ANALYSIS OF SCIENTIFIC RESEARCH ON IMPROVING THE DESIGN OF COTTON CLEANING MACHINES RESEARCHERS.

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Abstract: *This article presents an analysis of the structural features of cotton cleaning equipment installed at cotton processing enterprises, as well as current scientific research and investigations in this field. The study focuses on improving the efficiency of machines designed to remove large impurities from cotton. Experimental results are discussed based on changes in the diameter and spacing of the colossniks, including trials conducted with six- and eight-sided colossnik configurations.*

Keywords*: Saw drum, cluster, large impurities, cleaning, experiments, research, efficiency, impac*

In the global cotton cleaning industry, the development and implementation of technical and technological systems based on high-efficiency processes for removing small and large impurities from raw cotton has taken a leading position. In this regard, countries such as the United States, Australia, China, India, Uzbekistan, and others have achieved notable progress. Special attention is being paid to increasing production efficiency, improving technological processes, and ensuring the competitiveness of cotton fiber in the cotton cleaning sector.

“It has been observed that during the initial processing of raw cotton, preserving the natural quality indicators of the fiber and using resource-efficient technological equipment leads to a reduction in fiber production costs” [1]. Uzbekistan ranks among the leading countries in the world for cotton production. Therefore, a number of measures have been taken to implement the tasks outlined in the Presidential Decree of the Republic of Uzbekistan dated March 6, 2020, No. PQ-4633 “On measures to widely introduce market principles in the cotton industry,” the Cabinet of Ministers Resolution dated June 22, 2020, No. 397 “On measures to further develop cotton-textile production,” and other relevant regulatory documents.

To further develop cotton-textile production in the country, a new operational system — the cluster method — has been introduced. The cluster system encompasses the entire process from cotton planting to the final product. Cotton cleaning enterprises represent one link in this system. The process of removing small and large impurities from cotton is a key stage within these enterprises.

Particles with dimensions greater than 10 mm are classified as large impurities, while those smaller than 10 mm are considered small impurities [2].

The first saw-type cleaner developed in Uzbekistan is the BCH-2M model (Figure 1). This cleaning machine has a processing capacity of 1.2 tons per hour.

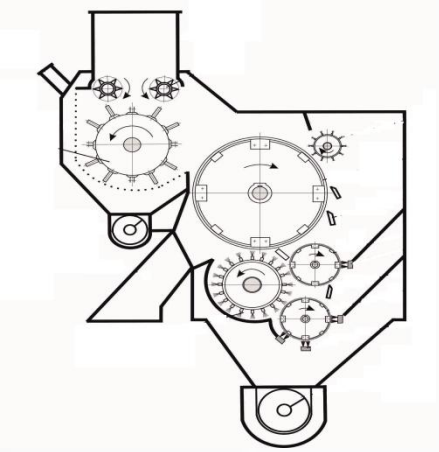

Figure 1. BCH-2M Saw-Type Cleaner

In recent years, “UXK” units have also been used for removing large impurities from cotton. Within the waste composition, it is possible to reduce the spacing between the colossniks in the initial, intermediate, and final regeneration sections, thereby improving the separation of cotton fragments.

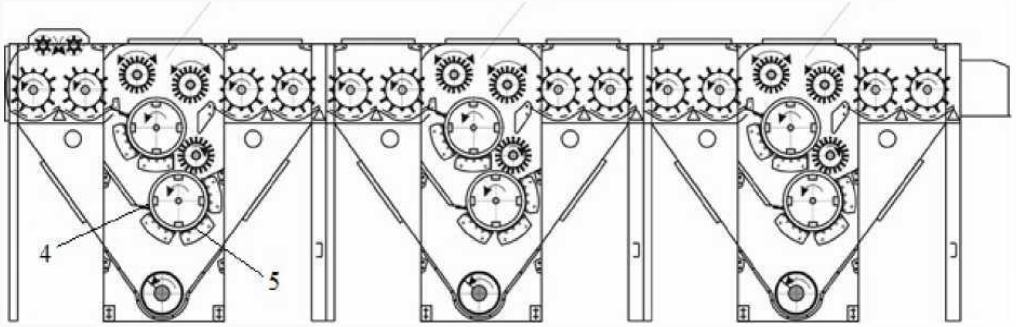

Figure 2. UXK Equipment Complex

Nowadays, many of our researchers are conducting scientific studies aimed at improving the design of machines used to remove large impurities from cotton. In the research conducted by A. Abrov, a rubber nozzle was fitted onto the colossnik grid to reduce the impact force when cotton fragments strike the grid during the cleaning process of large impurities.

