ISSN: 2053-3578 I.F. 12.34

PREPARATION OF THE CONSTRUCTION OF AN IMPROVED FIBER CLEANING MACHINE AND SUBSTITUTION OF ITS PARAMETERS

R.G.Rakhimov

Namangan Institute of Engineering and Technology,

160115, Namangan, Uzbekistan

Abstract. In the research work carried out in the article, a technological scheme of a fiber cleaning machine was developed and practical research was carried out on the design of an improved multi-bar fiber cleaner. As a result, it was found that the distance between the bars of the fiber cleaner was set to 50 mm and the distance between the first bar and the brush was 10 mm, which minimized the amount of fiber going into the waste and achieved the expected cleaning effect.

Keywords. Cotton, cotton fiber, fiber cleaning, fiber cleaner, impurities, roller grid, design, cylinder, air flow, efficiency, improvement

Introduction. Currently, in the cotton industry of Uzbekistan, single-cylinder fiber cleaners of the 1VPU type (Figure 1) are effectively used to clean cotton fibers from various impurities [1, 2]. They differ from single-cylinder fiber cleaners of the OVP type [3] by changes in the design of the pipes at the inlet and outlet of the cleaner and the type of grates. The cleaning efficiency of single-cylinder fiber cleaners of the 1VPU and 1VPM types used in the technological process of fiber cleaning in cotton ginning enterprises does not exceed 20-25% [4], which is insufficient to obtain fibers with high quality indicators, especially when processing “difficult to clean” selections of cotton.

ISSN: 2053-3578 I.F. 12.34

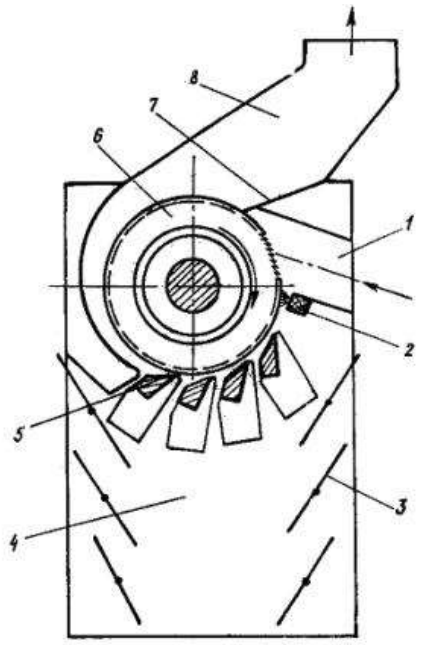

Fig.1. 1VPU single-cylinder fiber cleaner scheme

1- fiber inlet pipe; 2- combing brush; 3- louvered grille;

4- dirt chamber; 5- grate grille; 6- saw cylinder;

7- cutting blade; 8- fiber outlet pipe.

In the technological processes of foreign enterprises, the efficiency of fiber cleaning reaches 50-60%. The cleaning efficiency of single-cylinder fiber cleaners is not very high, so it does not meet the modern requirements of the cotton industry.

All of the above served as the basis for conducting scientific research on the creation of a more efficient, multi-stage cleaning agent with a straight flow. This scientific work is aimed at creating a technology for producing high-quality fiber from difficult-to-clean cotton raw materials, which is very relevant today.

As many studies have shown, after cotton ginning enterprises switched to high-performance fiber separation machines of the DP-130 type, the fiber cleaning machines designed for them no longer meet the requirements, including after working in 1-2 shifts, the gaps between the saw cylinders and the grates are broken, and they naturally require revision and adjustment [5].

As a result of identifying the factors affecting the quality indicators of the products produced by cotton ginning enterprises and observing and studying the technological process

ISSN: 2053-3578 I.F. 12.34

of cotton ginning enterprises, several problems were identified in the fiber cleaning process. For example, frequent violations of the distances between the saw cylinders and the grid due to the vibration of the saw cylinder of the fiber cleaning machine, changes in the distances between the grids due to incorrect and loose installation of the grate grid, and problems of increasing the useful surface during fiber cleaning should be taken into account and technical solutions should be found.

Single-drum fiber cleaning machines for cotton ginning enterprises are distinguished by their considerable convenience of operation. However, when working with them, it is necessary to eliminate the above-mentioned shortcomings.

The research work aimed to improve the productivity and cleaning efficiency of the single-drum fiber cleaning machine by improving it. In implementing this goal, it is necessary to ensure the effective operation of the main working bodies in the fiber cleaning chamber.

Research. First of all, the research work found that it was necessary to develop a technological scheme of a fiber cleaning machine based on the issues mentioned above. Design drawings of an improved multi-column fiber cleaner were developed in the design bureau of the Namangan Engineering and Technology Institute (Figure 2).

