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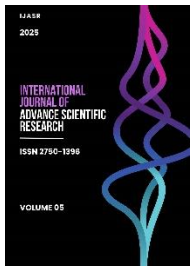

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Research Article

DETERMINING THE USEFUL SURFACE OF THE GRID USED IN THE CLEANING PROCESS AT COTTON GINNING ENTERPRISES

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ABSTRACT

The article analyzes the mesh surface, which is one of the main working parts of the raw cotton cleaning process at cotton ginning plants. The types and sizes of mesh surfaces used in cotton ginning plants, as well as their useful surface area, were determined using the Solidworks program. The useful surface angle of the mesh surface relative to the center of the spiked drum was determined at various values. As a result, graphs of the change in the useful surface relative to the center of the spiked drum are presented.

KEYWORDS

Cotton, fiber, seed, lint, separator, stone catcher, cyclone, fan, pipe, scraper, mesh surface, vacuum valve, gin, saw, linter, feeding roller, outlet pipe, shaft, screw, gasket.

INTRODUCTION

In our republic, large-scale measures are being implemented and certain results are being achieved in the development of the cotton industry, modernization and technical re-equipment of cotton ginning enterprises, increasing the profitability of production and processing of raw cotton, as well as increasing the competitiveness of manufactured products. In particular: Decree of the

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President of the Republic of Uzbekistan dated January 28, 2022 No. UP-60 "On the Development Strategy of New Uzbekistan for 2022-2026," including..."ensuring the stability of the national economy and continuing the industrial policy in the new domestic product, aimed at increasing the volume of industrial production by 1.4 times, with an increase in the volume of production of textile industry products by 2 times..." important tasks have been defined.

In the implementation of these tasks, in particular, it is important to increase the efficiency of the cotton cleaning process, effectively purify dusty air, improve the existing equipment and technologies at the enterprise, and determine their optimal values.

MATERIALS AND METHODS

At cotton ginning enterprises, the cleaning of raw cotton is one of the main processes. The main working parts of the cleaning process are the spiked drum and the mesh surface. In cotton ginning plants, mesh surfaces (horizontal or vertical grids, sieves) are widely used for separating cotton from large and small impurities. Their main function is to capture various wastes in cotton fiber, such as leaf debris, branches, small stones, and other impurities. The main function of mesh surfaces is to separate leaf remnants, shoots, seed coat, soil, and other impurities.

Types of mesh surfaces used in cotton ginning enterprises:

When the cotton flow passes through sieves, it separates small impurities through holes of various sizes. Vibrational or mechanical movement increases efficiency.

Drum mesh separators: Have holes of various sizes on the inner surface, which separate dust and small impurities through rotational movement. It is often used in conjunction with an aspiration system.

Grate-type mesh surfaces: In these devices, large impurities are separated through grates or perforated plates. Usually, it is located horizontally or obliquely, and the speed of cotton movement is controlled.

The concept of a useful surface is the part of the mesh surface that is effectively processed within the total area. That is, the area of the mesh surface, which actively participates in the separation of trash impurities and dust retention during the cotton cleaning process, is considered a useful surface.

The main factors influencing the usable surface are the shape and location of the meshes, which determine the efficiency of the usable surface. Inclined or horizontally arranged meshes help to optimize airflow. The size of the holes and their density directly affect the effective surface area. Large holes serve to separate large impurities, while small holes serve to trap fine dust. If the cotton flow velocity is too high, the efficiency of the usable surface may decrease. By choosing the optimal speed, it is possible to effectively separate impurities. Some mesh surfaces are used in conjunction with an aspiration system, which

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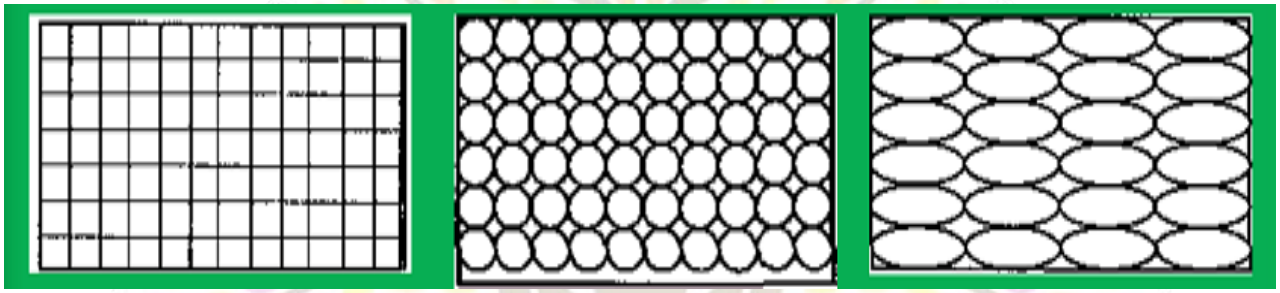
allows for the effective capture of dust and light impurities.

