INFLUENCE OF GRID RADIUS ON THE TIME OF INTERACTION WITH FLAT IN THE COTTON CLEANER FROM LARGE LITTER

Norbaeva Dilfuza Vokhidovna

PhD., "Technological machines and equipment"
Namangan Engineering and Construction Institute
Uzbekistan, Namangan.

Abstract: *The article presents the scheme and principle of the effective grate design of cotton cleaner from a large litter. An expression is obtained for calculating the interaction time of cotton with grates with different radii. Graphic dependencies of the time of interaction of cotton with the bars with the change in the radius of the bars are constructed. The parameters of the bars, which are installed in the area of the cleaner with increasing radii, are justified.*

Key words: *raw cotton, grate, radius of the grate, interaction time, radius of the grate, inter-grid zone.*

Introduction. Maximum preservation of the natural qualities of cotton should be based on the perfect design of machines and equipment for the primary processing of cotton and the creation of working parts of machines that effectively influence cotton. The main indicator of the operation of cotton ginning machines is their ability to separate litter, uluk and various impurities from raw cotton, maximally preserving the natural qualities of the fiber and seeds. The efficiency of isolating impurities from raw cotton largely depends on the quality characteristics, industrial grade and moisture content of cotton, fiber length, residence time of impurities in raw cotton, the nature of adhesion of the litter, etc.

In recent years, the requirements for the quality of cotton - fiber and seeds - have increased significantly. To obtain high quality cotton fiber and seeds, the issues of improving the design of the working parts of cotton primary processing machines, especially cotton purifiers from large impurities, are being comprehensively addressed. It should be noted that there are a number of studies on improving the designs and methods of calculating grate bars for cotton gins to remove large litter [1,2] .

But the creation of highly efficient grate designs for cotton scourers from large debris, as well as the development of methods for calculating their operating parameters based on theoretical and experimental studies remain insufficient.

New grate design . The known design of the grate for the fibrous material cleaner contains round-section grates located in arcuate sidewalls [3]. The main disadvantage of this design is the low efficiency of cleaning fibrous material, in particular raw cotton. To increase the cleaning effect due to the oscillations of the grate, a grate was developed, which contains a pair of sidewalls with holes and rod grates placed between the sidewalls, at the end sections of the axes of which elastic bushings are installed, located in the holes of the sidewalls [4]. The disadvantage of this design is the low efficiency of fiber cleaning.

In [5], the grate bars are made with variable diameter sizes, while the grate bars are installed in a sinusoidal sequence of changing diameter sizes. The gaps between the grate bars and saw cylinders are made identical with the possibility of changing the pitch between the grate bars and the installation radius of the grate bars relative to the axis of rotation of the cylinder. The disadvantage

ISSN 2349-7793 (online), Published by INTERNATIONAL JOURNAL OF RESEARCH IN COMMERCE, IT, ENGINEERING AND SOCIAL SCIENCES.,
under Volume: 17 Issue: 09 in September-2023
https://www.gejournal.net/index.php/IJRCIESS

of this design is a large percentage of raw cotton flotation along with debris, especially at the end of the cleaning zone, as well as a low cleaning effect on large debris . To increase the cleaning of cotton from large debris, we recommended a new design of a grate cleaner [6]. The essence of the design is that the grate of the fibrous material cleaner contains grates mounted in arched sidewalls in the form of round rods, the diameters of which are chosen to increase as the fibrous material is pulled through, and the diameter of the first grate is chosen to be equal to 18 мм, and the last one 22 мм, with $d_i = d_{i-1}$ +4mm/ n (where d_i is the diameter of the i -th grate, n is the number of grates and 22 мм-18mm = 4 mm), respectively, the step between the grates is made decreasing as the fibrous material is pulled through, and the step between the first and second grate is chosen 60 мм, and the step between the last two grates is chosen equal to 50 мм, while $t_{i,i+1} = t_{i-1,i}$ -10mm/ n -1 (where, t_i , i +1 is the step between i and i + 1st grate, 60 mm-50 mm = 10mm), the gap between the cylinder and the grate is chosen to be the same.

