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INCREASE PRODUCTION VOLUME BY REGENERATION OF COTTON

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Abstract: Cotton fiber is one of the main products of the textile industry in the world. Research work is carried out aimed at delivering raw cotton to processing processes while preserving its natural parameters and developing new scientific and technical solutions for resource-saving technologies and technical means. In this regard, priority is given to research on the technology of preliminary processing of cotton, cleaning cotton from small and large impurities, efficient organization of cotton processing, and the development of energy-saving technologies. At the same time, special attention is paid to the development of technical solutions that eliminate problems and increase the efficiency of all technological processes.

Keywords: regeneration, cotton, seeds, fiber, fly, production volume, saw drum, knife, grate, gap, result.

Introduction. In many leading research centers and universities of the developed textile industry of the world, a number of scientific studies have been conducted on the development and improvement of technology for cleaning raw cotton from various impurities. As a result of these studies, significant scientific achievements have been achieved: A series of scientific studies on cleaning cotton fiber from small and large impurities were carried out at the Southwest Cotton Cleaning Laboratory, the Australian Cotton Research Corporation, the National Research Center for Cotton Processing and Technology, and the Brazilian Agricultural Research Corporation, and as a result, effective technologies for cleaning cotton from waste were created.

Main part. Previously, the working parts of the device used in the process of cleaning raw cotton from large impurities were analyzed. Development of design drawings and construction of a new device for extracting cotton particles from the composition of impurities. The working parts of this device are the same as the working parts of the regenerator device, and before developing new working parts of the regenerator device, the movement of the cotton flow under the action of the saw drum and the grate placed under it was studied.

According to the conducted research, the main working parts of the device when extracting lumps of raw cotton from waste of existing regenerative machines are the saw drum, knives and grate, and their location, shape and interaction with each other have significant differences, affecting the cleaning efficiency. In the devices used, the grate shape has the form of a cylinder with a diameter. During the operation of the device, in the process of separating lumps of raw cotton from the composition of waste, cutting lumps of raw cotton from waste mixed with lumps of raw cotton without interruption depends on the geometric shape of the grates and the location of the blades. Taking into account the movement of waste mixed with cotton particles under the influence of a saw drum and factors affecting it, the working bodies of a new design of the regenerator device are proposed, the movement of cotton particles in it and the processes of separation and their removal from the waste were theoretically analyzed (Fig. 1).

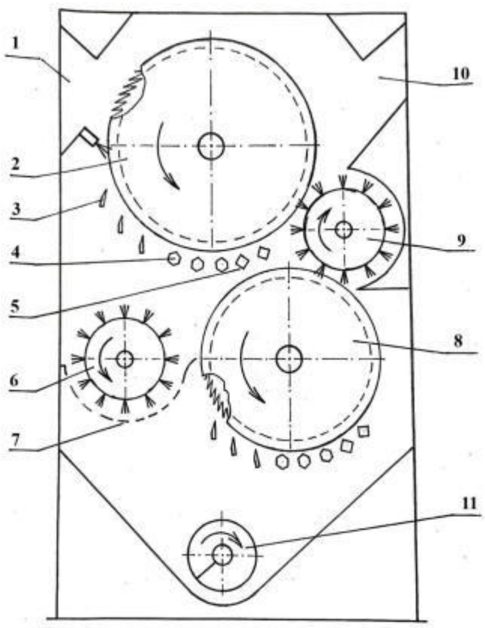

Fig.1. Technological scheme of the improved cotton regenerator
1-waste inlet shaft, 2-saw drum, 3-knife, 4-hexagonal grate, 5-four-sided grate, 6-brush drum, 7-mesh surface, 8-saw drum,9-brush drum, 10- impurity outlet, 11-screw drum.

