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THEORETICAL STUDY OF THE INFLUENCE OF SPACING ON THE EFFICIENCY OF CLEANING BETWEEN COTTON PRODUCERS IN THE COTTON CLEANING AREA

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Annotation

Currently, a lot of work is being done to improve the quality of low-grade cotton, which is difficult to clean manually and by machine, to improve product quality, reduce costs and provide the population with high-quality and affordable products. Analyzed the scientific work carried out by scientists at all stages of the production of cotton products, as well as the identification and elimination of factors that negatively affect the quality of cotton products, the creation of new resource-saving modern technologies that reduce the cost of production. Based on the analysis of the research results, the influence of speed, pressure and density between each column in the cleaning zone on the cleaning efficiency has been positively analyzed. Particular attention is paid to improving the consumer properties of cotton products due to their wide distribution. introduction into production.

Based on the results of the analysis of scientific works, theoretical equations of the effect of distance on the cleaning efficiency in the process of interaction with the column in the zone of cleaning the currently used cotton cleaning equipment from large contaminants were developed. In addition, with the help of springs that vibrate the grating during operation, the gap increases and narrows when the cotton becomes more or less.

According to the results of the analysis, it was theoretically proved that the optimal amount of change is 1-3 mm, i.e. in the range of 15-18 mm so that the cotton vibrates with the spring when cleaning, affects the cleaning efficiency.

Keywords: Cotton, machine picking, hand picking, coarse dirt, sorting, waste, saw drum, grate grill, spring, vibration.

Introduction

Ensuring deeper processing of raw cotton in all sectors of the textile and light industry for the production of finished textile products, export of finished products such as dyed yarn, knitted fabrics to foreign countries, the active introduction of modern technologies and design are very effective for saving [1].

Comprehensive measures are being taken in the country to develop the cotton industry, modernize and re-equip cotton ginning plants, increase the profitability of the production and processing of raw cotton, as well as the competitiveness of its products. The strategy of actions for the further development of the Republic of Uzbekistan for 2017-2021, in particular, sets the task of "increasing the competitiveness of the national economy, ... reducing the consumption of energy and resources in the economy, the widespread introduction of energy. -saving technologies in production".

In the context of today's globalization and modernization of the economy, it is of great importance to reduce production costs at industrial enterprises, the solution of which will open up wide opportunities for successful participation in competition in international markets. One of the main tasks facing the republic's ginneries today is to increase production efficiency by upgrading equipment, producing high quality products, ensuring competitiveness, reducing waste and improving product quality. To overcome this problem, a lot of research work was carried out to create a new technological stream for cleaning raw cotton from the main pollutants, using innovative developments in technological processes. However, the technologies used in the country's cotton industry do not fully preserve the original natural quality of raw materials. The high content of the main pollutants in cotton and the low efficiency of the cotton cleaning and drying technology result in low quality and high cost of cotton products. It is clear that the efficiency of cleaning a product can be increased by creating an effective technology for cleaning cotton from large contaminants.

Scientific work on cleaning cotton from large impurities

History of the origin and development of cotton cleaning equipment from major impurities

The first sawdust cleaner BCH-2M, developed in Uzbekistan, was created in 1950. The cleaning efficiency of the device, that is, the efficiency, was low and consumed a lot of energy. After that, the cotton ginning equipment was improved and brought to its current state. Currently, scientists in this area are doing a lot of scientific work, and new improved cotton is being introduced into the production of equipment for large-scale decontamination.

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On the basis of the research carried out by Sh. Khakimov [4], a new fastening device is proposed to replace the fast-bending stationary brush. To study the spinning process of this new spinning device on the surface of a raw cotton saw, a theoretical model of movement between the raw cotton spinning drums was developed.

In addition, according to the analysis of technological processes used in foreign countries, including the United States, it is recommended to clean the fibrous materials four times with a saw drum, which requires no more than 20-30 pile drums. The results of this analysis show that improvements in cotton decontamination equipment will lead to improved cotton quality.

