Tests in the insulating cameras of the improved separator

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Abstract. The article is devoted to the study of the equipment of a cotton fibers processing plant. At the same time, an improved version of the cotton fibers Separator is recommended. The results of the enhanced separator's experimental results are also presented. The scientific significance of the research results is justified by the development of a separator design ensuring the preservation of the initial quality indicators of cotton by protecting it from mechanical influence, as well as by developing a method for preventing obstruction during separation of cotton from air, by rational arrangement of the air chamber in the separator working chamber, and by increasing the efficiency of the separation process by establishing special guides after the inlet pipe.

1. Introduction
In today's rapid development of modern scientific and technical information, it is important to pay special attention to updating new technologies and technologies along with the national economy. We see this in the process of modernizing the Republic of Uzbekistan with foreign countries, entering Uzbekistan into international trade, increasing exports and imports of goods, modernizing development programs of leading developed countries, re-equipping industries with new technologies. One such industry is the ginning industry. Currently, more than 80 countries are engaged in the production of cotton [1,2].

Today, the main producers of cotton are the United States, China, India, Brazil, Uzbekistan, Pakistan and Mexico. At the present stage of development of the cotton ginning industry, technical and technological measures are being implemented to ensure the timely processing of the cotton crop and its timely delivery to consumers, with high natural preservation of its natural properties [3].

2. Constructive structure
Improving the efficiency of existing equipment and equipment in factories, improving the quality of products obtained in many respects corresponds to the technical requirements for these devices, the correct choice of technological regulations and the correct maintenance of aerodynamic standards in systems. Analysis of modern technological and aerodynamic conditions, selection and implementation of alternatives, production efficiency, identification of factors affecting the natural properties of cotton,
and the search for ways to eliminate them, making suggestions for preventing cotton loss in the aerodynamic system and is important in its implementation. An in-depth analysis of the separators commonly used today in factories is of great importance, the most common of which is the SS-15A.

This is because cotton, which is widely used in separators, causes damage to the fiber and cotton, the main product. Therefore, it is very important to identify ways to address the aforementioned drawbacks and introduce new improved separators. Figure 3 shows an axonometric longitudinal section of a new insulating chamber. As shown in Figure 1, the main new unit consists of a separation chamber 1, inlet 2 and 3 pipes, a type 8 insulator and a mesh 6, an isolation chamber 9, and a vacuum valve 4.

The separator works as follows: The separator chamber 1 with the air flow through the separator 2 enters the separation zone. As soon as cotton enters the separation chamber, it redirects the vacuum valve 4 at its own speed and is removed from the separator by means of a vacuum valve [4]. This is achieved by reducing the air pressure due to the insulating chamber 9 mounted on the outer surface of the grid. That is, in relation to the main scraper 8 installed by the separation chamber 5, the insulating chamber 9 is installed to a certain extent, depending on its direction, that is, an angle of inclination of 25° to our position [5,6].

![Figure 1. Overview of the new fixture installed on the SS-15A Advanced Separator.](image)

![Figure 2. A sectional view of an insulating chamber.](image)

![Figure 3. Axonometric view of the insulating chamber.](image)

As a result, the friction force between the surfaces of the cotton and the lattice decreases sharply, which does not increase the mechanical friction of the seeds, preventing fiber breakage and reducing the amount of fiber.
Following the modernization of the SS-15A separator, extensive production experiments were conducted. The experiments are mainly available in two types of separators: the first is the improved SS-15A separator, and the second is widely used in production [7].

The experiment was conducted at the Chelak ginnery in the Samarkand region. During the tests, an SS-15A dryer drum was used at the top of the drum, as well as an improved SS-15A separator mounted on a UHK cleaning stream. The SS-15A separator at the top of the dryer drum is shown in figure 4.

![Figure 4. Drying is located at the top of the drum.](image)

![Figure 5. Advanced SS-15A separator mounted on UHK in-line cleaning.](image)

3. Results and discussion

The amount of fiber added to the waste was selected as the main object of analysis, and the following method was used to determine the amount of fiber. The waste was removed from the dust bag in a bag for 10 minutes and weighed 0.01 g. This waste was then sieved through a 3x3 mm sieve to remove all impurities. The rest was garbage and then weighed. The level of mechanical damage to the seeds was determined by the existing method. The experiment used industrial varieties of cotton I, III, IV, and V. One piece of cotton was used to test the separators. In the experiment, the sultan used a selective cotton variety. I degree of pollution of industrial purity 2.05%, humidity 8.6%. Pollution degree 3 industrial grade 3.98%, humidity 10.92%, industrial grade IV cotton pollution 6.8%, humidity 13.5%, industrial grade B class 11.4% and humidity, and 16.5%, respectively. The amount of air consumed is the same in both separators and the productivity was 10-15 t / h. As shown in tables 1 and 2, the total mass of fiber added to the waste of the improved separator was 0.46 kg / h and 1.05 kg / h for cotton grade III. This is 0.23 kg / h less than a conventional separator, and 0.72 kg / h for class III cotton [8,9].