To determine the kinetic energy of a cotton ball with a mass of m, the equation of motion in time can be derived from equation (1) and it is equal to:

$$T=\frac{m}{2}\left(\dot{x}^2+\dot{y}^2\right)=\frac{m}{r}\left(R^2\omega^2+r^2+r^2\omega^2+2R_{\omega\dot{r}}\sin\alpha-2R_{\omega^2}r\cos\alpha\right) \quad (2)$$

Using the Lagrange type II equation, the partial derivative is obtained from equation (2):

$$\frac{d}{dt}\left(\frac{\partial T}{\partial \dot{r}}\right)-\frac{\partial T}{\partial r}=Q_{\mathrm{r}} \quad (3)$$

(3) The generalized forces of external forces acting on the flow of cotton particles on the surface of the saw teeth of the saw drum are determined from the equation, and general and partial solutions of the inhomogeneous equation are calculated.

$$m\ddot{r}=m\omega^2(r-R\cos\alpha)+Q_r \quad (4)$$

Here: Q_{r} – The generalized force is found by the following formula:

$$Q_{\mathrm{r}}=\Sigma \mathrm{X_i}\frac{\partial \mathrm{x}}{\partial \mathrm{r}}+\Sigma \mathrm{Y_i}\frac{\partial \mathrm{y}}{\partial \mathrm{r}} \quad (5)$$

$\mathrm{X_i}$, $\mathrm{Y_i}$ – $0\mathrm{X}$ and $0\mathrm{Y}$ the projection of the external forces on the axis is as follows:

$\mathrm{Y_i}=mg\sin(\alpha-\omega t)$ $\mathrm{X_i}=0$ Let's make an equation for the relationship between the weight of a cotton ball, the friction force by mass and the Coriolis force.

$$F_{TP}=-f\cdot m\cdot g\cos(\alpha-\omega\cdot t)+f\cdot F_{\mathrm{before}} \quad (6)$$

Here, the Coriolis force occurs when the de lint separates from the sawtooth.

$$F_{\mathrm{before}}=-2\cdot\omega_e\cdot\dot{r}_r\cdot\sin\alpha \quad (7)$$

Here, the angle is α - the angular relationship between the relative speed of the saw and P - the force of gravity acting on the cotton ball, and λ - the angle of the surface of the saw tooth is shown in Figure 3.

$$P=S\cdot p\sin\lambda \quad (8)$$

Here, S is the contact surface of a lump of raw cotton with a tooth, and is the angle between gravity and the surface of the saw tooth.

$$\lambda = \arcsin \frac{R\sin\alpha}{\sqrt{R^2 + h_0^2 - 2Rh_0\cos\alpha}} \qquad (9)$$

With this in mind, the overall bond strength of the delint to the tooth is determined by the following formula:

$$Q_r = mg\sin(\alpha - \omega t) + fmg\cos(\alpha - \omega t) + 2mfr\omega\cos\alpha + P\sin\lambda,$$
$$\left(\frac{\pi}{2} < \alpha < \pi\right) \qquad (10)$$

The experimental results showed that the dynamic load of the technological load of the regenerator grate rod was calculated as the load passing through the radial direction of the saw drum. The results of processing experimental studies show that the technological force is distributed along the length of the grate groove.

$$q_1 = \int S \cdot \sin\frac{\pi x}{L}\,\frac{dx}{dl} \qquad (11)$$

according to the law of forced vibration, the grate rod with a vibration load will look like this.

$$q(x)\sin\theta t \qquad (12)$$

According to the law, in the first approach, we will consider a grate rod of a new geometric shape in the form of a uniformly distributed beam supported by five supports. The equation of motion is not taken into account when composing the equations: due to the small impact loads of the rod perpendicular to the radial direction, the influence of vibration of other arrows of the grate, as well as the loads of the rod in the axial direction. Imagine the unaccounted-for amounts mentioned above in the form of an uncut beam on a support. For dynamic calculation, we will take this beam as a single-span, without taking into account all intermediate supports that are statically undefined, and replace them with a force acting on the beam with an unknown reaction force.

The stiffness of the supports at points A and E is equal to each other and is defined as the reverse fluidity of those installed at these points. The stiffness of the intermediate supports C 2, C 3 at points B,C,D is defined as the yield strength and stiffness of the beam itself. To formulate the differential equation of forced beam vibration under oscillating load, we differentiate the equation of the curved beam axis twice:

$$EY\frac{\partial^4 y}{\partial x^4} + m\frac{\partial^2 y}{\partial x^2} + \Sigma P_k = q(x)\sin\theta t \qquad (13)$$

Here u — moving the impact part;

$m\frac{\partial^2 y}{\partial x^2}$ - acceleration of the upward forces of inertia;

$\Sigma P_k = R_A + R_B + R_C + R_D + R_E$ - the force of resistance to upward movement;

$q(x)\sin\theta t$- an oscillating load that creates a forced vibration of the grate.

θ - angular frequency

$EY = const$ - thus, the grate is homogeneous and has the same cross-section along its entire length.