Research carried out on the connection of vibration in the cleaning of cotton from large impurities to the distance between the grates and the saw cylinder

Columnar grids of cotton ginners have been modified several times by scientists in this field. The grate used today in the treatment equipment is made of ST-40 steel. Each column has 5 columns. The first and second zones for cleaning the treatment equipment will be located, as well as the grates of the same column in the process of equipping. Colossal nets play a key role in cotton cleaning. Numerous scientific studies have been carried out on coded grids and their effect on cleaning efficiency.

Nabiev.Sh [3] conducted a study to study the effect of changing the distance between the columns when cleaning cotton from large contaminants in the UVK installation on the cleaning efficiency and the amount of cotton particles in the waste. In the study, the humidity was 8.2%, the pollution was 4.9%, An-Boyovut 2nd grade, cotton 1st grade. At the first stage, studies were carried out in the main cleaning department in order to determine the rational parameters of the distance between the columns. From the results of the analysis it can be seen that we can achieve an increase in cleaning efficiency due to the distance between the shoe and their oscillatory movement.

Theoretical studies on cleaning cotton from large impurities

Selection of the distance between the saw cylinder and the lever when cleaning the cotton from large impurities

To solve the problems of the technological process, a deep and comprehensive analysis of its performance using a mathematical model is required. However, complex technological processes, such as cleaning raw cotton from waste, bringing quality up to standard requirements, theoretically require solving a number of mathematical problems.

To maintain a predetermined average distance between the saw cylinder and the column, the column grate is adjusted so that the spring selected for vibrating motion moves the column grate in a range of 1-3 mm. The distance between the saw cylinder and the column ranges from 15 to 18 mm for low grade cotton.
As a result of compacting single-seeded ginners with low-grade cotton vibrating grids, the adhesion of the cotton to the saw teeth is increased.
The impurities in the incoming cotton flow are higher due to the increased vibration of the incoming cotton in the flow due to the vibration of the grate in the range of 1-3 mm. This will increase the cleaning efficiency of the UHK ginning equipment.
Taking into account the size of the raw cotton, the distance between the saw cylinder and the vibrating column grate by means of a spring was made in the range of 15 to 18 mm to improve the cleaning efficiency. To maintain clearance between the saw cylinder and the saw, the saws are positioned so that each saw facing the saw cylinder is in a curved line. The result is minimal damage to cotton fibers and seeds.

Theoretical analysis of the effect of the distance between the equipment colosnik and the saw cylinder on the cleaning efficiency when cleaning cotton from large impurities

Technological construction of a swing-arm grid with the help of a projectile is explained in the drawing (figure 1), where the general scheme of a swing-arm grid is presented.

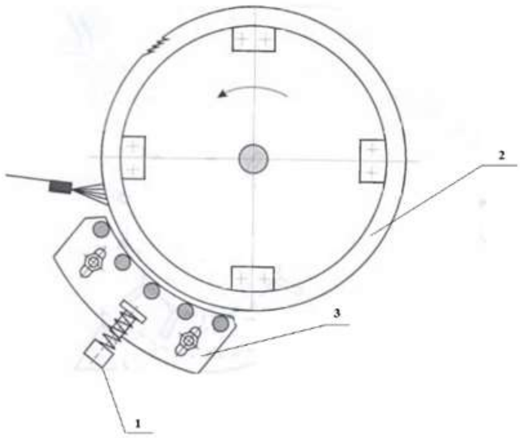

Figure 1. Colosnik grate for cleaning cotton
1– spring for grate vibration,2–pile drum,3 – fixed with a swinging colosnic
As a result of vibration of the grate during operation, low-grade seed cotton, which undergoes a cleaning process, improves its adhesion to the saw teeth due to short blows from the bottom, and dirt penetrates through the single-seeded cotton springs. through the bars.

By rotating the grate, clogging is prevented, cleaning is slightly increased and cotton seeds are added to the dirt.

We theoretically study the changes in pressure, density and velocity after each column passes as a result of the interaction of the raw cotton flow with the column system during its movement. To simulate this process, the following assumptions were made.