By choosing the optimal diameter of the mesh holes, inclined placement of the mesh surface, installation of an additional aspiration system, and the use of vibration or rotary mechanisms, it is possible to increase the effective surface area of mesh surfaces used in cotton ginning enterprises.

Analysis of the research results

Mesh surfaces (Fig. 1), used in cotton ginning enterprises, are woven from steel wire and made by making holes in steel sheets, can be made of solid sheet with an eye of various shapes or ribs of various shapes.



а) **б)** **в)**

Figure 1. Diagram of mesh surface types.

a). woven from steel wire. b), c). made of sheet metal with various holes..

1-table

№	Size of holes on the mesh surface	
1	The mesh surface hole length is	18 мм
2	The mesh surface hole width is	5 мм
3	The distance between two holes on the mesh surface is	5 мм
4	Sheet thickness	3 мм
5	The distance between adjacent mesh surfaces is	3 мм

To determine the useful surface area of the mesh surface, the angle of the mesh surface relative to the center of the spiked drum was determined using the solidworks program at various values.

To obtain the net surface area, it is necessary to determine the net surface area. For this, the circumferential length of the mesh surface relative to the center of the spiked drum was determined. In the UHK unit, the circumferential length of the

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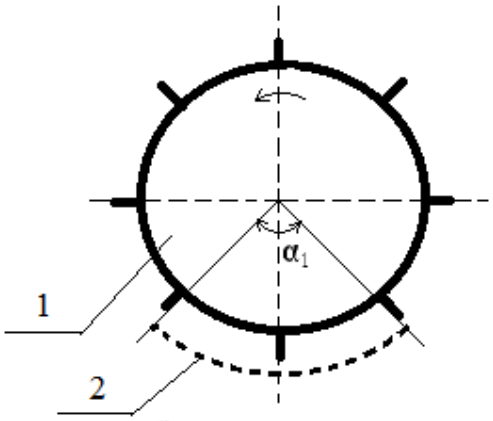
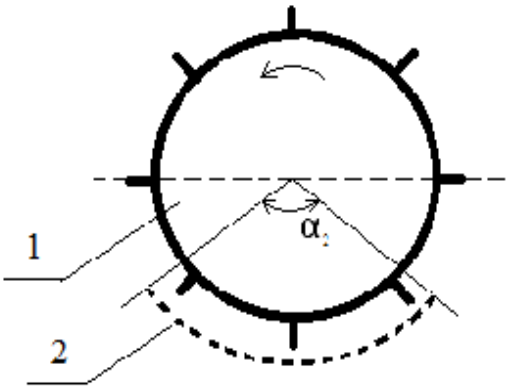
mesh surface is 1343.92 mm. If we determine the length of the above-mentioned angles α, taking into account their angles, then at an angle α1=90o relative to the center of the spiked drum, the length of the mesh surface was 339.41 mm, at an angle α2=110o the length of the mesh surface was 393.19 mm, and at angles α3=130o and α4=150o the length along the width of the mesh surface was 435.02 mm and 559.97 mm. From this it is evident that by increasing the angle of the mesh surface relative to the center of the spiked drum, we observed an increase in the length along the width of the mesh surface, which, of course, leads to an increase in the useful surface. (Fig. 2)

Based on these data, we determine the area at which the holes are located at various angles α1=90o, α2=110o, α3=130o, α4=150o relative to the center of the spiked drum.

