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PRINCIPLES OF IMPROVEMENT OF HEAVY MIXTURES FROM COTTON RAW MATERIALS

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Abstract: This article provides an analysis of devices that capture heavy impurities from the composition of cotton raw materials available in cotton ginning enterprises and ways of their improvement. In addition, the condition of the equipment used in foreign enterprises was also analyzed for comparative studies. During the research, the negative effects of heavy compounds in cotton on the working organs of devices in the technological process were also studied.

Keywords: cotton, ginning, heavy mixtures, device, incinerator, pipeline, pneumotransport, improvement, efficiency.

Introduction. Today, one of the most important problems in cotton ginning enterprises is various impurities, heavy impurities and cases of damage to cotton. During the initial processing of cotton, when raw cotton is sent to the process of cleaning and separating the fiber from the seed, heavy objects with cotton are transferred to the technological process, and fire occurs in the machines, and cases of damage to the working bodies of the technological machines occur. This in itself has a negative impact on the deterioration of the quality of the fiber and the continuous operation of the cotton pre-processing society. In addition, energy efficiency is also important during the operation of cotton ginning machines. It is also important to increase work productivity and increase production capacity [1,2].

The first aerial conveyor was used by Dorfman in 1893 to unload grain from ships. The efficiency of the device was small and it consumed a lot of energy. Despite this, it was widely used in Europe for unloading grain. Because the air transport device had a number of advantages over mechanical transporters.

Pneumatic transport was gradually used successfully in the fields of grain processing, chemistry, and construction [3]. The development of science and technology has further expanded the fields of application of pneumatic transport equipment. In particular, the emergence of methods of transporting the transported material in capsules [4] in pneumatic machines opened up new prospects for development in this field.

We have already mentioned that the suction type pneumatic transport is mainly used for the transportation of cotton inside the enterprise. The advantage of the suction pneumotransport is that the working air pipe system can be easily changed depending on the location of the storage areas of the cotton ginning enterprises, and its length can be extended by connecting additional air pipes to the primary air pipes. . The productivity of the pneumatic transport depends on the production capacity of the cotton

ginning enterprise, that is, the amount of raw cotton processed per hour, which is on average 10 tons per hour.

In foreign countries, mainly US cotton cleaning technology is used. In this technology, cotton is transferred to production using pneumatic transport equipment (Fig. 1).

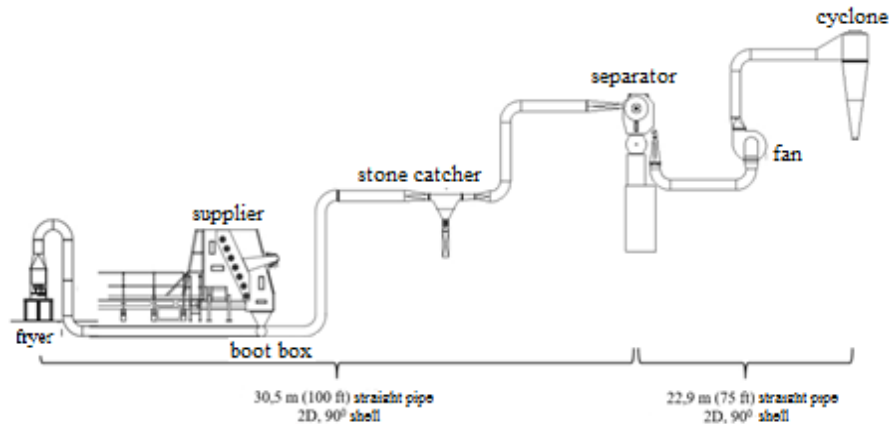


Figure 1. US cotton cleaning technology pneumatic transport system.

The peculiarity of this equipment is that it has a system for breaking cotton modules and heating the air used. This system allows the technology to transfer cotton with the required productivity and uniformity and to a certain degree. As a result, cotton dries to a certain extent during transportation. At the same time, heating cotton ensures better separation of impurities from it.