1. Cotton mass is considered stationary in the adjacent environment and the movement of the stream, it is unchanged in the zone where the fertile colognes in the stream are located and is equal to Q_0. impurities separated from the stream do not affect productivity Q_0.
2. The behavior of the current is considered to be one-dimensional among the colosnics.
3. Voluntary kolosnik interacts with the flow of cotton (medium), and the immersion of the kolosnik in the environment is determined either according to the Gers or Vinkler law, or on the basis of experience. We determine the speed, pressure and density (parameters) of the flow between the xar kolosnik and the cutting surface, respectively, with v_i, p_i and S_i. $(i = 1.n)$ n-the number of kolosniks.
4. The basis of the ABCD device is installed on the elastic element, during the movement the distance between all its points and the drum is the same, in this case the centers of the submersible torque $t = 0$ colosnics are in the O_i points, they move to the B_i point in the direction of the drum radiusi the same distance to the $u_0(t)$.

We determine the pressure parameters between the first and second colosnic.

Let's assume that the initial (except for the colossal zone) parameters of the current are ρ_9, v_0 h_0 and S_0. Before interacting with the first colosnik, let the flow thickness be h_0, then the working productivity of the stream in the case will be equal to $Q_9 = \rho_9 v_0 h_9 L$, where L is the length of the drum.

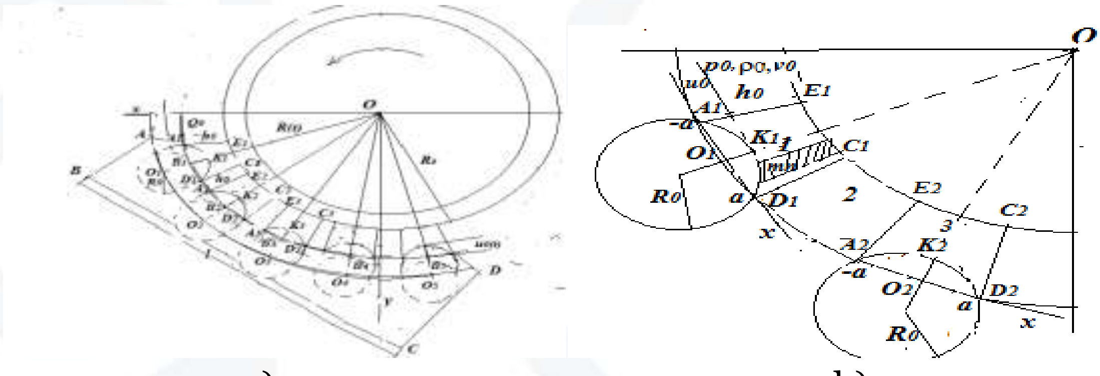

Figure 2. The general (a) and calculation (b)schemes of interaction of cotton products with colosnic in the cleaning zone.

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Interaction of homashyo with the first kolosnik $A_1K_1D_1C_1E_1$, in the zone we determine the parameters of the current (figure 1a). We direct the Ox arrow along the A_1D_1 cross section (figure 1b). The optional Surface (perpendicular to the plane) is determined by the following formula [1]:

$$S = (h_0 - u_0 + \frac{x^2}{2R_0})L \qquad -a < x < a \qquad (1)$$

here h_0 the initial thickness of product, $a = \sqrt{2u_0R_0}$ u_0 - kolosnik's displacement (immersion) in the direction of the drum according to 4 hypotheses is calculated as its submerged relative to the flow, and its value is determined either experimentally [1], or according to the law of Gers or Vinkler, R_0– colosnic radius, L - the length of the drum roller. We draw up the Eyler equation under the condition of stationary motion for the separated mn element [2]:

$$-[Sp + d(Sp)] + Sp - qfLdx = \rho vSdv \qquad (2)$$

here $q = kp$ – side pressure, k - pressure coefficient, $f = f_1 + f_2$, f_1, f_2 – coefficient of friction between the drum and the colosnik, respectively, with cotton
$S = h(x)L$ taking the equation and the q expression to the denominator (2) is the expression dx, we get the equation in the following way:

$$\rho vh\frac{dv}{dx} = -\frac{d(ph)}{dx} - kfp \qquad (3)$$

here $h = (h_0 - u_0 + \frac{x^2}{2R_0})$

(3) in the equation, the unknowns ρ, v, p are involved, we use two conditions to fill it. First, the condition of the flow stationary

$$\rho vh = \rho_0 v_9 h_0 = Q_0 / L \qquad (4)$$

The second condition must be appropriate for the equation of the case of the environment.
To do this, we get a connection between the pressure and the density. The linear connection between the pressure and the p volume $\varepsilon = \frac{\Delta V}{V_0} = 1 - \frac{\rho_0}{\rho}$ deformation according to [2,3] works is reasonable.