Initially, the angle of the mesh surface relative to the center of the spiked drum α1=90o, the circumferential length of the mesh surface 339.41 mm, and the useful surface area of the mesh surface 1900 mm were determined using the Solidworks program. (Fig. 3)



A) when α1=90˚



B) when α2=110˚

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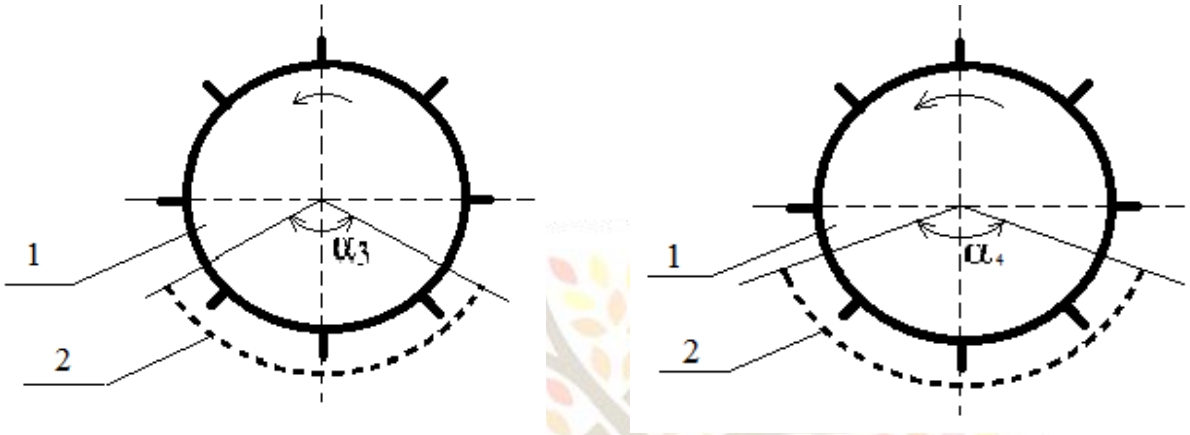

C) when a3=130˚ D) when a4=150°

Figure 2. Different values of the angles of the mesh surface relative to the center of the spiked drum

1-spike drum, 2-grid surface.

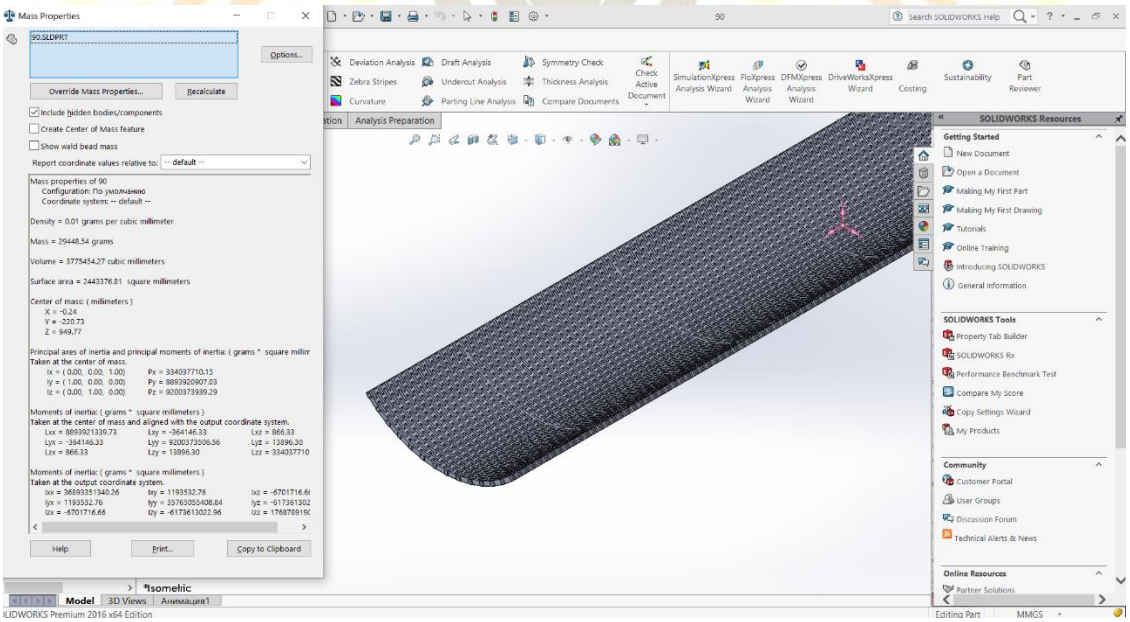

Figure 3. Data on the mesh surface with an open hole at an angle α1=90o relative to the center of the spiked drum.

