

Product Quality's Analysis by Improving Cotton Cleaning Technology

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Abstract: This article is about the national process of processing raw cotton with a variety of problems in cleaning large and small scum. In order to find solutions to this problem, it has determined by the analysis of the effectiveness of the small-scale cotton-fertilization technology for other cotton fertilizers compared to other models.

Keywords: cotton, litter, pressure, feed rollers, density, linear speed, rotation speed, power, speed, length, force, seeds, mass

Introduction. At the current stage of development of ginneries, one of the biggest tasks is to improve the quality and productivity of industrial products. Cleaning of the cotton from contaminants is important in overcoming these tasks. That is, the quality of the fiber obtained is directly related to the degree of contamination of cotton, so the cleaning of cotton from contaminants is one of the main directions in the cotton industry.

The processed cotton will contain fine and coarse impurities and mineral compounds. Contamination in cotton consists of leaves, twigs, bushes, stems, flowers, buds, stalks, weeds. Mineral compounds consist of soil, dust, sand, stones, and sometimes pieces of metal. Contamination is conditionally divided into large and small types, and compounds larger than 10 mm are considered major contaminants. Qualitative assessment of contamination takes into account the size of the particulate matter and their binding to the fiber, as well as brittleness. In this case, regardless of the size, they are brittle stalks, which become more and more fragile and bind to the fibers when exposed to mechanical action for cleaning, such as dried leaves. They are also called active pollution, and those that are not dispersed are called passive pollution. Large contaminants are usually located on the surfaces of cotton pieces, are loosely bound to the fibers, and are relatively easily separated [1-4].

The Main Findings. The function of large dirt cleaners is mainly to remove large contaminants, which is especially important in machine harvesting conditions. They have the following basic technological requirements:

- no damage to the fibers and seeds during the cleaning of cotton;
- not separating fiber from seeds;
- not to waste cotton fibers and fibrous seeds;
- control and adjustment of productivity, cleaning efficiency and consumption of cotton pieces;
- the efficiency of the cleaner, the dimensions of the installation should be appropriate to its place in the composition of the cotton gin.

The process of separation of mixtures from cotton depends on the selection variety of cotton, the characteristics of the industrial variety, its moisture level, fiber length, the time of addition of the mixture to cotton and the nature of adhesion to the fibers.

The effectiveness of cleaning cotton from contaminants depends on the method of exposure of the machine to the cotton: shaking the cotton on a net surface or rake, air flow interference during cleaning, the dynamic effect of piles or planks on the cotton, the dust of the saw drums tickles and scrapes.

The increase and decrease in the productivity and efficiency of the ginnery depends on the technological processes of drying and cleaning of cotton. Nowadays, due to the increase in the number of varieties of cotton and the emergence of certain varieties that are difficult to clean, it is necessary to improve the technology and techniques of cleaning cotton from contaminants [5-8].

To date, the ginnery is used in the machine 1XK well-grained cleaning machine.

Below is a diagram of the cross section of this machine. The cleaner consists of 8 pile-bar drums. The pegs are 75 mm high, and after each row of pegs, the bars are fastened to the drum at the same height. Under the drums are mounted grate.

The cotton is loaded into the machine through the loading shaft to the supply rollers (1). The supply rollers are responsible for the uniform supply of cotton to the pile-rail drums.