$$p = p_0 + K\varepsilon = p_0 + K(1 - \frac{\rho_0}{\rho}) \qquad (5)$$

p_0 - initial pressure in product, K - volume change module (experimental size).(4) and

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(5) using connections, we determine the expression of speed by pressure

$$\frac{v}{v_0} = 1 + \frac{p_0}{K}(1 - \frac{p}{p_0}) \quad (6)$$

(3) by putting this expression on the left side of the equation, we form an equation from it relative to the pressure p

$$\frac{dp}{dx} = -p\frac{h' + kf}{h - M^2 h_0} = -p\frac{x + R_0 kf}{[b_0 + x^2]} \qquad -a < x < a \text{ when} \quad (7)$$

here $b = 2R_0[h_0(1 - M^2) - u_0]$, $M = v_0 / c_0$ $a = \sqrt{2R_0 u_0}$

$c_0 = \sqrt{K / \rho_0}$ - same speed of sound in raw material environment.

(7) the solution of the equation depends on the sign of the b variable. In order for the cleaning process to take place, we require that (7) this function is decreasing on the condition of $p / p_< < 1$ according to the formula. It is enough to fulfill the $b > 0$ inequality on this condition. Using $b_0 = b^2$ equality (7) we get the solution of the equation on the condition of $p = p_0$ equality in $x = -a$ in the form of the following

$$p / p_0 = \exp\left[-\frac{fkR_0}{b} arctg(\frac{u_0 x}{b} + \frac{u_0 a}{b})\right]\sqrt{\frac{b^2 + a^2}{b^2 + x^2}} \quad (8)$$

the laws of the rate of flow along the $A_1K_1D_1$ arc and the distribution of its density are represented by the following phomoles

$$\frac{v}{v_0} = 1 + \frac{p_0}{K}(1 - \frac{p}{p_0}), \quad \frac{\rho}{\rho_0} = \frac{v_0 h_0}{vh} \quad (9)$$

In 3 and 4 figures, the graphs of the distribution of the speed of the flow of raw materials in stationary motion (3 figures) and the density (4 figures) in the first zone are given.

Analytical accounting of theoretical research

We accept the following values in the accounts. $R_0 = 0.24m$, $u_0 = 0.00021\text{m}$, $h_0 = 0.03\text{m}$, $\text{k} = 0.6$, $\rho_0 = 50kg / m^3$, $\text{Q}_0 = 5000\text{kg/hour}$, $p_0 = 1000\text{P}a$ From the analysis of the graphs, there is an increase in the flow rate along the zone, and a decrease in the density. The number of M and the coefficient of friction can affect the laws of speed and density distribution to the desired extent. Such an effect is explained clearly in the values that are close together in M number.

$f = 0.3$ $\qquad$ $f = 0.4$

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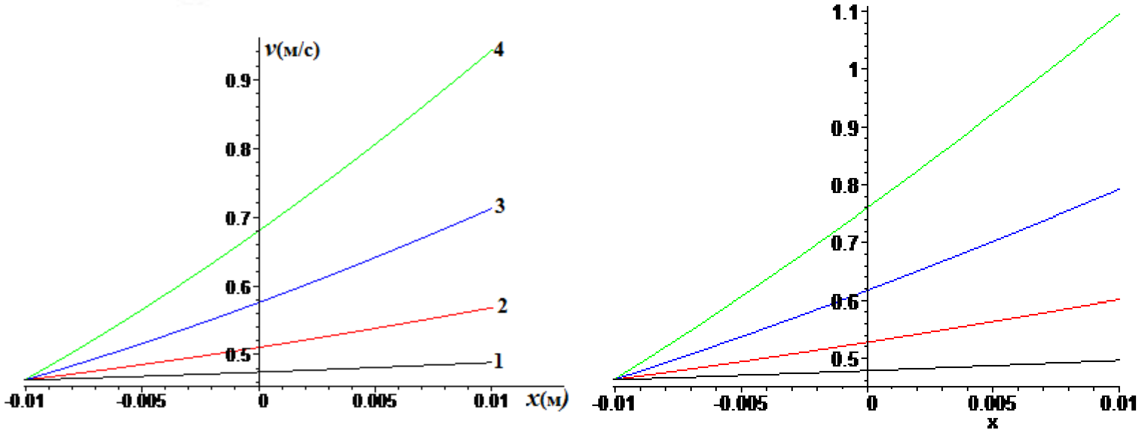