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Fig. 3 shows the data of the mesh surface with a hole, as can be seen, the mass of the mesh surface was 29448.54 grams.

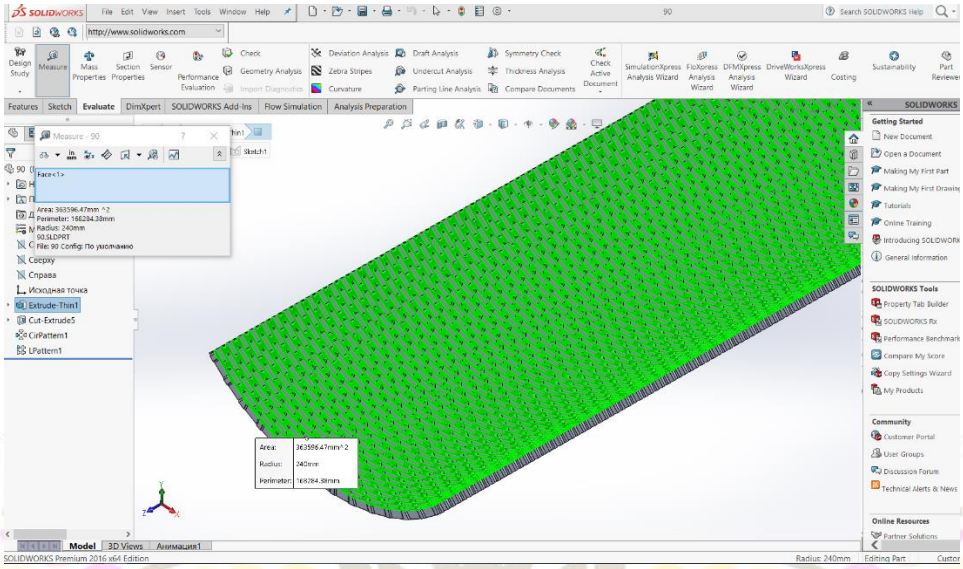
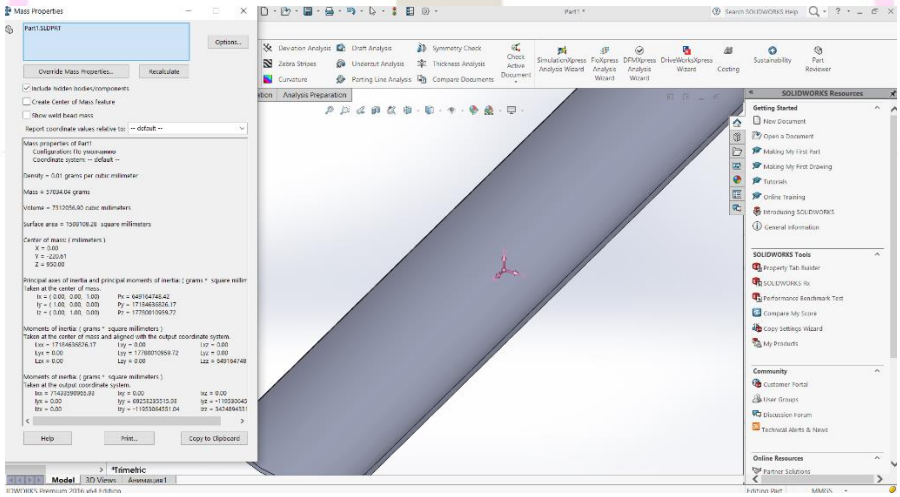


Figure 4. Area of the mesh surface at an angle α1=90o relative to the center of the spiked drum

Using the evaluate program of the Solidworks program, we determined the area of the mesh surface 363596.47 mm2 using the measuare button. At the next stage, the mass and surface area of the sheet before perforation were determined.