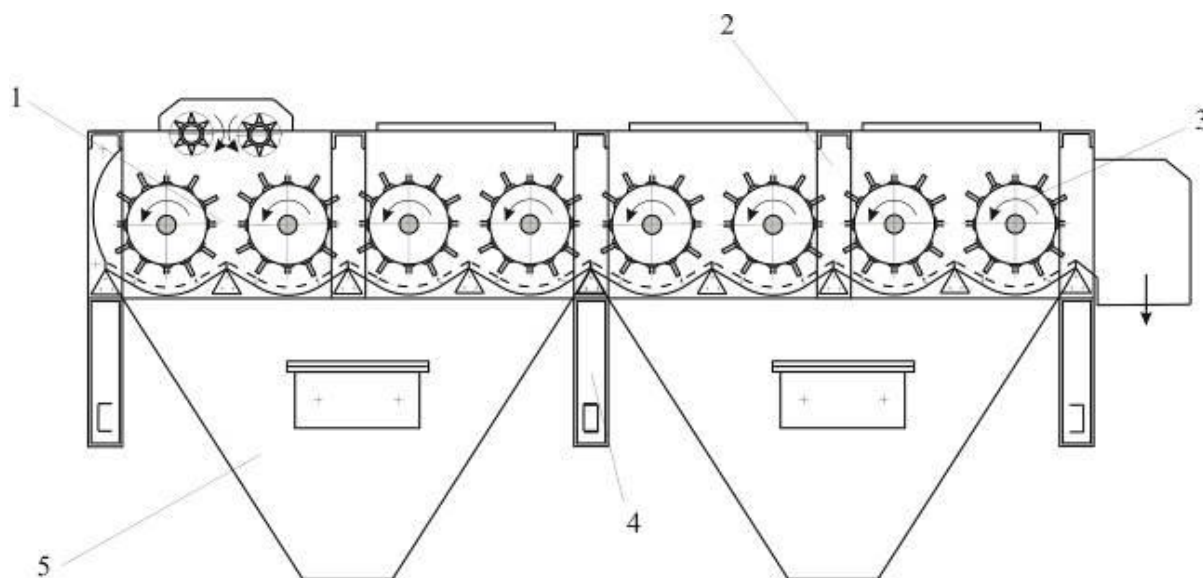


Figure 1. Scheme of 1XK cotton cleaner.

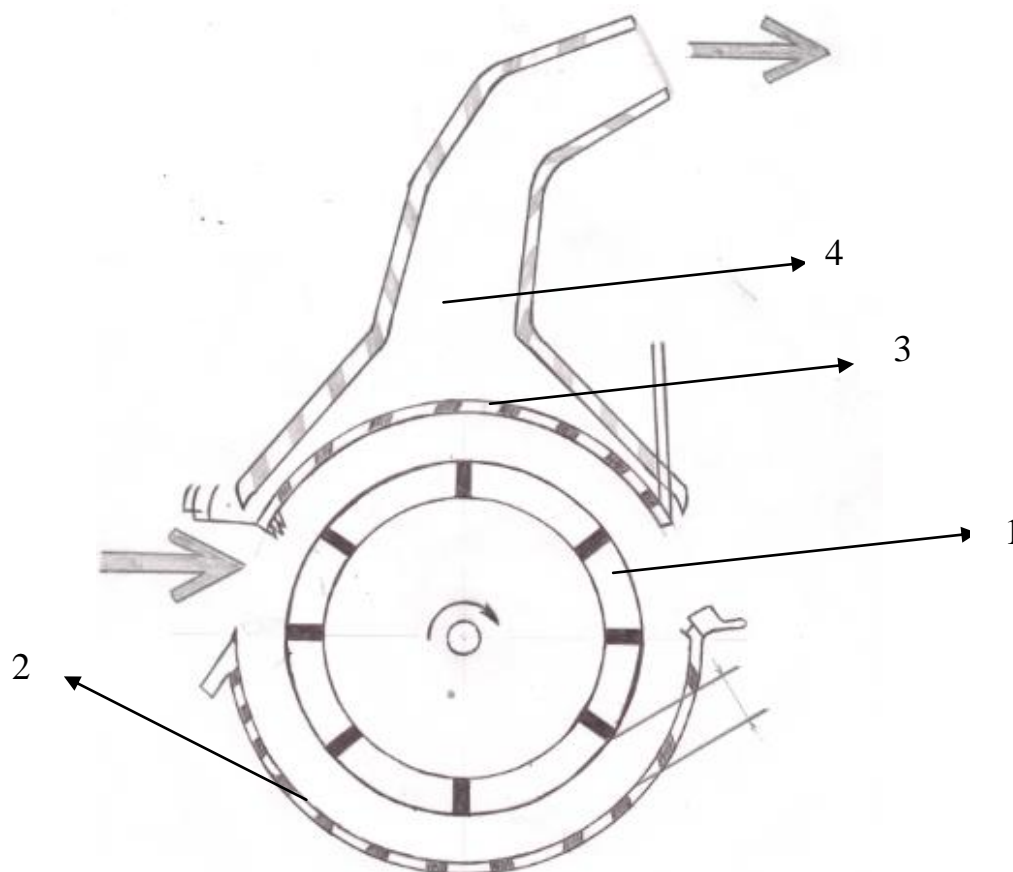
1- feed rollers; 2- stick cylinders; 3-net surface; 4- column; 5- bunker of dirty impurities