It is appropriate to use this feature in the cotton industry of our country. The scheme of pneumatic transport used in the Uzbek cotton industry is presented in Figure 2, and it has the same structure as the US pneumatic system.

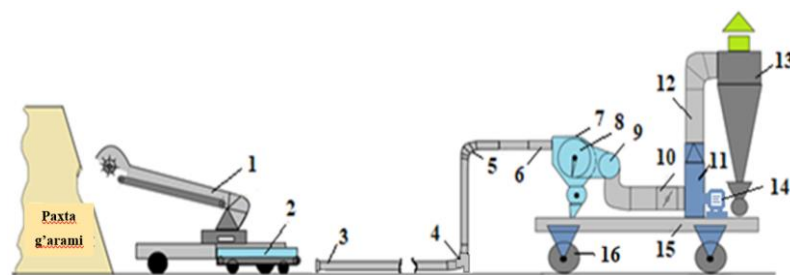


Figure 2. Pneumatic transport equipment of cotton ginning enterprises.

- 1-Mechanical cotton conveying equipment; 2- auxiliary belt conveyor; 3-working air pipe; 4- stone crusher; 5- shell; 6-diffuser; 7- separator; 8- suction air duct; 9- collector; 10-throttle; 11- fan; 12-exhaust air duct; 13- cyclone; 14-electric walker; 15-trailer; 16-wheel

The composition of cotton significantly affects the efficiency of the equipment installed in the technological process of cotton ginning enterprises, and their continuous

operation. Heavy impurities in the cotton content cause damage to the working parts of cleaning machines and saw teeth of gins and linters during its processing. This change causes damage to the seed and fibers during the extraction of fiber from the seed in the gin machine.

In cotton cleaning machines, it causes a decrease in the cleaning efficiency, as well as the addition of more cotton particles to the waste. In addition, heavy impurities can cause fires as a result of hitting metal working bodies of processing machines. Therefore, the entrapment of heavy impurities in the working chambers of cotton processing machines has always been the focus of scientists and industrial experts in the field, and they have searched for ways to keep the heavy impurities fully contained in the air-assisted conveying device.

D. L. Kelbert found out the causes of fire in the process of separating the fiber from the seed in the saw teeth of the cotton cleaning, gin and linter machines. It was determined that metal fragments (nails, nuts, washers) contained in heavy mixtures are the main cause of this.

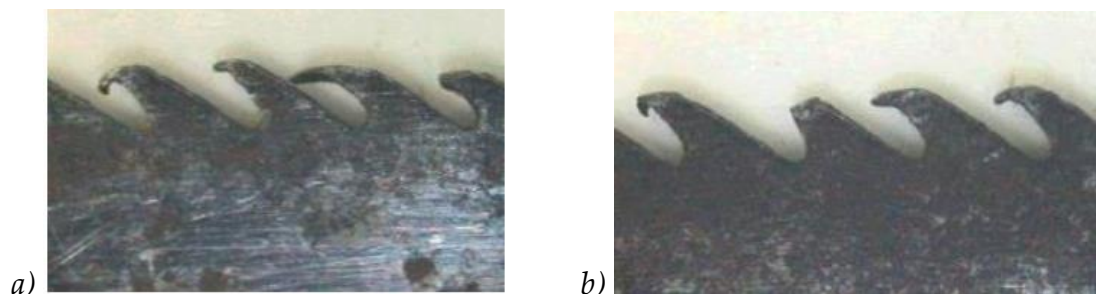


Figure 3. Damage to saws caused by stones and metal objects:
a) state of bending of teeth, b) state of bending and fracture of teeth

T.D. Makhametov studied the causes of breakage of saw teeth in linter and gin machines in his research work. The experiments conducted by the authors [5] showed that the damage of the saw teeth was caused by the metal pieces accidentally falling into the working chamber of the gin. (Fig. 3.)