Figure 3. Flow rate of raw materials $v(м/c)$ 1 is the coefficient of friction in the cleaning sector in two values of f and the distribution graphs in different values of the number of $M = c_0 / v_0$. $1 - M = 0.1$,. $2 - M = 0.2$,. $3 - M = 0.3$,. $4 - M = 0.4$

$f = 0.3$ $f = 0.4$

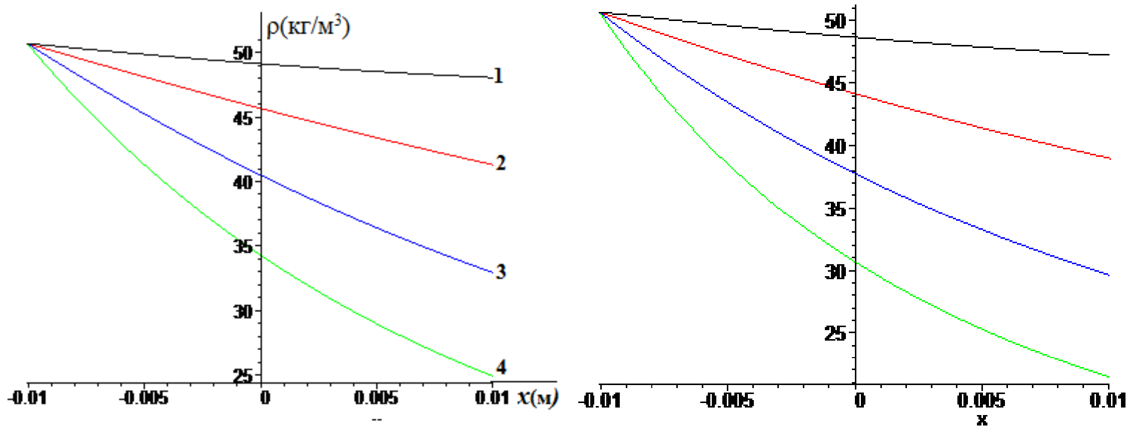

Figure 4. The density of raw material flow graphs of distribution of the coefficient of friction in the cleaning sector of $\rho(кг/м^3)$ in two values of f and in different values of the number of $M = c_0 / v_0$. $1 - M = 0.1$,. $2 - M = 0.2$,. $3 - M = 0.3$,. $4 - M = 0.4$

In the process of interaction of raw materials particles according to kolosnik, partial impurities can be separated from its composition as a result of the formation of a positive action on the impurities in the humashko takib and a decrease in the bonding forces between the impurities and the fibers in the humashyo. To study this jrayon, we will use the Sevostyanov model, which is presented in the literature [4]. According to this model, the reduction in the mass of impurities separated from the composition of the raw material is presented in this diffrential form:

$$\frac{dm}{m} = -\frac{1}{1+a_0}\frac{d\rho}{\rho} \qquad (10)$$

Here m - raw material mass, a_0 - the invariable positive parameter (10) is the support of the equation to the first zone, in the case of $m = m_0$, $\rho = \rho_0$ $x = -a$, we integrate in terms $\lambda = 1/(1+a_0)$

$$\frac{m}{m_0} = \left(\frac{\rho}{\rho_0}\right)^{-\lambda}$$

Here m_0 the initial mass of raw material.