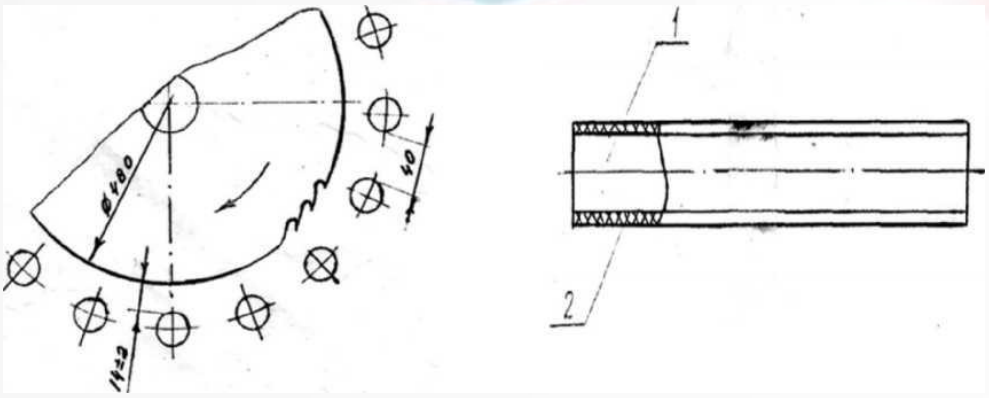

Figure 3. Rubber-Coated Colossnik

As a result, during the process of removing large impurities from cotton, the cotton fragments caught by the teeth of the saw drum strike the surface of the colossnik with reduced impact force, significantly decreasing the damage to the cotton seeds [3].

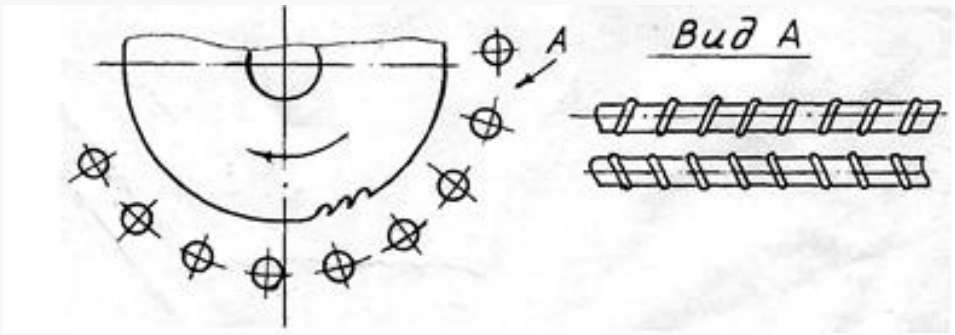

Figure 4. Cotton Cleaner with Uneven-Surfaced Colossnik Grid

Figure 4 illustrates how, during the process of removing large impurities from cotton, the cotton fragments caught by the teeth of the saw cylinder strike the surface of the colossnik. To reduce the impact force of this collision, the colossniks are mounted on an elastic base. As a result, damage to the cotton seeds is minimized, and the formation of various defects in the fiber is prevented. Additionally, installing the colossniks in a conical shape contributes to increased cleaning efficiency.

Moreover, the uneven surface texture of the colossniks enhances the cleaning process. During impact, the colossniks vibrate and shake, which accelerates the separation of impurities from the cotton.

Comparative studies show that when the newly proposed feeding device is used, cleaning efficiency increases by 4.6%, and the amount of free fiber in the cleaned raw cotton decreases by 0.016%. Initially, the amount of cotton fiber in the waste was the same for both the existing and proposed devices. However, over time, the brush-type cleaner showed increased cotton loss due to brush wear. In contrast, the proposed device demonstrated minimal wear, resulting in a more stable waste content. Considering these indicators, the proposed device offers high economic efficiency. Experimental trials of the cotton feeding device onto the surface of the saw drum confirmed the results through practical testing.

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