The device contains grate bars 1 with increasing diameter and decreasing steps between them, a saw cylinder 2. The gap between the saw cylinder 2 and the grate bars is constant. In this case, the following relations were selected (Fig. 1):

$$d_i = d_{i-1} + 4 \text{ mm}/n;\; t_{i,i+1} = t_{i-1,i} - 10 \text{ mm}/n-1;\; \Delta = \text{const}$$

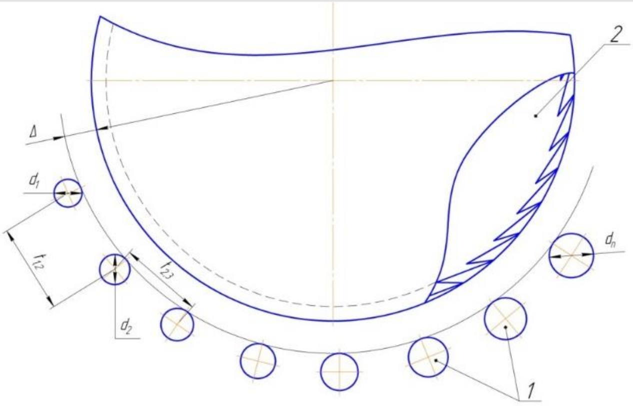
where, d_i is the diameter of the i -th grate, n is the number of grates and 22 мм-18 mm = 4mm, t_i , i +1 is the step between the i -th and i +1-th grate, 60 mm-50 mm = 10mm, Δ- the gap between saw cylinder 2 and grate bars 1.

The grate of the fibrous material cleaner works as follows. In the pulling zone (the area between the first and last grate bars 1), the fibrous material is captured by the teeth of the saw cylinder 2 and pulled along the grate bars 1, while pulsed collisions of the material occur on various cylindrical surfaces of the grate bars 1. At the same time, to ensure continuity of the process, the gaps between the grate bars 1 and the saw blade cylinder 2 are chosen constant. At the beginning of the cleaning zone from raw cotton, large debris will be released more than at the end of the cleaning zone and therefore at the beginning of the cleaning zone the step between grate bars 1 will be large, which allows the effective loss of debris through the gaps between grate bars 1. At the end of the cleaning zone of raw cotton will be more loosened and the debris contained in it will also be smaller and therefore, due to the reduced gap between the grate 1 and the larger diameter of the grate 1, the escape of cotton flakes along with the litter is significantly reduced.

The proposed design of the grate of the fibrous material cleaner allows for an increase in the cleaning effect and reduces the removal of cotton flakes along with litter.

Research results. In the process of cleaning cotton, it is important to determine the time of interaction of the raw cotton fly with the grate bars, especially when their sizes change.

ISSN 2349-7793 (online), Published by INTERNATIONAL JOURNAL OF RESEARCH IN COMMERCE, IT, ENGINEERING AND SOCIAL SCIENCES.,
under Volume: 17 Issue: 09 in September-2023
https://www.gejournal.net/index.php/IJRCIESS



1-grid bars; 2-saw cylinder.

Fig.1. Grate for cleaning raw cotton from large debris.

Figure 2 shows a diagram for calculating the interaction time of raw cotton fly with the grate.