Cotton is passed through net surfaces with drums, which separate the contaminants. The two-pile block forms a cleaning section together with a hopper that removes contaminants and can be used independently.

It is recommended to combine cotton cleaner which called 1XK one at a time into the initial and final sections to hard-to-clean cotton gins. The UXK cleaner unit is also used in row-assembled complexes or ginning units [9-10].

The cotton regenerator called 1RX consists of a semi-cylindrical axial pneumatic feeder and an EN.177 saw section. Regenerator 1RX is used to separate cotton from waste. It is recommended to collect and process the separated cotton.

In order to improve the technological processes of the machine for cleaning small contaminants type 1-XX, scientific research was conducted and analyzed in the production environment. The results showed that the air flow generated from the first pile drum was found to have minor impurities (soil and cotton leaf particles) mixed with the air and adversely affected the natural properties of the fiber after the next technological process.



Improved technological scheme of 1-XX cotton cleaner.

1- stick cylinders; 2-net surface; 3- air inlet pipe, 4- suction pipe inside the box

In order to overcome these problems, an air inlet device was developed and experimental tests were carried out on the top of the first pile drum. The work enters the roll box through the 1st cotton supply roller. The 2-pin drums are cleaned of fine contaminants through the 3-net surface. 4-A net surface is placed on top of each pile drum and an air duct is installed to suck the dust air.

Based on the analysis of scientific research, a working scheme of a new cotton separator was prepared. The advantage of this device is that the air direction changes and the probability of cotton encountering these net surfaces is reduced due to the fact that the net surface is mounted upwards in the separator working chamber [11-13].

Results and discussion. The initial contamination of AN-35 III grade 2 class raw cotton was 11.9%, after cleaning 5.4%, and the cleaning efficiency was 54.6%. AN-35 IV grade 2 cleaning efficiency of cotton with primary contamination 15.5%, cleaning efficiency 56.1%, S65-24 grade II with cleaning efficiency 9.6%, cleaning efficiency 53.1% formed. It was found that the amount of cotton separated in the waste during the cleaning of cotton with primary contamination was 5.2% of the mass of waste. However, during the test work, the device was observed to work efficiently without clogging.

According to the results of comparative research tests, after the cleaning process of S-6524 II / 2 industrial grade cotton, the amount of cleaning of fine defects increased from 4.42% to 2.85%, the sum of fine impurities increased from 1.14% to 0.96%, fibrous the amount of 0.93 to 0.91%, the amount of broken seeds from 0.69% to 0.65%, the amount of fibrous seed husk from 1.01% to 0.98%, the amount of sprouted fiber from 0.07% to 0.05% The decrease was determined on the basis of quality indicators of fiber products.

Conclusion. In conclusion, the research conducted to improve the design of the pneumo-separator, as well as the new designs created, will increase the efficiency of the process of separating cotton from the air stream. As a result, it ensures that the cotton is separated from the air stream and fully adheres to the saw teeth, without damaging the cotton fiber and seeds, without affecting the quality of the cotton. It also helps to effectively clean the contaminants.

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