International Journal of
Inclusive and Sustainable Education
ISSN: 2833-5414
Volume 1 | No 4 | Oct-2022

Study Analysis of the Effect of Separator Type SS-15A on the Natural Properties of Seeded Cotton

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Abstract: This article presents an analysis of the research conducted on the effect of the separator, which is a device for extracting cotton from the air, on the natural properties of cotton at a cotton ginning enterprise. SS-15A type separator equipment separates seeded cotton from air and sends it to cleaning and ginning departments. During the operation of the separator, the impact on the raw materials, the issues of reducing damage cases were analyzed.

Keywords: Raw material, seed, fiber, cotton, vacuum valve, scraper, separator, air chamber.

Cotton fiber is one of the main products of the textile industry in the world market. The import potential of cotton fiber in the countries of the world is increasing year by year. According to the information of the International Consultative Committee (ICAC), "in the 2017/2018 season, countries such as Bangladesh, Vietnam, China, Turkey, Indonesia, and Pakistan occupy the leading positions in the import of cotton fiber" [1]. Currently, cotton ginning industry enterprises are faced with the urgent problem of producing the quality of products that meet world standards. In order to solve this problem, in the following years, great attention is being paid to the introduction of new technologies and techniques for the initial processing of cotton that meet the coordinated technological requirements in cotton industry enterprises.

Cotton garam stored in PTK is transferred to the drying-cleaning and ginning department using vacuum-valve air. The SS-15A type separator separates the seeded cotton transported from the air with the help of this air and sends it to the next process. During the operation of the separator, the amount of damage to the seed when the cotton piece hits the rubber surface is much less than when it hits the metal surface. As a result of the conducted experiments, it was found that seed damage is reduced by 7 times at an angle of 90° and when the speed of the cotton piece is 50 m/s.

The influence of seed and seeded cotton on seed damage during air movement was studied by Kha.A.Ziyoyev [3]. In order to reduce damage to the seed when moving in cotton pipes, it is proposed to increase the angle of impact of the particles on the outer wall of the pipe. It is proposed to determine the approximate value of the angle of impact without damaging the seed according to the following formula:

$$\alpha = \arccos \frac{V_{кр}}{V_{м}} \quad (1.1)$$

here:

α - the angle of impact of the seeded cotton particle on the outer wall of the pipe;

V_{kr} -is the critical speed in damage, equal to 15.5 m/s in the conditions of a direct break on the metal surface;

V_m -is the speed of movement of seed and seeded cotton particles;

Research has shown that seed cotton moisture, it through the device. Research has shown that the seed damage increases with the moisture content of the seeded cotton, the increase in the number of passes through the device, as well as the increase in the speed of the air flow and the decrease in the concentration of the mixture. According to the authors, the seeds are damaged at the bends of the pipes and at the separators.

The efficiency of the seed cotton pneumatic transport device depends in many ways on the performance indicators of the separator.

The main requirements for the separator are to separate the seed cotton from the air flow while maintaining its natural parameters and ensure the smooth operation of the pneumatic device with minimal pressure losses.

Currently, seeded cotton is in a pneumatic transport device SS-15A separator is also widely used (Figure 1). It consists of the following parts: chamber 1, vacuum - valve 6, electric drive 5 fixed to the frame 10. In the separation chamber 1, the back wall is made of a solid steel sheet, and the side walls are made of mesh with holes with a diameter of 6 mm for air passage. consists of.