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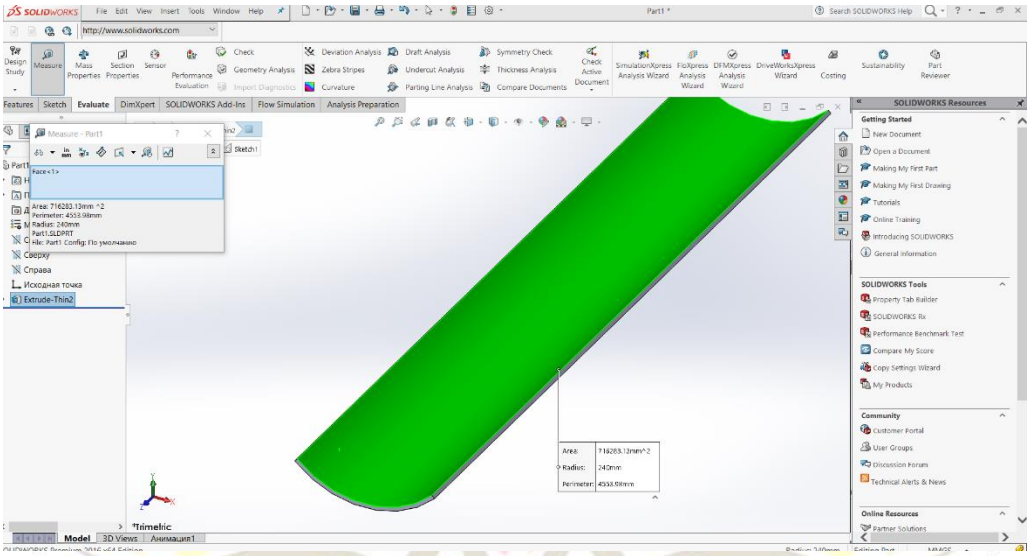

Figure 5. Sheet mass and surface area before perforation

It can be seen that the mass of the mesh surface was 57034.04 grams, and the area was 716283.13 mm2.

To find the useful surface area, we subtract the total surface area from the sheet area after the hole has formed:

$$F_f = F - F_t = 71628313 - 363596.47 = 35268666$$

мм^2,

Substituting the obtained results into expression (1):

$$k_{f.yu.} = \frac{352686,66}{71628313} \cdot 100\% = 49,2\%$$

We can also determine how much we have reduced the mass of the list by dividing it by dividing the mass after the mass from the mass before it (usually it corresponds to the coefficient of useful surface):

$$\frac{57034.04 - 29448,54}{57034.04} \cdot 100\% = 48.3\%$$

Consequently, the coefficient of effective area of the adopted mesh surface is equal to, and we achieve a 48.3% reduction in the sheet mass.

At the next stage, to determine the useful surface area of the mesh surface, the values of the angle of the mesh surface relative to the center of the spiked drum at various values were also determined using the solidwors program and are presented in Table 2.

2-Table

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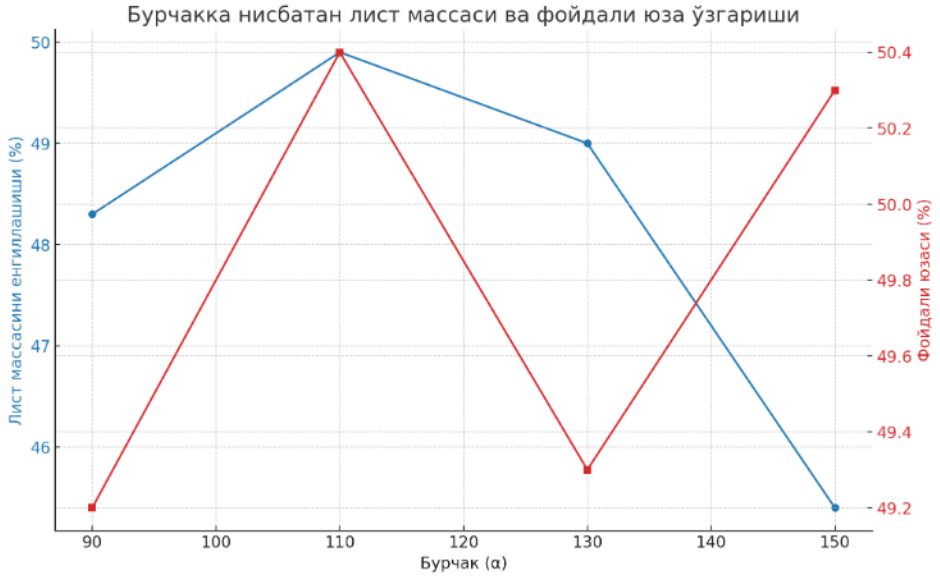
№	Angle of the mesh surface relative to the center of the spiked drum	Circular length of the mesh surface	Grid surface length	Sheet lightening	Usable surface
1	$\alpha_1=90º$	339,41 mm	1900 mm	48.3%	49.2 %
2	$\alpha_2=110º$	393,19 mm	1900 mm	49,9 %	50,4 %
3	$\alpha_3=130º$	435,02 mm	1900 mm	49 %	49,3%
4	$\alpha_4=150º$	559,97 mm	1900 mm	45,4%	50,3%



The data presented in Table 3 are represented graphically. The blue line represents the lightening of sheet mass, and the red line represents the useful surface area.

