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STUDY OF THE INFLUENCE OF FIBER CLEANING EQUIPMENT ON FIBER QUALITY BY CHANGING THE MAIN WORKING ELEMENTS

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Abstract

At the present stage of development of cotton processing industry, it is important to increase the volume of production and improve the quality of the obtained cotton fiber. To implement these tasks, it is necessary: to carry out a comprehensive reconstruction of existing and construction of new cotton processing plants and equip them with new modern equipment that meets world standards, improve the technological processes of processing raw cotton, improve the quality of scientific research and widely implement their results in industry.

Keywords

fiber cleaner, ear, module peelings, cleansing effect.

Introduction. The main criterion in processing raw cotton is the quality of the resulting fiber. One of the important stages of the regulated technological process of processing raw cotton is cleaning the fiber from foreign impurities. Despite the fact that before the gin process, raw cotton is repeatedly cleaned from foreign impurities, and the gin process itself is accompanied by some additional cleaning, some small foreign impurities and defects still remain in the resulting cotton fiber, which makes the fiber cleaning process mandatory [1].

Existing fiber cleaners do not provide for obtaining cotton fiber of sufficiently high quality; the main reasons for which are: multiple fiber cleaning processes; imperfect designs of working parts and mechanisms; insufficiently substantiated choice of operating parameters and movement modes; harsh conditions of the technological cleaning process.

In order to eliminate the above-mentioned shortcomings, it is necessary to identify the reasons for the low efficiency of the impact of the working parts on the processed fiber and to develop new designs of the working parts of fiber cleaners that have the property of effective impact on cotton fiber while simultaneously preserving its natural properties, which contribute to improving the quality of the produced fiber [2].

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Research into the dynamics of the movement of working bodies and its influence on the technological process of fiber cleaning has not been carried out in sufficient detail.

In this regard, the development of new designs of working bodies of fiber cleaners, rational selection of parameters and modes of their movement is an urgent national economic task, the solution of which is devoted to the dissertation work.

Dynamic analysis of the machine unit of the fiber cleaner was carried out using methods of the general theory of mechanisms and machines. The solution of the dynamics problem was carried out analytically using known methods for solving differential equations [3].

Materials and methods. 3 Experimental studies of the power loading of the saw drum drive mechanism and the grate bars of the fiber cleaner were carried out using the strain gauge method, and the speed parameters were measured using magnetoelectric sensors.

The grate for the fibrous material cleaner developed by us is distinguished by its simplicity of design, shown in (Fig-1).

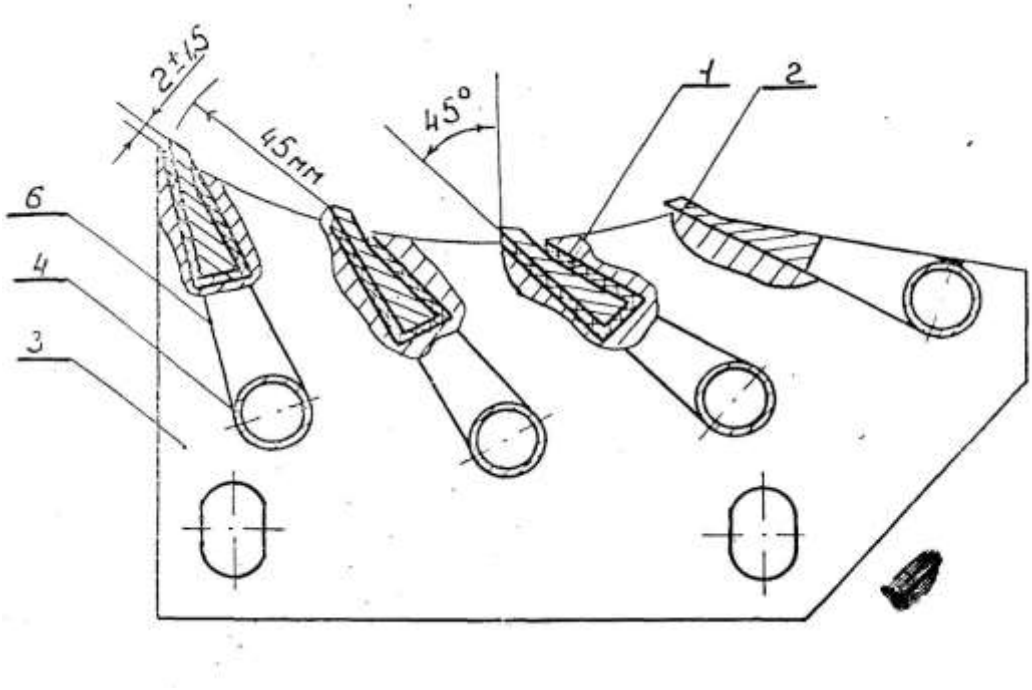

Fig-1. Grate of the fibrous material cleaner

1 – elastic element; 2 – grate; 3 – sidewall; 4 – support pipe;