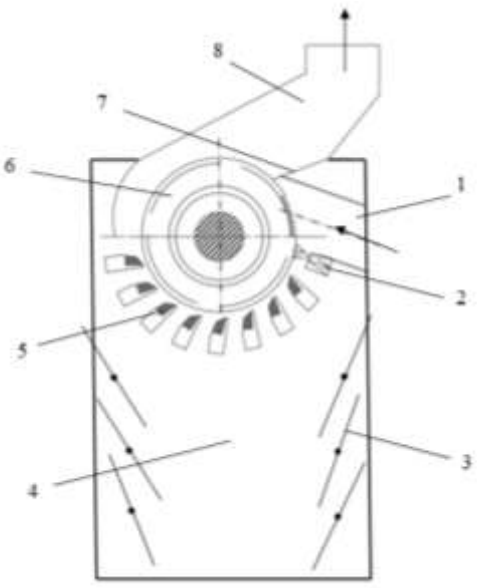

Fig.2. General scheme of the fiber cleaner

1-inlet pipe, 2-flat guide brush, 3-blind grate,

4-waste chamber, 5-barrels, 6-saw cylinder, 7-knife, 8-clean fiber pipe

ISSN: 2053-3578 I.F. 12.34

This device does not differ much in terms of the principle of operation of the 1VPU fiber cleaner [6, 7]. The fibers coming from the spinning process enter the separation chamber through the inlet pipe 1 of the multi-barrel fiber cleaner with the help of air. Then the rotating saw cylinder 6 is caught by its teeth and the bars 5 move along the grate formed by them, and as a result, dirt, lint and other foreign substances begin to separate from the content. The impurities separated from the fibers pass through the grid formed by the combustors 5 and fall into the waste chamber 4, while the cleaned fibers are removed by air from the saw cylinder 6 and discharged through the outlet pipe 8.

The main advantage of the improved fiber cleaning device is that the cleaning efficiency of the fiber cleaner increases significantly due to the increase in the effective cleaning surface by increasing the number of grates to 8.

The discharge of waste from the fiber cleaner is carried out by a belt conveyor or screw conveyor. The amount of air sucked into the waste chamber of the fiber cleaner is adjusted by changing the position of the 3 individual louvered grilles.

Based on the above, the direction chosen in the study was determined as improving the cleaning efficiency of straight-flow fiber cleaning machines and creating convenience for servicing them based on the modernization of the 1VPU straight-flow single-drum fiber cleaner.

In the study, the improved grate and other working bodies were manufactured in the repair shop of the Kosonsoy cotton ginning enterprise (Fig. 3). The bars that make up the grid of the grid are made of steel-45, and the physical and mechanical properties of the material were tested in the Laboratory of Machinery and Equipment of the Tashkent Institute of Textile and Light Industry.

ISSN: 2053-3578 I.F. 12.34

Fig. 3. Experimental copy of the column grid

To test the improved fiber cleaning device, it is necessary to select its optimal design and prepare it. In our case, the design of this device was developed in accordance with the scheme given in the previous chapters regarding its creation.

Production tests were carried out on cotton raw materials of Andijan-35, Bukhara-102 selection varieties, second grade, with an initial impurity of 1.35% - 0.8%, and a moisture content of 8.4% - 8.1%. The selected samples were analyzed in the laboratory of the Kosonsoy cotton ginning enterprise for the quality indicators of cotton raw materials (moisture content, impurity content), fibers (variety, mass fraction of defects and foreign impurities), fractional composition of fiber waste, and the content of free fiber in waste. Practical studies of the improved device were carried out in two-stage fiber cleaning processes with a single saw cylinder and a two-stage fiber cleaning process with a single saw cylinder and a condenser-type fiber cleaner. The results of the study showed that after ginning, the cotton raw material had a contamination level of 1.39% in the gin trough, and the mass fraction of foreign impurities was 5.5%, while after the single-drum fiber cleaner, this figure was 4.14%. The cleaning efficiency of the existing single-drum fiber cleaner was 32%.