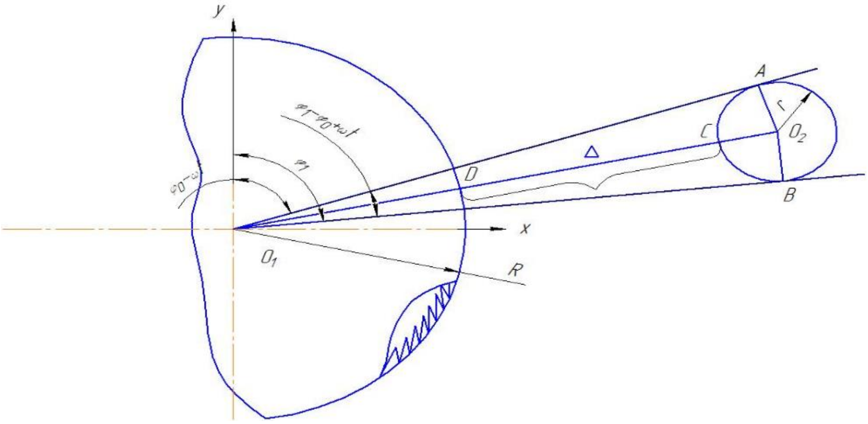


Fig.2. Calculation scheme for determining the time of interaction of cotton flakes with the grate

From the calculation diagram (see Fig. 2) it is clear that in the zone of pulling cotton through the grate, the interaction of the fly occurs with an angular displacement equal to $(\varphi_r - \varphi_0 + \omega t)$the saw cylinder.

From $\Delta O_1 O_2$ we can determine

$$\sin\left(\varphi_1 - \varphi_0 + \omega t\right)\frac{1}{2} = \frac{AO1}{AO2}(1)$$

After some transformations from (1) we obtain:

$$t = \left(\varphi_1 - \varphi_0 + 2arcsin\frac{r}{R+\Delta+r}\right)\ (2)$$

where R , r are the radii of the saw cylinder and the grate, respectively;

Δ - gap between the saw cylinder and the grate;

$\varphi -$ initial rotation position of the saw cylinder;

ω- angular speed of the saw cylinder;

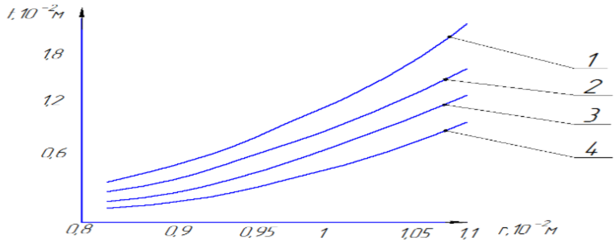
t is the time of interaction of cotton flakes with the grate.

The numerical solution of problem (2) was carried out on a PC with the following initial parameter values:

r = 18 ...22 mm; R = 240mm; Δ =10…14mm; n_b=280…340 min^{-1}.

ISSN 2349-7793 (online), Published by INTERNATIONAL JOURNAL OF RESEARCH IN COMMERCE, IT, ENGINEERING AND SOCIAL SCIENCES., under Volume: 17 Issue: 09 in September-2023
https://www.gejournal.net/index.php/IJRCIESS

Based on the results of solving the problem, graphical dependences of the change in the time of interaction of cotton flaps with the grate bars on the change in the radius of the grate bars were constructed, which are presented in Fig. 3.



1- at n $_b$ =280 min $^{-1}$; 2- at n $_b$ =300 min $^{-1}$;
3- at n $_b$ =320 min $^{-1}$; 4- at n $_b$ =340 min $^{-1}$.

Fig.3. Graphic dependences of the change in the time of interaction of cotton flakes on the change in the radius of the grate of the cotton cleaner from large litter.

Analysis of the obtained dependencies shows that an increase in the radius of the grate leads to an increase in the time of interaction of cotton flakes with the grate according to a nonlinear pattern. Thus, with an increase from 0.85 * 10 $^{-2}$ m to 1.1 * 10 $^{-2}$ m at n $_b$ = 280 min $^{-1,}$ the interaction time increases from 0.33 * 10 $^{-2}$ to 1.82 * 10 $^{-2}$ s . At values of n $_b$ =340 min $^{-1}$ of the saw cylinder, the interaction time of raw cotton flakes with the grate increases from 0.18*10 $^{-2}$ s to 0.97*10 $^{-2}$ s.

Research has shown that in order to increase the time of interaction of cotton flakes with the grate, allowing an increase in the cleaning effect, it is advisable to increase the radius of the grate as the cotton is pulled through the working area of the cleaner. It is recommended to increase the radius of the grate from 0.9 * 10 $^{-2}$ m to 1.1 * 10 $^{-2}$ m with a decrease in the gaps between the saw drum and the grate as the cotton is pulled through the cleaning zone.

