INTERNATIONAL CONFERENCE ON INTERDISCIPLINARY SCIENCE
Volume 03, Issue 05, 2026

DEVELOPMENT OF A LABORATORY STAND FOR INSTALLING A TRAPPER FOR HEAVY MIXTURES IN COTTON

Alisher Abdukholikov
assistant, Termez state university of engineering and agrotechnologies
190100, Republic of Uzbekistan, Surkhandarya region, Termez
E-mail: alisherabduxoliqov9394@mail.ru

ABSTRACT

The article presents the results of an experimental study of the influence of the long-pile drum diameter of the heavy impurity trap on the efficiency of separating heavy impurities in cotton and the amount of cotton added to the heavy impurities. Based on this, the parameters studied were: the diameter and rotation speed of the long-pile drum, the angle of inclination of the deflector at the base of the long-pile drum, the angle of inclination of the reflective wall, and the distance between the vacuum valve and the axes of the long-pile drum.

Keywords: heavy mixture, handle, device, diameter, speed, drum, effect, vacuum valve, separation, distance.

Introduction. Uzbekistan moved to full processing of cotton fiber in 2020 through the organization of cotton-textile clusters [1], as a result of which the requirements for the quality of cotton cleaning and its products have increased. In the operational process of a cotton-cleaning plant, the problem of separating heavy impurities from cotton is not sufficiently solved by existing stone-catching devices. The stone catchers used at the plants have a very low efficiency: they mainly capture large heavy objects, while small objects continue into the technological process.

Research methodology. To eliminate these shortcomings, research is being conducted to develop and substantiate the parameters of a device for separating heavy impurities from cotton [2, 3, 4]. According to the schematic of the heavy-impurity catcher in the cotton mass, its working drawings and a prototype device for separating heavy impurities were prepared at LLC “Ijod,” which is part of the JSC “Scientific Center Khlopkoprom.”

The following parameters were selected for study: the diameter and rotational speed of the drum with long spikes, the guide plane at the base of the drum with long spikes, the inclination angle of the reflecting wall, and the distance between the axes of the guide plane at the base of the drum with long spikes and the vacuum valve.

Below in Fig. 1 is the laboratory prototype of the device, a catcher of large weed impurities.

a) б)

Fig. 1. Experimental prototype of the device, a catcher of large trash impurities

a – housing of the unit with the long-spike drum,

b – housing of the unit with the vacuum valve

The drum with long spikes shown in Fig. 1, designed for capturing heavy impurities, was manufactured in three variants with diameters of 350, 400, and 450 mm, all having the same spike length.

The rotational speed of the drum with long spikes was adjusted using an electric motor and interchangeable pulleys attached to the drum shafts. Experiments were planned for three rotational speed options: 400 rpm (8.33 m/s), 600 rpm (12.5 m/s), and 800 rpm (16.6 m/s). During the experiments involving the vacuum valve and the drum with long spikes, two horizontal distances between the axes of the units were tested—350 mm and 700 mm.

The installation of the catcher for large weed impurities in cotton was assembled in the laboratory building of JSC "Scientific Center Khlopkoprom." Using a suction fan and the necessary pipelines, the process of extracting transported cotton from the air was carried out on centrifugal cyclone equipment (Fig. 2).

Fig. 2. Installation of the experimental setup of the large-impurity catcher device mounted in the laboratory workshop of the scientific center.

The operation of the laboratory bench of the large-impurity catcher device is carried out as follows. The outlet pipe of the device is intended for introducing cotton containing heavy impurities through pipes connected to the suction fan. Since the suction fan has special large blades, the cotton particles pass through the gaps between the blades and enter the fan's pipeline system, from where they are directed into the cyclone, where the cotton is separated from the air.

Under the operating conditions of the equipment and the pneumatic conveying system used at cotton-cleaning plants, the airflow rate and air velocity at the inlet pipe are approximately 5 m^3/s and 40 m/s, respectively, and depending on the velocity, size, and weight of the transported cotton, mainly from 18 to 25 m/s.

The heavy impurities in the cotton (conventionally stones) were divided into four groups by weight. In each group, about 100 stones of the same size and weight were selected, and their mass was determined using electronic scales (Fig. 3).

The weight of each selected stone in the four groups was as follows: in the first group – 25.9 grams, in the second group – 11.2 grams, in the third group – 5.6 grams, and in the fourth group – 3.0 grams.

Each experimental variant was repeated three times to ensure repeatability. To obtain more accurate research and development results based on the generalization of statistical information collected during the experiments and to avoid errors, one of the widely used methods today is mathematical statistics [5, 6, 7].

Fig. 3. Groups of stones selected for use in the experiments

For the experiments, cotton of the S-6524 selective variety, industrial grade II, class 2, was selected, with an initial trash content of 5.6%, moisture content of 9.1%, and mechanical seed damage of 0.8%.

To obtain high-precision results and eliminate errors when processing research and development data based on the generalization of statistical information collected during the experiments, it was planned to process the results using one of the widely applied modern methods—mathematical statistics.

Research results. The results of the experiments are presented in the graphs in Figures 4 and 5 below.

From the analysis of the graphs shown in Figure 4, it can be seen that the diameter of the drum with long spikes does not have a significant effect on the separation of relatively heavier impurities (stones) from cotton.

Thus, graph No. 1 in Fig. 4 is represented by a straight line, and the efficiency of the heavy-impurity separation device is the same for all variants, amounting to 75%. However, as the weight of the heavy impurities decreases, the obtained results differ from one another, and the graphs change from straight to curved. The results showed that the greater the weight of the stones, the higher the efficiency of their separation, and the smaller the weight of the stones, the lower the efficiency of separating them from the transported cotton.

References

1. Abdukholiqov A.U., Karimov M.R., Abdurahmonov O.Sh. "Development of a linear gripper device for heavy mixtures in raw cotton" *Scientific-Technical Journal of Fergana Polytechnic Institute*, pp. 209–212.

2. Abdukholiqov A.U., Karimov M.R., "Working out and implementation of the safflower cleaning machine" *Materials of the Republican Scientific and Technical Conference "Problems and Solutions of Cargo and Passenger Transportation in the*

Southern Region of the Republic", Termez State University of Engineering and Agro-Technologies, October 25–26, 2024, pp. 314–318.
3. Abdukholiqov A.U., "Development of a highly efficient gripper device for heavy mixtures" *Materials of the Republican Scientific and Technical Conference "Problems and Solutions of Cargo and Passenger Transportation in the Southern Region of the Republic"*, Termez State University of Engineering and Agro-Technologies, October 25–26, 2024, pp. 723–726.
4.