3.1. The results of the experiments

3.1.1. The results obtained in the experiments are presented in tables 1 and 2.

| Grade of cotton | The amount of fiber removed from the waste compound | SS-15A | An improved SS-15A | The level of pollution and humidity of cotton, % |
|-----------------|---------------------------------------------------|--------|---------------------|-----------------------------------------------|
| I               |                                                   | 0.70   | 0.46                | Z=2.05                                        |
|                 |                                                   |        |                     | W=8.6                                         |
| II              |                                                   | 1.18   | 0.76                | Z=2.05                                        |
|                 |                                                   |        |                     | W=8.6                                         |
### Table 2. Results of an existing separator with an improved SS-15A separator.

| Grade of cotton | The level of damage to the seeds,% | SS-15A | An improved SS-15A | The level of pollution and humidity of cotton, % |
|----------------|-----------------------------------|--------|--------------------|-----------------------------------------------|
| I              | 1.32                              | 1.08   | Z=2.05             | W=8.6                                         |
| II             | 1.41                              | 1.21   | Z=2.05             | W=8.6                                         |

3.1.2. Graphically presentation the results obtained from experiments. Figure 6 shows the change the amount of free fiber added to the exhaust from the SS-15A separator with an improved separator. By analyzing this diagram, the SS-15A separator shows that the amount of free fibers in the separator is 50-70% greater than the amount of free fiber produced in the improved separator. So, in Industrial Class I, it increases from 0.46 kg / h to 0.7 kg / h; In industrial class II, it increases from 0.78 kg / h to 1.18 kg / h; In the industrial class III, it increases from 1.05 kg / hour to 1.78 kg / hour. In the fourth grade, cotton IV will increase from 1.16 kg / hour to 2.07 kg / hour.

Finally, industrial-grade cotton V grew from 1.32 kg / h to 2.26 kg / h. This means that the SS-15A separator has a fiber break between the surface of the grill and the scraper, as a result of which the disconnected fiber passes through the mesh hole through the air stream and is collected in a dust collector.

![Figure 6](image1.png)

**Figure 6.** Changes in the amount of free fiber in the type of waste depending on the industrial grade of cotton in the separator: 1- in an improved separator; 2- In the separator SS-15A.

![Figure 7](image2.png)

**Figure 7.** Changes in the value of mechanical damage to cotton seeds by industrial grade of cotton in the separator: 1- in an improved separator; 2-SS-15A on the separator.

It is seen from the graph in figure 6, with the fall of the industrial grade of cotton, the amount of free fibers increases in waste. Figure 7 shows the effect of an advanced separator with an SS-15A separator on the amount of mechanical damage to seeds. As can be seen from this graph, with the change in industrial varieties of cotton, the amount of mechanical damage to cotton seeds changes [10].

That is, the level of mechanical damage to cotton seeds in I-type cotton increased from 1.08% to 1.32%; While the industrial grade II increased from 1.21% to 1.41%; While the industrial grade III class grew from 1.38% to 1.52%; In the 4th grade of industrial grade cotton, it grew from 1.87% to 2.07%. Finally, grade 5 grew from 2.57% to 3.38%. Therefore, the amount of mechanical damage to the cotton
seeds changes as a result of the movement of the cotton through the air flow between the surface of the grating of the separator SS-15A [11,12].

4. Conclusions
The results show that the increase in the amount of free fiber and the increase in mechanical damage to the seeds is due to the pressure exerted on the surface of the cotton by the air flow in the separator chamber. An increase in compressive strength causes an increase in the number of free fibers, that is, an increase in the number of free fibers and an increase in the degree of mechanical damage to the seeds. In conclusion, it is important to reduce the pressure on the surface of the cotton. Therefore, the isolation chamber recommended in the advanced separator reduces this pressure. This can be seen in the graphs in figure 6-7.

References
[1] Murodov O 2019 Perfection of designs and rationale of parameters of plastic Koloski cleaning cleaners International Journal of Innovative Technology and Exploring Engineering 8(12) 2640-6
[2] Hodjiev M T, Abazov I, Usmanov H S and Eshnazarov D A 2017 Pat. of the Republic of Uzbekistan 01204
[3] Khojiev M T, Juraev A D, Murodov O D and Rakhimov A K 2019 Development of design and substantiation of the parameters of the separator for fibrous materials International Journal of Recent Technology and Engineering 8(2) 5806-11
[4] Muksin K, Ilkhom A and Javlon K 2019 A new technology for dust removal from cotton processing International Journal of Recent Technology and Engineering 8(3) 583-6
[5] Ilkhom A, Muksin X, Orof A and Ruxsora K 2019 The composition of releasing passion of dusty in the process of pat International Journal of Engineering and Advanced Technology 8(3 Special Issue) 279-83
[6] Abbazov I, Sarimsakov O, Khodjiev M and Mardonov B 2018 Waste Produced at Cotton Waste Factories American Journal of ASCIT Communications 5 22-8
[7] Khodjiev M T, Abbazov I Z and Karshyev B E 2016 Increase of an overall performance of a deduster on cotton ginning enterprises European Science Review 10 171-7
[8] Djuraev A and Khudaykulov Sh 2019 Analysis of the results of an experiment to determine the torque on the shaft of a gin saw cylinder International Journal of Advanced Research in Science, Engineering and Technology 6(9) 10653-64
[9] Urinov N, Saidova M, Abrorov A and Kalandarov N 2020 Technology of ionic-plasmic nitriding of teeths of disc saw of the knot of saw cylinder IOP Conference Series: Materials Science and Engineering 734(1) 012073
[10] Rajabov O and Shodiyev Z 2019 Analysis of Small Fluctuations of a Multifaceted Mesh under the Influence of Technological Load from the Cleaned Cotton - Raw International Journal of Advanced Research in Science, Engineering and Technology 6(10) 11396-9
[11] Anvar J and Ozod R 2019 Analysis of the Interaction of Fibrous Material with a Multifaceted Grid of the Cleaner International Journal of Recent Technology and Engineering 8(1) 2661-6
[12] Rajabov O, Fazliddin K, and Salimov Sh 2020 Substantiation of Parameters of the Fibrous Material Cleaning Zone International Journal of Engineering and Advanced Technology 9(3) 1052-7