In the article, along with determining the effective surface area of the mesh surface, the amount of sheet weight reduction was also determined using the program. Using the Solidworks program, based on the analysis of various values of the angle of the mesh surface relative to the center of the spiked drum, it was determined how much the useful surface area increases at each value and how much the sheet mass is lightened. The graph shows the change in sheet mass efficiency (blue line) and useful surface area (red line) at different values on the α axis.

Conclusions

With the help of the Solidworks program, work was carried out on the design of the mesh surface, which is one of the main working parts of cleaning machines used for cleaning cotton at cotton ginning

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enterprises, and the optimal value of the angle of the mesh surface relative to the center of the spiked drum was determined. It can be seen that the highest efficiency of sheet mass and the highest percentage of the usable surface were achieved at an angle of the mesh surface to the center of the spiked drum at 1100°. If the mesh surface is applied in the production process at an angle of 1100 relative to the center of the spiked drum, then the efficiency of work increases, i.e., the efficiency of cleaning cotton from impurities increases.

REFERENCES

1. Salomova, M., Salokhiddinova, M., & Muradov, R. (2023, June). How to increase the effect radius of the cotton transport process in a mobile device. In AIP Conference Proceedings (Vol. 2789, No. 1). AIP Publishing.
2. Rahimov, F., Rajapova, N., & Salomova, M. (2019). R. Muradov Create a Device that can Remove Heavy Components from the Chassis Chamber. International Journal Advanced Research Science, Engineering and Technology//Of ijarset, 6(7), 2350-0328.
3. Якубов, И. (2021). Саломова Машхура, Маматқулов Орифжон. Чигит шикастланишини камайтириш мақсадида сепаратор конструкциясини такомиллаштириш// Халқаро илмий-амалий конференсия материаллари тўплами, 11(23), p647-649.
4. Саломова, М., Рахимов, Ф., & Қосимов, Х. (1992). Пневмотранспорт қурилмаси элементларини такомиллаштириш. Механика муаммолари. 2019й, 101-104.
5. Tokhirova, M., Khasanov, A., Salomova, M., Sarimsakov, O., & Muradov, R. (2023, June). To study the process of leveling raw cotton on the horizontal belt surface of the feeder. In AIP Conference Proceedings (Vol. 2789, No. 1). AIP Publishing.
6. Nodirbek, M., Shukhratjon, K., Mashkhura, S., & Akmal, U. (2024). STUDY OF THE DISTRIBUTION PROCESS IN PIPES IN THE DIFFERENT AIR FLOW TRANSMISSION ZONE. Universum: технические науки, 9(4 (121)), 47-49.
7. Саломова, М., Рахимов, Ф., & Қосимов, Х. (1992). Пневмотранспорт қурилмаси элементларини такомиллаштириш. Механика муаммолари. 2019й, 101-104.
8. Toshpo'latov Mansurbek, Komilov Shuxratjon Raximjon o'g'li, Salomova Mashhura Arabboy qizi, & Muradov Rustam Muradovich. (2024). PAXTA CHIGITINI TOZALASH QURILMALARINI ISHLASH TIZIMI TAXLILI. Новости образования: исследование в XXI веке, 2(18), 338–342. извлечено от http://nauchniyimpuls.ru/index.php/noiv/article/view/14695
9. Якубов, И. (2021). Саломова Машхура, Маматқулов Орифжон. Чигит шикастланишини камайтириш мақсадида сепаратор конструкциясини такомиллаштириш//Халқаро илмий-амалий конференсия материаллари тўплами, 11(23), p647-649.

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10. Rahimov, F., Rajapova, N., & Salomova, M. (2019). R. Muradov Create a Device that can Remove Heavy Components from the Chassis Chamber. International Journal Advanced Research Science, Engineering and Technology//Of ijarset, 6(7), 2350-0328.