The mass of impurities separated from raw material is determined by this equation:

$$\Delta m = m_0 - m = m_0\left[1 - \left(\frac{\rho}{\rho_0}\right)^{-\lambda}\right]$$

The table shows the mass of impurities separated in the first zone every hour at different values of the parameter λ and M. The increase in the parameters of λ and M from the analysis of the values in the table leads to a sharp increase in the amount of divorced masses.

Table. In 1-th section, the parameters of the homogeneous time interval from the composition of the material are the mass of impurities, separated by different values of λ and M.

Table 1

$\lambda = 0.2$

$M = v_0 / c_9$	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
$\Delta m(kg/\text{hour})$	0.32	1.78	4.06	7.00	10.52	14.65	19.56	25.78

$\lambda = 0.3$

$M = v_0 / c_9$	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
$\Delta m(kg/\text{hour})$	0.28	2.21	5.29	9.40	14.46	20.51	28.78	36.95

$\lambda = 0.4$

$M = v_0 / c_9$	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
$\Delta m(kg/\text{hour})$	0.98	4.74	10.18	16.62	23.69	31.24	39.42	48.72

In conclusion, from the results of the analysis from Table 1, we can say that we can see that the theoretical research carried out leads to an increase in the cleaning efficiency of the cotton dialed in a difficult cleaning machine.

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Conclusion

Analysis shows that cleaning efficiency of harvesting equipment plays a key role in harvesting machine-picked and low-grade cotton. In theory, this is based on the fact that to improve the efficiency of cleaning equipment, we can achieve this by moving the grates of the grates with the help of springs, that is, by ensuring their vibration.
Based on the results of the analysis of scientific works, theoretical equations of the effect of distance on the cleaning efficiency in the process of interaction with the column in the zone of cleaning the currently used cotton cleaning equipment from large contaminants were developed. The use of springs is also standardized to provide vibration to the grate during operation and to increase the distance between cotton when cotton becomes more or less. The result is improved adhesion of low-quality cotton seeds to the saw teeth as it goes through the cleaning process, and reduces the amount of single-seeded cotton pieces entering the dirt through the columns. According to the results of the analysis, the effect of increasing the cleaning efficiency is theoretically proved by the fact that the optimal value of the change is in the range of 1-3 mm, i.e. in the range of 15-18 mm. From the analysis of the results of this theoretical analysis, we conclude that theoretical studies of harvesting equipment and the widespread introduction of modern advanced equipment into production play a key role in improving the quality of cotton.

References

1. International cotton advisory committee. Washington, From the Secretariat of the ICAC. https://icac.org/, email secretariat@icac.org. September 1, 2018
2. Muksin, K., Ilkhom, A.,Iqbol, M., Javlon, K. and Marguba, R., 2020. TECHNOLOGICAL BREAKTHROUGH OF COTTON CLEANING ENTERPRISES Fiber Waste. European Journal of Molecular & Clinical Medicine, 7(2), pp.508-515.
3. V. Kuznetsov, S. Denisov. Pneumotransport of woodworking enterprises. Bratsk State Technical University. Bratsk., 2007.
4. Baydyuk P.V., Khozhiev M.Kh. Methodology for determining hydraulic pressure losses in a horizontal working pipeline of a pneumatic conveying system for raw cotton. // R.Zh. Cotton industry. 1992. No. 2.C. 8-9.
5. Abbazov, I. Z. "IMPACT DEVICE FOR COLLECTING FIBER WASTE ON DUST TRAPPING." Textile Journal of Uzbekistan 7.1 (2019): 28-35.Гуревич М.И. “Идеал суюқлик оқимлари назарияси”. Москва 1961-йил. 496 б.
6. Талиэв В.Н. “Шамоллатиш аэродинамикаси”. Москва 1979-йил. 295 б.

