92
22	40	3.5	94

It can be seen from the table that when the trapezoidal guide is installed, the impact of the cotton pieces on the mesh surface is reduced by 35-40%, which ensures that the bulk of the cotton pieces entering the separator working chamber fall into the correct vacuum valve. This, in turn, improves air absorption from the mesh surface, allowing to extend the distance of transportation of raw cotton from the bale to 10-15 meters.

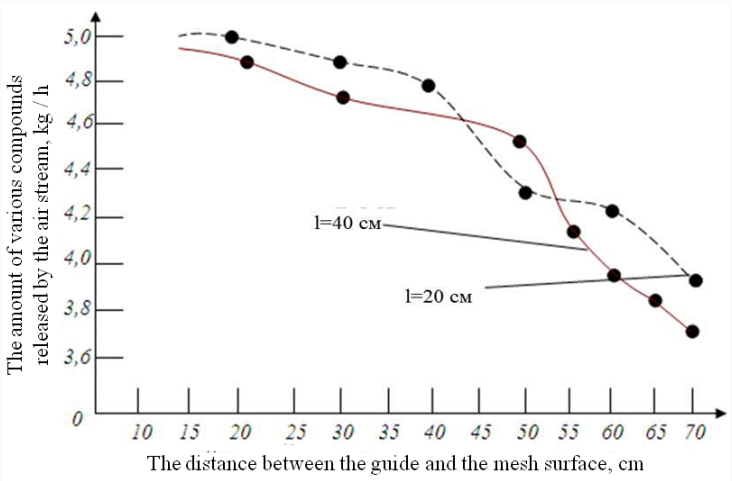

Figure 3. Dependence of the distance between the trapezoidal guide and the mesh surface on the amount of fiber emitted by the dusty air

The graphs show the test results of a set of guides installed in 2 variants (trapezoidal width of the guide: length 20 cm, 40 cm). The results show that the most efficient operation was observed in the variant with the largest number of guides in the form of a rope trapezoid.

Conclusion. Research has been conducted to reduce the amount of free fiber emitted by machines installed in the technological process of ginneries. In order to reduce the adhesion of cotton to the surface of the separator mesh, trapezoidal guides were proposed, mounted on the separator device and tested in the 20 cm and 40 cm lengths of the guides. Also, the most efficient operation was observed in the variant with the largest number of sets of routers in the form of a rope trapezoid.

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