5 – fairings

The grate consists of trapezoidal cross-section grates 2 installed in the sidewall 3 by means of elastic elements (supports) I. In order to maintain the technological gap between the edge of the grate and the working drum within acceptable limits and to create favorable conditions in the near-grate zone, preventing the adhesion of the separated waste impurities to the working surface, the grates are connected

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by means of fairings 5 to the supporting hollow rods 4. During the cleaning process, the fibrous material is beaten along the grate, as a result of which the waste impurities are knocked out of the fiber strands [6].

The installation of grates 2 on elastic supports I determines their dynamic (oscillatory) mode of movement during the cleaning process. In this case, forced oscillations from the grates, excited by the processed material itself, are superimposed on the free oscillations of the fiber strands [7]. By appropriately selecting the parameters of the elastic support (material and geometric dimensions), it is possible to establish such oscillation modes of the grates in which resonant or near-resonant oscillations of waste inclusions are possible, which will lead to an increase in the cleaning effect of the fiber cleaner.

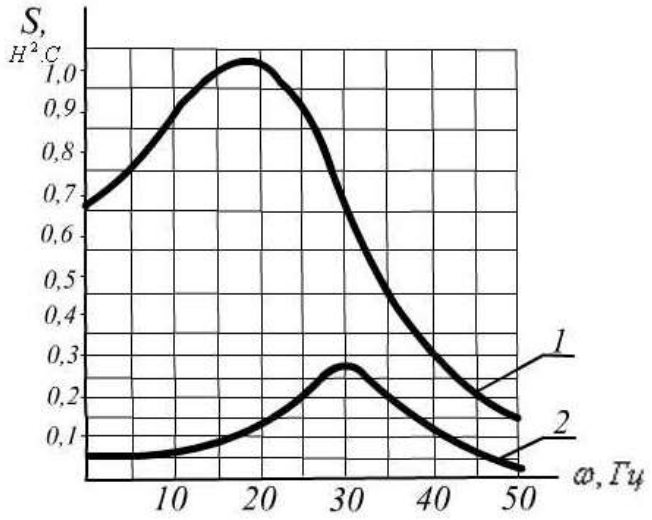

Fig. 2. Spectral densities of random functions

Bending forces in the extreme zones of sections of the I-series grate; 2-grate. With elastic elements

In the fourth section of the, the ecological provisions of the segment are presented.

In the fifth section of the work, an economic calculation is given.

Summary. Based on the analysis of existing designs of fiber cleaner grates, their functional classification is proposed and a new design of grates with elastic elements that more actively affect the processed fiber is developed.

Based on the compiled dynamic and mathematical models, the dynamics of the machine unit of the fiber cleaner was investigated taking into account the characteristics of the electric motor and the actual process resistances from the cotton fiber. It was found that when the productivity of the fiber cleaner changes within the range of П = (0.800) kg/hour, the average values, and oscillations of the angular velocity and torque on the saw drum shaft change within the range of = (157.155) rad/s, = (0 - 0.20) rad/s, Mcp = (0.7) N m, .- 70) N m, respectively.

Comparatively small values of the mean oscillations of the angular velocity cause the monotony of the saw drum action on the processed fiber.

A method of theoretical calculation of the modes of movement of grates with elastic elements under the influence of multiple periodic pulses from cotton fiber has been developed, which allows determining the law of its movement, as well as conducting a qualitative analysis of the characteristics of the elastic elements of the change in the law of movement depending on the geometric and rigid characteristics of the elastic elements, saw and frequency of pulse application. Based on the results, the following optimal values are recommended: grate mass B 5.4 kg, fairing thickness - 2.0 mm.