7. Abbazov Bahodir Toir o'g'li, Muradov Rustam Muradovich, Egamberdiev Fazliddin Otakulovich /// Construction Analysis Of Large Polluters Cotton Cleaning Machines Urganch 2021 yil 82-bet

8. Аббазов Б.Т., Мурадов Р.М., Аббазов И.З. Пахтани йирик ифлосликлардан тозалаш машиналари конструкциясини такомиллаштириш буйича олиб борилган илмий тадкикот ишларининг тахлили Бухоро 2021 й 196-бет

9. Kayumov, A. K., Kasimov, D. N., Doniyorova, M. A., Ruzmatov, B. S., & Doniyorov, B. B. (2020). Research on the Production of New Textile Fabrics with a Silk-Cotton Mixture with a Road-Embossed Pattern. Solid State Technology, 63(4), 555-564.

10. Мирошниченко Г.И. Основы проектирования машин первичной обработки хлопка М.Машиностроение. 1972. 486 с.

11. Сулаймонов Р.Ш., Максудов Э.Т., Жуманиязов К. Испытания модернизированного двухбарабанного волокноочистителя в производственных условиях// Проблемы текстиля. -Ташкент, ТИТЛП, 2016.-№4.-С7-12.

12. Мардонов Б.М., Р.Ф.Юнусов. Е.А.Лугачев Моделирование процесса ухода соринок из состава волокнистой массы при динамическом взаимодействия ее с сетчатой поверхностью. Сборник трудов «Инновационные технологии товаров народного потребления, качество и безопасность» Международная научно-практическая конференция Алматы, 17-18 июня, 2010. С.274-276.

13. Ulugmuradov H. Y., Abbazov I. Z., Muradov R. M. Study on improving the efficiency of cleaning the pile drum //IOP Conference Series: Earth and Environmental Science. – IOP Publishing, 2020. – Т. 614. – №. 1. – С. 012127.

14. Усманкулов А. К. и др. ПАХТАНИ ТОЗАЛАШ МАШИНАЛАРИ КОНСТРУКЦИСИНИ ТОКОМИЛЛАШТИРИШ БУЙИЧА ОЛИБ БОРИЛГАН ИЛМИЙ ТАДҚИҚОТ ИШЛАРИНИНГ ТАҲЛИЛИ //Журнал Технических исследований. – 2020. – Т. 3. – №. 4.

15. Ulug'muradov K.Y., Abbazov IZ, Muxametshina ET. PAXTA ZONOTIDA TOZALASH MOSHINALARNI TAHLILI //Zbiór artykułów naukowych recenzowanych. – 2020. – S. 13.

16. Аббасов И. З. и др. ПАХТА ТАРКИБИДАН МАЙДА ИФЛОСЛИКЛАРНИ АЖРАТИБ ОЛУВЧИ ЯНГИ УСКУНА КОНСТРУКСИЯСИНИ ТАҲЛИЛИ //Журнал Технических исследований. – 2020. – Т. 3. – №. 3.

17. Gulbayev UYO, Ro'zmatov B.S., Yuldashev KX CHAR VA MO'YNA SANOATIDA INNOVATSION TA'LIM KLASTERINI YARATISH VA JOYIB ETISHI //Fan va ta'lim. – 2021. – Т. 2. – №. 1.

18. Аббазов И. З. и др. ТЕХНОЛОГИК ЖАРАЁНЛАРДАН ЧИҚАЁТГАН ЧАНГ ЗАРРАЧАЛАРИНИНГ ФРАКЦИОН ТАРКИБИ //Science and Education. – 2021. – Т. 2. – №. 3. – С. 129-135.
19. Мардонов Б.М Р.Расулов Р.Х.,Фазылов. Расположения колосников в колосниковой решетке очистителя хлопка сырца от крупно сора Сборник трудов «Инновационные технологии товаров народного потребления, качество и безопасность» Международная научно- практическая конференция Алматы, 17-18 июня, 2010. -С.222-223.
20. Джонсон К. Механика контактного взаимодействия Изд.Мир , 1989, 510 с.
21. Мирошниченко Г.И Основы проектирования машин первичной обработки хлопка. М. «Машиностроение»1972, 480 с.
22. Мардонов Б.М. Пахта саноати технологик жаоаёнларини моделлаштириш 2 қисм. Ташкент, 2014, 190 бет
23. Севостьянов А.Г.,Севостьянов П.А Моделирование технологических процессов. М Легк. п пищев.промыщленность 1984, 344 с.