Conclusions. A new effective design of the grate for removing large debris from cotton has been developed. An expression has been obtained for calculating the time of interaction of the cotton fly with the grate. Based on the analysis of the obtained dependencies, the values of the grate radii in the cleaning zone are recommended.

References:

1. Росулов Р.Х., Джураев А., Хакимов Ш.Ш., Норбаева Д.В. Очистителъ волокнистого материала. Заявка на изобрежение. 2018 г.
2. Ultman V.E., Chebakov V.M., Chudnovsky A.I. To the question of the destruction of spatial-structural polymers .- "Mechanics of Polymers", 2014, No.4, pp.525-529
3. Jumayevich, M.O., & a’lovidinovna, S.N. (2023). Analysis of dust from cotton factories and its effects on human health. European journal of modern medicine and practice, 3(6), 30-37.
4. Джамолов, Р.К., Пардаев, Б.Ч., & Расулов, Р.Х. (2023). Пахтани майда ифлосликлардан тозалаш тизимида кўп қиррали қозиқли барабан қоплама диаметрини ўзгариб боришида тозалаш самарадорлигига таъсирини ўрганиш. Pedagogs jurnali, 30(2), 93-97.
5. Росулов, Р.Х., Эрдонов, А.М., Усманов, Х.С., Исмаилов, А.А., & Тангиров, А.Э. (2023). Очистка хлопка-сырца вибрационным способом. Главный редактор: Ахметов Сайранбек Махсутович, д-р техн. наук; Заместитель главного редактора: Ахмеднабиев Расул Магомедович, канд. техн. наук; Члены редакционной коллегии, 56.

6. Абдулхафизов, Б.Х. (2023). Пахтани Йирик Ифлосликлардан Тозалаш Технологияси Машиналари Таҳлили. Journal of Universal Science Research, 1(5), 129-139.

7. Мансуров, М. Т. (2023). АВТОМАТИЗАЦИЯ МЕХАНИЧЕСКИХ УСТРОЙСТВ С ПОМОЩЬЮ ARDUINO. Научный Фокус, 1(1), 1992-1997.

8. Nozimjon, Q., & Rasuljon, Y. (2021). The issue of automation, analysis and anxiety of online testing. Asian Journal Of Multidimensional Research, 10(7), 94-98.

9. Отаханов, Б. С., Пайзиев, Г. К., & Хожиев, Б. Р. (2014). Варианты воздействия рабочего органа ротационной машины на почвенные глыбы и комки. *Научная жизнь*, (2), 75-78.

10. Rustamov, R., Xalimov, S., Otaxanov, B. S., Nishonov, F., & Xojiev, B. (2020). International scientific and scientific-technical conference" Collection of scientific works" on improving the machine for harvesting walnuts.

11. Мелибаев, М., Кидиров, А. Р., Нишонов, Ф. А., & Хожиев, Б. Р. (2018). ОПРЕДЕЛЕНИЕ ГЛУБИНЫ КОЛЕИ И ДЕФОРМАЦИИ ШИНЫ В ЗАВИСИМОСТИ ОТ СЦЕПНОЙ НАГРУЗКИ, ВНУТРЕННЕГО ДАВЛЕНИЯ И РАЗМЕРОВ ШИН ВЕДУЩЕГО КОЛЕСА. *Научное знание современности*, (5), 61-66.

12. Нишонов, Ф. А., Хожиев, Б. Р., & Қидиров, А. Р. (2018). ДОН МАХСУЛОТЛАРИНИ САҚЛАШ ВА ҚАЙТА ИШЛАШ ТЕХНОЛОГИЯСИ. *Научное знание современности*, (5), 67-70.

13. Хожиев, Б. Р., Нишонов, Ф. А., & Қидиров, А. Р. (2018). УГЛЕРОДЛИ ЛЕГИРЛАНГАН ПЎЛАТЛАР ҚУЙИШ ТЕХНОЛОГИЯСИ. *Научное знание современности*, (4), 101-102.