In cotton gins, line separators are widely used in the technological process to separate heavy impurities. Linear heaters have a number of advantages over other heaters, such as simplicity of structure, ease of use, low cost and reliability.

But despite the fact that today there are various designs of linear stone crushers, the researches of scientists and experts in this field have shown that there is currently no equipment that is effective enough, and the existing ones do not meet the requirements.

Based on this, it is now very necessary to develop new, high-efficiency dryers and apply them to the technological process of cotton ginning enterprises.

Improvement of the structure of devices that separate heavy impurities from cotton and increasing their efficiency often depends on the results of research conducted by a wide range of scientists.

They conducted a series of researches to find the laws necessary to increase the efficiency of the devices by sifting the heavy mixtures mixed with cotton. They searched for the most effective types of working bodies and their geometrical parameters of the pulverizing devices, taking into account the physical-mechanical and aerodynamic properties of cotton and heavy mixtures [6].

The increase in the rate of cotton preparation puts the task of increasing production capacity, increasing the productivity of equipment, and improving the quality of products before the cotton processing industry. The performance of these tasks is highly dependent on the operation of the air-borne transport device deployed in the area. Because it is directly included in the continuous technological process of the cotton ginning enterprise, it is an important part that determines its initial and work pace.

It is divided into two types depending on the place of installation. The first one is called a line stoner. They are located in the line of the air conveyor and are installed up to the separator. The second is non-linear separators, which are installed after the separator.

Let's get acquainted with the linear stone crushers that are common in cotton gins. At first, you will get acquainted with the construction of the damper, which is installed at the transition of the horizontally located pipe of the air transport device to the vertical position.

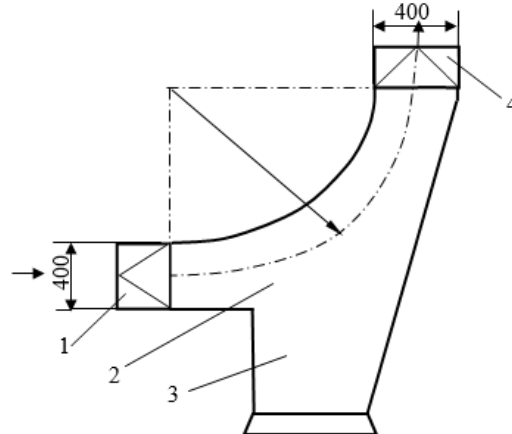


Figure 4. Radial stone holder.

1. Inlet pipe, 2. Separation chamber, 3. Pocket, 4. Outlet pipe

The above stone trap (Fig. 4) is mainly composed of an inlet pipe (1), a separation chamber (2), a pocket (3), and an outlet pipe (4).

This dryer works as follows: the cotton and its heavy impurities, which are transported by suction air in the air conveyor, enter the separation chamber through the inlet pipe and hit the walls of the separation chamber with a slightly reduced speed. As a result, heavy impurities from the cotton content fall into the bottom pocket.

Air flow assistance continues its course through the cotton outlet pipe, which has been cleaned of heavy impurities.

Due to the fact that the efficiency of this trap is low - around 60 percent, it is necessary to conduct scientific research on the improvement of its structure.

Nowadays, it is an urgent task to improve the efficiency of the technological process, work productivity, and maintain the quality indicators of cotton raw materials in cotton ginning enterprises by improving the constructions of existing ginning devices. A number of theoretical and practical works are being carried out in this regard.

In order to eliminate the existing problems in the cooling devices, a new improved design of the cooling device was developed. In the improved construction of the offered sintering device, cotton raw material hits the mesh surface mounted on an elastic base and is transferred to the next process, and the heavy impurities separated from the cotton content are continuously discharged through the pocket. As a result, seeds are protected from damage and lead to reduction of various defects in fiber content and improvement of fiber quality.

Theoretical and practical research is currently being conducted on this device.

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