In cotton raw materials with the same degree of contamination, the mass fraction of defects and foreign impurities was 4.9% after the gin, 3.2% after the double-drum fiber cleaner, and the cleaning efficiency was 36.0%. The clean fiber in the waste after the single-drum fiber cleaner was 33.5%, and after the double-drum fiber cleaner was 24.5%. After the double-drum fiber cleaner, the waste was checked separately for each saw cylinder. The proportion of clean

ISSN: 2053-3578 I.F. 12.34

fiber in the fiber waste from under the first cylinder was 37.4%, and from under the second saw cylinder it was 11.95%, and the mass of the waste after the first saw cylinder was 158 g, and after the second saw cylinder it was 57 g. The air pressure of the first cylinder is less than that of the second cylinder. Therefore, the amount of fiber in the waste from the second saw cylinder is less. In the fiber cleaning section, when a single-drum fiber cleaner was used, the mass fraction of defects and foreign impurities was as follows: after the gin 3.4%, after the aggregate 2.5%, cleaning efficiency 31.3%, the amount of fibers in the waste 43%, the contamination of the cotton raw material in the gin tray 0.9%.

In the fiber cleaning section with a double-drum fiber cleaner, the mass fraction of defects and foreign impurities was: after the gin 4.8%, after the aggregate 3.2%, cleaning efficiency 35%, the amount of fibers in the waste 38%. The degree of contamination of the cotton raw material and the amount of fibers in the waste decreased with the connection of the second saw cylinder. The cleaning efficiency did not change much with the connection of the fiber cleaner compared to the double-drum fiber cleaner [8].

Based on the above experiments, an improved multi-bar single-drum fiber cleaning device was tested.

Based on the above data, when the grid spacing in the experimental fiber cleaner was set to 45 mm, the fiber content of the waste was reduced by 10-12%. This means that in our case, that is, when the initial spacing of 50 mm was set in the specially developed fiber cleaner and the first grid and brush were set to 10 mm, the fiber content in the waste did not increase significantly and allowed to increase the efficiency of the grid within the recommended values. According to studies [9], when the grid spacing was more than 60 mm, a lot of fibers were released into the waste, as a result of which the normal operation of the fiber cleaner was disrupted.

In all variants of the experiments, the number of grid bars was equal to 8 pieces, only the installation distances between the grid bars were changed.

ISSN: 2053-3578 I.F. 12.34

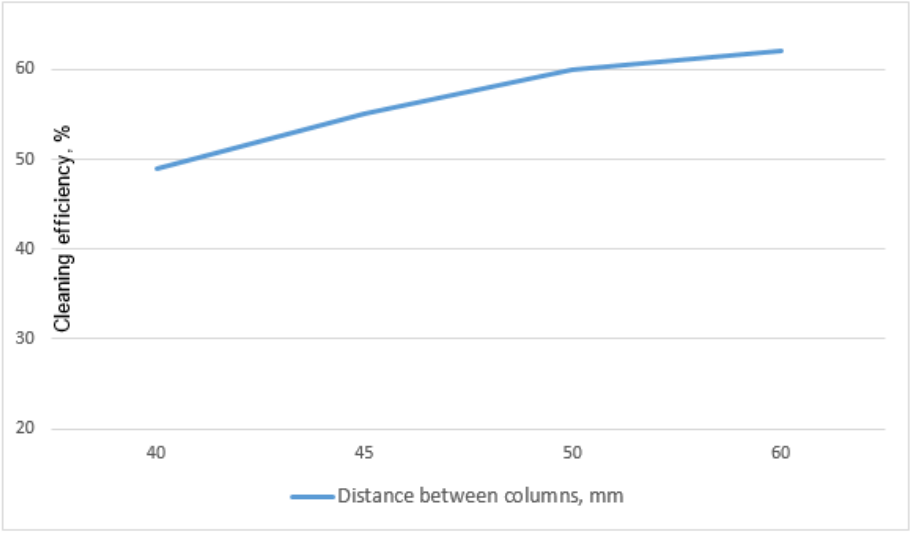

Fig. 4. Dependence of the distance between the columns on the cleaning efficiency

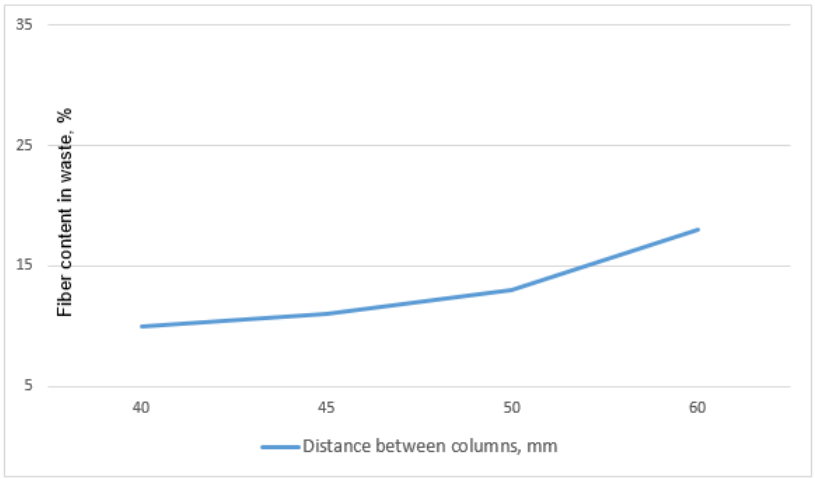

Fig.5. Dependence of the amount of fibers in the waste on the distance between the grates