14. Худайбердиев, А. А., & Хожиев, Б. Р. (2017). Энергосберегающая технология проведения процессов нагревания нефтегазоконденсатного сырья и конденсации углеводородных паров. *Научное знание современности*, (4), 395-400.

15. Худайбердиев, А. А., & Хожиев, Б. Р. (2017). Влияние температуры на плотности нефти, газового конденсата и их смесей. *Научное знание современности*, (4), 389-394.

16. Киргизов, Х. Т., Саидмахамадов, Н. М., & Хожиев, Б. Р. (2014). Исследование движения частиц почвы по рабочей поверхности сферического диска. *Вестник развития науки и образования*, (4), 14-19.

17. Mansurov, M. T., Otahanov, B. S., Xojiyev, B. R., & Nishonov, F. A. (2021). Adaptive Peanut Harvester Stripper Design. *International Journal of Innovative Analyses and Emerging Technology*, *1*(4), 140-146.

18. Mansurov, M. T., Otahanov, B. S., & Xojiyev, B. R. (2021). Advanced Peanut Harvesting Technology. *International Journal of Innovative Analyses and Emerging Technology*, *1*(4), 114-118.

19. Mansurov, M. T., Nishonov, F. A., & Xojiev, B. R. (2021). Substantiate the Parameters of the Plug in the" Push-Pull" System. *Design Engineering*, 11085-11094.

20. Рустамов, Р. М., Отаханов, Б. С., Хожиев, Б. Р., & Нишанов, Ф. А. (2021). УСОВЕРШЕНСТВОВАННАЯ ТЕХНОЛОГИЯ УБОРКИ АРАХИСА. *МЕХАНИКА ВА ТЕХНОЛОГИЯ ИЛМИЙ ЖУРНАЛИ*, (3), 57-62

21. Мансуров, М. Т., Отаханов, Б. С., Хожиев, Б. Р., & Нишонов, Ф. А. (2021). Адаптивная конструкция стриппера для уборки арахиса. *Международный журнал инновационных анализов и новых технологий*, *1*(4), 140-146.

22. Отаханов, Б. С., Пайзиев, Г. К., Хожиев, Б. Р., Миркина, Е. Н., & Левченко, С. А. Технические науки. *Интерактивная наука*, 50-54

23. Халимов, Ш. А., Хожиев, Б. Р., & Абдурахимова, Г. Ш. (2017). ИССЛЕДОВАНИЯ ФИЗИКО-МЕХАНИЧЕСКИХ СВОЙСТВ АРМИРОВАННЫХ КОМПОЗЦИОННЫХ ПОЛИМЕРНЫХ МАТЕРИАЛОВ ПРИ РАЗНЫХ ТЕМПЕРАТУРАХ. *Научное знание современности*, (4), 373-378.

24. Toxirjonovich, M. M., Akhmatkhanovich, N. F., & Rakhmatullaevich, X. B. (2022, May). COMBINATION MACHINE FOR HARVESTING NUTS. In *Conference Zone* (pp. 19-21).

25. Toxirjonovich, M. M., & Rakhmatullaevich, X. B. (2022, May). THE RESULTS OF A STUDY ON THE SELECTION OF THE WORKING PART THAT SEPARATES THE NUT PODS FROM THE HUSK. In *Conference Zone* (pp. 14-18).

26. Нишонов Фарходхон Ахмадхонович, Кидиров Атхамжон Рустамович, Салохиддинов Нурмухаммад Сатимбоевич, & Хожиев Бахромхон Рахматуллаевич (2022). ПРОБЛЕМЫ И РЕШЕНИЯ СБОРА УРОЖАЯ АРАХИСА. Вестник Науки и Творчества, (1 (73)), 22-27.

27. Мансуров Мухторжон Тохиржонович, Хожиев Бахромхон Рахматуллаевич, Нишонов Фарходхон Ахматханович, & Кидиров Адхам Рустамович (2022). МАШИНА ДЛЯ УБОРКИ АРАХИСА. Вестник Науки и Творчества, (3 (75)), 11-14.