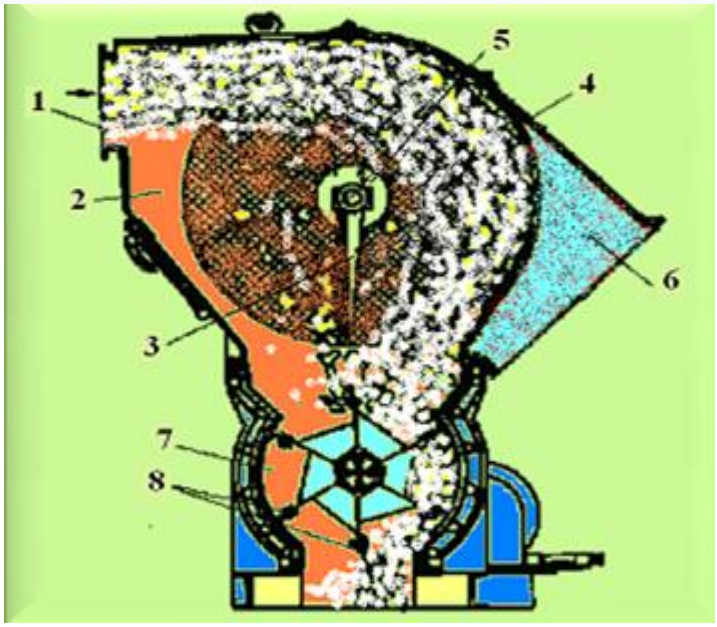


Figure 2. Cross-sectional view of the CC-15A separator

1-Seed cotton entrance; 2 - Air separation chamber for seeded cotton;

3-Kirgich; 4- Mesh installed on the sides; 5- Kirghich arrow; 6- Dirty air transmission pipe; 7 - vacuum valve; 8 - vacuum valve blades

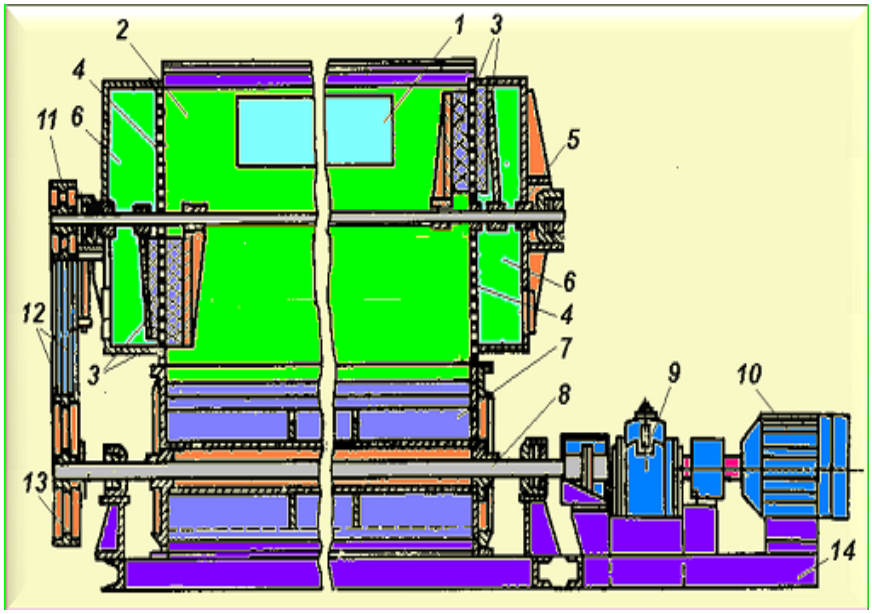
Cleaning of the mesh surface from seeded cotton is carried out with the help of 2 scrapers 7 installed on the shaft 9. The outer surface of the mesh surface is cleaned of fiber dust using a scraper-cleaner 8.

During operation, a mixture of seed cotton and air enters the separation chamber through the inlet pipe. Due to the large size of the chamber, the flow rate in it decreases sharply. The main part of the seeded cotton continues to move by the force of inertia and moves to the back wall, slips from its surface and exits with the help of the blades of the vacuum valve, and the remaining part hits the mesh surface.

The seeded cotton is separated from the surface of the mesh with the help of elastic scrapers, and they are also lowered into the vacuum valve. The pattern of movement of the cotton falling into the vacuum valve and the distribution of seeded cotton along the working length of the vacuum valve have not been fully studied.

Unfortunately, in the SS-15A separator, most of the cotton entering the chamber is stuck to the mesh surfaces by the suction force from the two side air deflectors and then scraped off. Of course, in such

a case, it is wrong to talk about the equal distribution of cotton along the working length of the vacuum valve. Such a situation causes uneven wear of the rubber blades of the vacuum valve. A piece of cotton is cleaned with the help of scrapers and elastic scrapers on the mesh surface, and they are also lowered into the vacuum valve.