REFERENCES:

1. Yuldashev, K., Sharipov, K., Najmitdinov, S., Inamova, M., & Ruzimatov, S. (2024). Modelling cotton fiber doffing from saw teeth based on a mathematical model. E3S Web of Conferences, 537, 08017. https://doi.org/10.1051/e3sconf/202453708017

2. Тўхтаев Шерзод, & Саримсақов Олимжон (2021). ПАХТА ҒАРАМИНИ МЕХАНИК БУЗИШ ВА ҲАВО ТРАНСПОРТИГА УЗАТИШДАГИ НОТЕКИСЛИКНИ ЎРГАНИШ. Oriental renaissance: Innovative, educational, natural and social sciences, 1 (4), 477-482.

3. Нажмитдинов Шухрат Абдукаримович, & Шарипов Хайрулло Нўмонжанович. (2023). Жин машинаси ишчи камерасининг конструксияси ва бошқа деталларининг тола ажралиш жараёнига таъсир омилларини тадқиқ қилиш. "XXI ASRDA INNOVATSION TEXNOLOGIYALAR, FAN VA TA'LIM TARAQQIYOTIDAGI DOLZARB MUAMMOLAR" nomli respublika ilmiy-amaliy konferensiyasi, 1(10), 104–109. https://doi.org/10.5281/zenodo.8429357

4. Yo'ldashev Hasanboy Sulaymon O'G'Li, Inamova Maftuna Dedamirza Qizi, & Sarimsakov Olimjon Sharifjanovich (2023). Arra tishlaridan paxta tolasini yechib olish jarayoni parametrlarini ilmiy asoslash. Илм-фан ва инновацион ривожланиш / Наука и инновационное развитие, 6 (6), 84-95. doi: 10.36522/2181-9637-2023-6-9.

5. Yuldashev, K., Sharipov, K., Najmitdinov, S., Inamova, M., & Ruzimatov, S. (2024). Modelling cotton fiber doffing from saw teeth based on a mathematical model. E3S Web of Conferences, 537, 08017. https://doi.org/10.1051/e3sconf/202453708017.

6. Sh. Najmiddinov. M. Inamova. M. Mamadaliyev. Sh.Isayev. (2024). To'rli yuza yordamida paxta xomashyosidan ajratib olinayotgan chiqindilarni ajralish shartini hisoblash dasturi. №DGU 38552.

7. Sh. Isayev. I. Muhsinov. X.Yuldashev. Theoretical Analysis Of The Motion Of Raw Cotton With Uniform Feeder In A Cotton Cleaner. The American Journal of Engineering and Technology, USA January 22, 2021 | pages: 13-20.

8. Нажмитдинов Шухратжон Абдукаримович, Ўрунбоев Бекзод Бахтиёр ўғли, Тўхтаев Шерзод Солижонович. Пахта хомашёсини майда ифлосликлардан тозалаш технологияси таҳлили. DOI: 10.5281/zenodo.7887968. ISSN (E): 2181-4570. Betlar 122-128 gacha. «Journal of Universal Science Research» ilmiy jurnali. Sana: 02.05.2023. O'zbekiston. http://universalpublishings.com/index.php/jusr/article/view/621.

9. Нажмитдинов Шухрат Абдукаримович, Абдулхафизов Бунёд Хакимжанович. "ЭКСПЕРИМЕНТАЛЬНЫЕ ИССЛЕДОВАНИЯ ВАРИАНТОВ ПРОФИЛЕЙ КОЛОСНИКОВЫХ РЕШЕТОК НА ЭКСПЕРИМЕНТАЛЬНОЙ УСТАНОВКЕ МОДУЛЯ КРУПНОГО СОРА". UDC: 677.021.156. PRINT ISSN 2181-9637 ONLINE ISSN 2181-4317. ИЛМ-ФАН ВА ИННОВАЦИОН РИВОЖЛАНИШ ИЛМИЙ ЖУРНАЛИ. Sana: 3 / 2023. Betlar 99-105 gacha. https://dx.doi.org/10.36522/2181-9637-2023-3-10

10. Нажмитдинов Шухрат Абдукаримович, Шарипов Хайрулло Нўмонжанович. "Пахта хомашёсини ташувчи ҳаводан ажратиб олиш жараёнини ресурс тежамкор усулда такомиллаштириш". "XXI ASRDA INNOVATSION TEXNOLOGIYALAR, FAN VA TA'LIM TARAQQIYOTIDAGI DOLZARB MUAMMOLAR" Nomli Respublika Ilmiy-Amaliy Konferensiyasi, 1(10). Sana-11.10.2023yil. Betlar 110–117gacha.
https://universalpublishings.com/index.php/itfttdm/article/view/2214
https://doi.org/10.5281/zenodo.8429397