The cotton raw material was analyzed for total contamination and moisture and selected. Samples of cotton raw material were selected after the gin feeder. The fibers were selected after ginning and after the improved fiber cleaner and the content of defects and impurities was analyzed in the enterprise laboratory.

The quality indicators of cotton raw material, fiber and fiber waste were determined according to the existing methodology [10].

Figures 4 and 5 show that due to the increase in the useful area in the developed fiber cleaner, it was possible to increase the distance between the grates of the grate grate from 40 mm to 60 mm. At the same time, the cleaning efficiency increased from 48 to 64%, and the fiber content in the waste decreased from 18% to 11%.

Conclusion. Thus, in the developed fiber cleaner, when the step between the grates is increased to 60 mm, it can be seen that the amount of fiber falling into the waste increases along with the increase in cleaning efficiency (16-18%), and we can conclude that the minimum distance between the grate bars of 40 mm allows, although the cleaning efficiency is relatively low, the amount of fiber in the waste is minimal (up to 8-10%). Taking the above into account, the distance between the grate bars was set to 50 mm and the distance between the first grate and the brush was set to 10 mm, as a result, the amount of fiber falling into the waste was kept to a minimum and the expected cleaning effect was achieved [11].

References

1. O.A.Azamatovich, A.J.B O'g'li, Q.A. Akramovich. Determining the Optimal Parameters of an Advanced Linter Machine. *Engineering*. 2023. 15 (12), 810-820. https://doi.org/10.4236/eng.2023.1512057
2. O.A.Azamatovich, V.F.Badriddinivich. Application Of Soft Launcher Device With Linter Device Electrodvigate. Ijodkor O'qituvchi. 2024, 4 (38), 34-37. https://bestpublication.org/index.php/iq/article/view/10445
3. A.Obidov, M.Vokhidov, J.Abdurahmonov. Exploring the Efficiency of Experimental Construction of Sorting Ginned Cotton Seed Machine. *Engineering*. 2024, 13, 18-29. https://doi.org/10.4236/eng.2021.131002
4. R.G. Rakhimov. Clean the cotton from small impurities and establish optimal parameters // The Peerian Journal. Vol. 17, pp.57-63 (2023)
5. R.G. Rakhimov. The advantages of innovative and pedagogical approaches in the education system // Scientific-technical journal of NamIET. Vol. 5, Iss. 3, pp.293-297 (2023)

6. F.G. Uzoqov, R.G. Rakhimov. Movement in a vibrating cotton seed sorter // DGU 22810. 03.03.2023

7. F.G. Uzoqov, R.G. Rakhimov. The program “Creation of an online platform of food sales” // DGU 22388. 22.02.2023

8. F.G. Uzoqov, R.G. Rakhimov. Calculation of cutting modes by milling // DGU 22812. 03.03.2023

9. F.G. Uzoqov, R.G. Rakhimov. Determining the hardness coefficient of the sewing-knitting machine needle // DGU 23281. 15.03.2023

10.N.D. Nuritdinov, M.N. O'rmonov, R.G. Rahimov. Creating special neural network layers using the Spatial Transformer Network model of MatLAB software and using spatial transformation // DGU 19882. 03.12.2023

11.F.G. Uzoqov, R.G. Rakhimov, S.Sh. Ro’zimatov. Online monitoring of education through software // DGU 18782. 22.10.2022

12.F.G. Uzoqov, R.G. Rakhimov. Electronic textbook on "Mechanical engineering technology” // DGU 14725. 24.02.2022

13.F.G. Uzoqov, R.G. Rakhimov. Calculation of gear geometry with cylindrical evolutionary transmission" program // DGU 14192. 14.01.2022

14.Sh. Korabayev, J. Soloxiddinov, N. Odilkhonova, R. Rakhimov, A. Jabborov, A.A. Qosimov. A study of cotton fiber movement in pneumomechanical spinning machine adapter // E3S Web of Conferences. Vol. 538, Article ID 04009 (2024)

15.Rakhimov R.G. Determination magnetic quantum effects in semiconductors at different temperatures // VII Международной научнопрактической конференции «Science and Education: problems and innovations». 2021. pp.12-16.