

## ANALYSIS AND IMPROVEMENT OF EQUIPMENT FOR SEPARATING COTTON PIECES FROM COTTON CLEANER WASTE

Jamolov R.K., Karimov T.K.

Scientific Research Institute of Fiber Crops

### Abstract

This article analyzes axial-flow equipment designed to separate cotton pieces that remain in the large waste generated during the cotton cleaning process. The design and technological features of currently used regenerators are studied, and the reasons for their decreased cleaning efficiency in the presence of fine impurities are revealed. The paper substantiates the possibility of increasing regeneration efficiency by introducing a mechanical receiving feeder in place of a pneumatic supply unit.

**Keywords:** regeneration, saw drum, pneumatic feeder, waste, cotton pieces, cleaning efficiency.

### INTRODUCTION

At primary cotton processing plants, various types of saw and spiked drum equipment are used to clean raw material of large and small impurities. However, a certain amount of cotton pieces remains in the waste separated during the cleaning process. This situation increases technological losses and reduces economic efficiency.

In recent years, regenerators operating on the axial-flow principle have been used to re-separate cotton pieces from waste. Practical experience shows that their effectiveness varies depending on the composition and contamination level of the waste. Therefore, the analysis and improvement of existing designs is a relevant issue [1, 2, 3].

Cotton cleaning units use sections consisting of saw drums and grate bars to separate large impurities. Subsequently, combined machines designed for the simultaneous separation of small and large impurities were created. In such

equipment, the cotton mass moves axially via a screw; small impurities are separated in the spiked drums, and large impurities are separated in the saw sections.

However, they were not widely implemented due to the complexity of their design, difficulty of maintenance, and limited productivity. Special regenerators were also developed to separate cotton pieces from waste. They primarily operate using a pneumatic supply system.

In the most common designs, the pneumatic feeder has a semi-cylindrical shape, with the inlet and outlet pipes positioned tangentially. A fan creates a vacuum in the chamber, and the waste is drawn by the airflow into the cleaning section [4, 5].

As the saw drum rotates, cotton pieces are caught by the teeth and separated from the waste by striking the grate bars. The separated cotton is doffed by a brush drum and thrown back into the stream. The process is repeated several times to achieve regeneration.

Observations show that cotton pieces are re-cleaned 3-4 times. At a low level of contamination, the regeneration efficiency reaches 90-95%. However, when the share of fine impurities in the waste exceeds 30%, the cleaning efficiency decreases significantly. In this case, the contamination of the regenerated cotton increases, and adding it to the main stream leads to a decline in fiber quality.

The main cause of the problem is the airflow turbulence and the insufficient inertia of fine fractions within the pneumatic supply unit. Small impurities and light cotton fibers are directed to the outlet pipe by the airflow without reaching the saw drum. Attempts were made to solve the problem by installing various baffles in the pneumatic feeder, but this did not yield positive results due to an increase in aerodynamic resistance.

The analysis results showed that the pneumatic supply system is the weak link of the regenerator. Therefore, it is advisable to use a mechanical receiving feeder instead of a pneumatic one. In this configuration, waste is fed in a controlled manner into the working zone of the saw drum using a screw or a bladed drum.

This method provides the following advantages:

- the probability of cotton pieces reaching the surface of the saw drum increases;
- air turbulence is reduced;
- fine impurities are separated in a controlled manner;
- cleaning efficiency is stabilized.

According to calculations and experimental observations, using a mechanical feed can increase regeneration efficiency by 10-12%. At the same time, the contamination level of the regenerated cotton is reduced.

### REFERENCES

1. Coordinated Technology of Primary Cotton Processing, PDI 30-2012, "Uzpaxtasanoat" Association, "Paxtasanoat Ilmiy Markazi" JSC, Tashkent, 2012. - 35 p.
2. Manual on the Primary Processing of Cotton. - Tashkent: "Nodirabegim Publishing House," 2019. - 477 p.
3. Djamolov R. K., Abdurakhmonov R. S., Abidova A. R., Abdullayev K. Y. Analysis of Equipment for Separating and Cleaning Cotton Fragments from Waste Discharged by Cotton Ginning Machines. Scientific Journal of Mechanics and Technology. Namangan Institute of Engineering and Construction, Vol. 5, No. 3, 2024, p. 15.
4. "Development and Mastering of Serial Production of a New Saw-Type Cleaner for Seed Cotton from Large Debris," R&D report under contracts, P.N. Borodin, "PAXTASANOAT ILMIY MARKAZI" OJSC, Tashkent, 2012.
5. Abidova A.R., Djamolov R.K. Development of a Device Design for Cotton Waste Regeneration. // Universum: Technical Sciences: electronic scientific journal. 2023. 5 (110).