Picture 1. Schematic diagram of the SS-15A separator.

1 - camera; 2 - mesh surface; 3 - air inlet pipe with seed cotton;

4 - inlet and outlet pipe; 5 - electric drive; 6 - vacuum valve;

7 - scrapers; 8 - scraper-cleaner; 9 - shaft; frame 10;

During cleaning, as a result of the cotton piece being squeezed between the scraper and the mesh surface, the seed is broken and the cotton fiber is separated from the seed, i.e., "false" ginning is observed, which leads to the appearance and loss of free fiber. will come. Thus, during the technological process of separation of seeded cotton from the air flow in the SS-15A separator, it causes deterioration of its natural properties and loss of fiber content.

The data show that the fiber losses during the re-transfer of seed cotton using a separator are on average 0.0285% for high varieties and 0.052% for low varieties. In subsequent retransmissions, losses increase by approximately the same amount. It should be noted here that if we switch from percentage indicators to weight indicators [4], when the productivity of the pneumatic device is 15 t/h, the average losses are 4.14 is kg/h. Today's scientific research shows that the reasons for the loss of fiber in industrial varieties of cotton have not been clearly indicated. During the technological process, the laws of movement of cotton between the mesh surface and the scraper, including the factors that negatively affect the natural properties of cotton, have not been fully studied.

Among the separators used in production SS -15A separator included. Therefore, we separated it from the air in this separator and studied the state of distribution of the cotton flow along the working length of the vacuum valve. Based on the analysis of the results of the industrial varieties I, II and IV of the Sultan selection variety, the state of distribution of cotton flow according to the working length of the vacuum valve is presented graphically (Fig. 2).

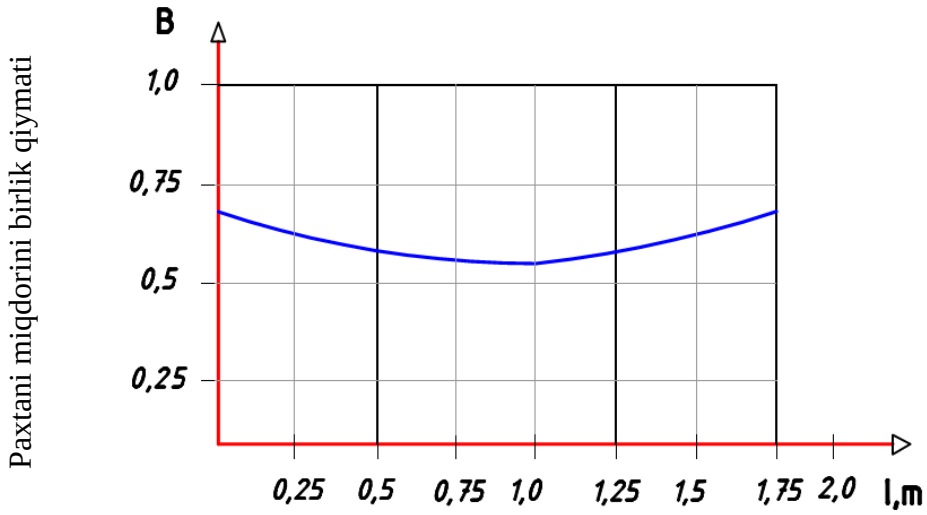


Figure 3. Vacuum is the distribution of cotton flow over the working length of the valve.

As can be seen from the given graph, the cotton flow is unevenly distributed over the working length of the vacuum valve, and it is more on both sides and less in the middle part. The main reason for this is that the cotton, entering the working chamber with air, hits the mesh surface on the side and moves the bridge to the side. As a result, air is sucked into the vacuum valve, the seed is damaged and the fiber breaks.

The increase in the productivity of existing devices and equipment in cotton ginning enterprises, the improvement of the quality of the obtained product depends in many respects on the fulfillment of the technical requirements imposed on these devices, the correct selection of technological regulations and the correct maintenance of aerodynamic standards in pneumatic transport systems. By analyzing the existing technological and aerodynamic conditions, analysis of the natural properties of cotton is one of the first stages of research.

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