28. Нишонов, Ф. А. (2022). Кидиров Атхамжон Рустамович, Салохиддинов Нурмухаммад Сатимбоевич, & Хожиев Бахромхон Рахматуллаевич (2022). ПРОБЛЕМЫ И РЕШЕНИЯ СБОРА УРОЖАЯ АРАХИСА. *Вестник Науки и Творчества,(1 (73))*, 22-27.

29. Мансуров, М. Т. (2022). Хожиев Бахромхон Рахматуллаевич, Нишонов Фарходхон Ахматханович, & Кидиров Адхам Рустамович (2022). МАШИНА ДЛЯ УБОРКИ АРАХИСА. Вестник Науки и Творчества,(3 (75)), 11-14.

30. Эргашев, Ш., Отаханов, Б., Хожиев, Б., & Тўраев, Ж. (2022). МАШИНА ДЕТАЛЛАРИГА ҲИМОЯ ҚОПЛАМАЛАРИНИ ЁТҚИЗИШ ТЕХНОЛОГИЯЛАРИНИНГ РИВОЖЛАНИШИ. Scientific Impulse, 1(2), 322-331.

31. Нишонов, Ф. А., Кидиров, А. Р., Салохиддинов, Н. С., & Хожиев, Б. Р. (2022). ПРОБЛЕМЫ И РЕШЕНИЯ СБОРА УРОЖАЯ АРАХИСА. Вестник Науки и Творчества, (1 (73)), 22-27.

32. Мансуров, М. Т., Хожиев, Б. Р., Нишонов, Ф. А., & Кидиров, А. Р. (2022). МАШИНА ДЛЯ УБОРКИ АРАХИСА. Вестник Науки и Творчества, (3 (75)), 11-14.

33. Мансуров, М. Т., Абдулхаев, Х. Ғ., Нишонов, Ф. А., & Хожиев, Б. Р. (2021). ЕРЁНҒОҚ ЙИҒИШТИРИШ МАШИНАСИНИНГ КОНСТРУКЦИЯСИ. МЕХАНИКА ВА ТЕХНОЛОГИЯ ИЛМИЙ ЖУРНАЛИ, (4), 39.

34. Эргашев, Ш. Т., Отаханов, Б. С., & Абдуманнопов, Н. А. (2021). МАЛОГАБАРИТНАЯ ЗЕРНОСУШИЛКА ДЛЯ ФЕРМЕРСКИХ ХОЗЯЙСТВ. Universum: технические науки, (6-1 (87)), 55-58.

35. Абдуманнопов, Н. А. (2018). Модернизация кольцевой печи для обжига строительного кирпича. Научное знание современности, (12), 25-29.

36. Мелибаев, М., & Абдуманнопов, Н. (2018). (9-ТМЖ-16 гуруҳ талабаси). Ходовая часть тракторов-плодородие почвы-урожай. In " Инновационное научно-образовательное обеспечение агропромышленного комплекса". Материалы 69-ой международной научно-

практической конференции. 25 апреля 2018 г.-Рязань, Издательство. Рязанского государственного агротехнологического университета (No. 11, p. 232).

37. Отаханов, Б. С., Абдуманнопов, Н. А., Ёкубжонов, Н. Н., & Гиёсов, К. А. Engineering sciences. Интерактивная наука, 49.

38. Tolanovich, E. S., Sadirdinovich, O. B., Rustamovich, K. A., & Abdulkhakimovich, A. N. (2021). New Technology for Drying Grain and Bulk Materials. Academic Journal of Digital Economics and Stability, 9, 85-90.

39. Отаханов, Б. С., Абдуманнопов, Н. А., Ёкубжонов, Н. Н. У., & Гиёсов, К. А. У. (2019). Оптимизация параметров ведомого ротора бесприводного ротационного рыхлителя. Интерактивная наука, (11 (45)), 49-51.