

Improvement of Drive Separator Design for Increase Performance

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Abstract: In this article, the problems of improving the efficiency of the moving separator, which is the main working part of the device used in cotton ginning enterprises for transporting cotton by air, are studied.

Keywords: Pneumatic conveyor, stone, mesh surface, pile drum, spring, separator, pipe, fan.

The main task of cotton ginning plants is to produce high-quality fiber, lint and seed from the cotton received annually, while preserving its natural properties. To achieve this task, it is necessary to properly organize the technological process of primary cotton processing and effectively use ginning machines.

The impurities found in cotton are divided into organic and mineral substances by origin. Organic substances include cotton leaves, twigs, calyxes, flower petals and other plant parts. Mineral additives include stones, sand, soil, chips and others.

The primary processing of cotton consists of a number of technological processes (storage, storage, transportation, drying, cleaning, fiber separation, etc.), forming a unique technological chain. This chain is closely related to the performance of each unit and the quality of the machines preceding it. Taking this issue into account, it can be concluded that the technological chain equipment has a significant impact on the quality indicators of cotton.

In cotton ginning plants, the cleaning of raw materials from impurities and transportation to the drying shops is carried out in the pipelines of the air conveyor. Its simplicity and the ability to deliver the product to the specified places in any complex directions without damage have led to the widespread use of the air conveyor in the cotton ginning industry.

In cotton ginning plants, it is not possible to transport cotton from the ginning area 200 meters or more from the main building with a single air conveyor. As we know, the efficiency of a cotton ginning machine is determined by the following formula:

$$\kappa = 100(1 - \frac{c_1}{c_2}) \quad (1)$$

In this case: c_1 - impurity in unginned cotton (%)

c_2 - impurity in cleaned cotton (%)

In order to increase the impact zone of the pneumotransport device at the Dostlik cotton ginning plant, a device consisting of a four-pile drum and a mesh surface is installed in the centrifugal fan device. (Figure 1)

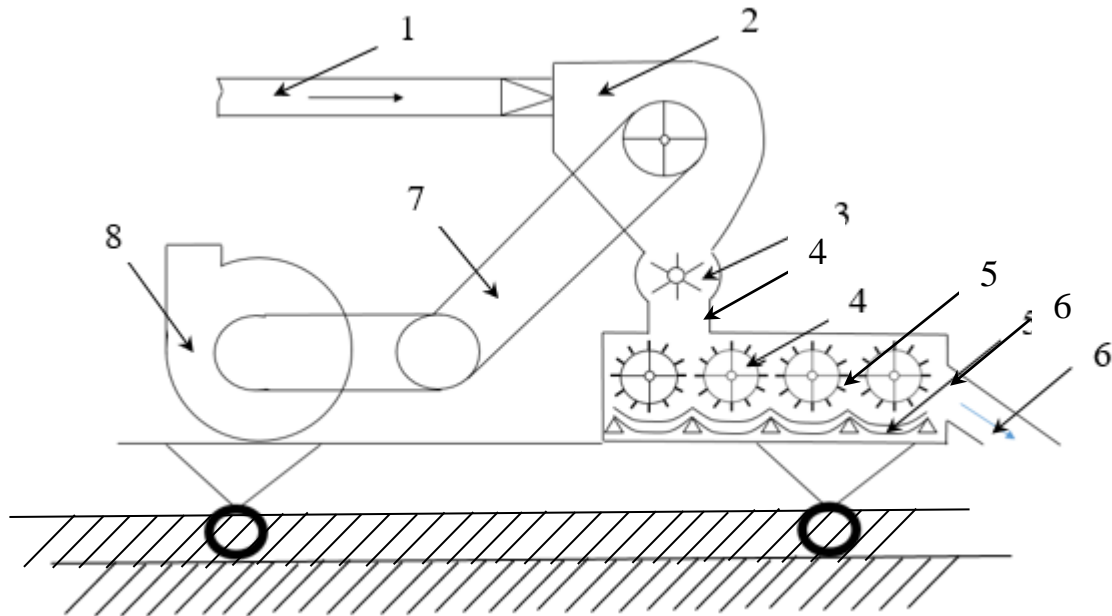


Figure 1. Improved propulsion device circuit

1. Inlet pipe, 2. Separator SS-15A, 3. Vacuum valve, 4. Pile drum, 5. Mesh surface, 6. Seed pipe, 7. Air intake pipe, 8. Fan.

In the technological process of the Dostlik cotton ginning factory, an experiment was conducted using an improved moving device in the device that transports cotton in pipes with the help of air.

In the cotton separator, the cotton separated from the air is compressed with the help of vacuum-valve blades and thrown into the first pile drum.

The cotton is sifted by the piles of the first drum, and as a result of hitting the mesh surface, small impurities are released.

After the first cotton drum, the second, third and fourth drums repeat the above process.

During cotton transportation in pipes and separation from air in the separator, active impurities in its content can turn into passive impurities.

Currently, VTs-12m centrifugal fan is used to transport cotton from a distance of 100-150 meters in cotton ginning plants. If we look at the aerodynamic characteristics of the VTs-12m fan, air consumption $Q = 7 \text{ m}^3/\text{s}$, full pressure $H = 6000 \text{ Pa}$ will be around. 75 kW electromotor for the VTs-12m fan, 11 kW electromotor for the separator is installed when the drive unit is operating. 62 kW of electricity is used per hour to transport cotton 100 meters away. If the devices are located at a distance of 200 meters, and a mobile device is connected in series to a stationary device, then the energy consumption will double and amount to 124,000 sum.

In some factories, a mobile unit is installed in the structure of the mobile unit to clean 1HK cotton from small impurities. It consists of four or six drums with pegs and a mesh surface.

In an improved mobile unit, the blower pipe of the centrifugal fan is blown under the vacuum valve of the separator. As a result, it becomes possible to use air that simultaneously sucks and blows cotton from the impurities in the machine.



Figure 2. An improved moving device installed in a cotton ginning plant located in Gijdivon district

1-centrifugal fan, 2-suction pipe, 3-separator, 4-vacuum valve, 5-separator inlet pipe, 6-blowing pipe.

When using an improved moving device, the suction and blowing air generated by the fan are used simultaneously. A twofold reduction in energy consumption was achieved. Studies have shown that the moving device can transport cotton up to 50 meters under the influence of suction air, and up to 100 meters under the influence of blowing air. In addition, it was found that if the damage to the cotton seed in the pneumatic transport device under the influence of suction air alone was 1.4%, then this indicator decreased by 0.8% due to the simultaneous use of suction and blowing air flows.

Although the mobile device is equipped with a cyclone, the area is polluted due to the lack of a dust chamber. This drawback is completely eliminated in the mobile device proposed by the authors.

Conclusion. By using an improved mobile device for transporting cotton from the gins to the production workshops using pneumatic transport pipelines, it was possible to reduce electricity consumption by two times and significantly reduce damage to the seed. In addition, the ecology is also improved by reducing the release of dust into the atmosphere in the cotton ginning plant.

This creates a good opportunity for separating cotton from fine impurities in the mobile device. Various types of cotton were tested through the improved mobile device.

Based on the results obtained, the feasibility of separating cotton from fine impurities in the mobile device was fully confirmed.

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