It is known that the free vibration of the beam decays over time, while only forced vibration occurs in a fixed mode, therefore, the free end of the beam is not taken into account in equation (13).

The partial solution of the equation will have the following form:

$$Y_{\text{often}}\,(\mathrm{X},\mathrm{T}) = (X)\sin(\theta t)$$

If you substitute it into the original equation, it will look like this:

$$Y_4^{IV}(X) - S^4 \cdot y(X) = \frac{q(X)}{EY} \qquad (14)$$

Here, $S^4 = \frac{m\theta^2}{EY}$ the general solution of the equation will look like this:

$$Y_{\text{comm}}\,(\mathrm{X}) = Q \cdot A_{sx} + \mathrm{b} \cdot B_{sx} + c \cdot C_{sx} + d \cdot D_{sx}$$

Here,

$A_{sx}, B_{sx}, C_{sx}, D_{sx}$ It is determined by the recommended method, which affects the function. is a particular solution of the equation if q(x) is not polynomial

$$Y_{\text{often}}(\mathrm{X}) = \frac{q(x)}{S^4 EY}$$

Then the general solution of the equation (the complete integral) will have the following form:

$$(X) = Y_{\text{comm}}(X) + Y_{\text{often}}(\mathrm{X}) = \mathrm{Q} \cdot A_{sx} + b \cdot B_{sx} + c \cdot C_{sx} + d \cdot D_{sx} + \frac{q(x)}{S^4 EY} \qquad (15)$$

where a, b, c, d are determined by successive differentiation of equation (15) using the initial conditions:

$$y(0);\;\; y'(0);\;\; M(0) = EJy''(0);\;\; Q(0) = EJy'''(0)$$

CONCLUSIONS

1. The effect of the saw drum, which is the main working part of the regeneration device, and the grate structures placed on its axis on the efficiency of the device has been studied.

2. The movement of raw cotton and various impurities in the inlet and working chambers of the regenerator device, the forces acting on them, and their effect on the geometric cleaning efficiency were determined by analyzing the actual working organs of the regenerator device.

3. The main working organs of the device are a saw drum, knives and a multi-faceted grate, while it was found that their location, shape and interaction with each other affect the cleaning efficiency.

4. As a result of processing experimental studies, it was possible to determine the technological force distributed along the length of the grate rod, the vibration load and the forced vibrations of the rod.

LIST OF LITERATURE

1. Х.Хурамова. Предварительное выделение мелких сорных примесей в новой установке отделения хлопка-сырца из отходов. // UNIVERSIUM: техникнические науки. https://7universum.com/ru/tech, 6 (123).
2. Kh.Khuramova. Establishment of the device for separation of fibers suitable for spinning from the waste of the cotton cleaning process . // Scientific and Technical Journal Namangan Institute of Engineering and Technology. Volume 9, Issue 1 -2024.
3. R.Muradov, Kh.Khuramova. Studying the types and their composition of pollutant mixtures containing cotton seeds. // Scientific and Technical Journal Namangan Institute of Engineering and Technology. Volume 9, Issue 1 -2024.
4. Х.Хурамова. Paxta tozalash jarayonida chiqadigan chiqindilar tarkibidan yigiruvga yaroqli bo’lgan tolalarni ajratib olish qurilmasini asoslash . // Интернаука: научный журнал. № 22 (339), Часть 5, июнь 2024 г.
5. С.Бахриддинов, Х.Хурамова. Инновационные пути решения процесса качественной регенерации хлопка. // Интернаука: научный журнал. № 23 (340), Часть 2, июнь 2024 г.
6. Х.Хурамова, Х.Усманоа. Совершенствование процесса очистки хлопка. // UNIVERSIUM: техникнические науки. https://7universum.com/ru/tech, 10(127) 4 октябрь 2024 года.
7. X.Xuramova, S.Baxritdinov. Paxtani tozalash jarayonidagi ishlash orqali yaroqli paxta bo’lakchalarini chiqindini qayta ajratib olish. // NamMQI. Mexanika va texnologiya ilmiy jurnali. №3 (16), 2024 y.
8. X.Xuramova, F.Raximov, X.Isaxanov. Tozalash mashinalarining ishchi organlarini zamonaviy dasturlardan foydalangan holda loyihalash. // FarPI. Ilmiy-texnika jurnali. № 4. Tom 28-2024 yil.
9. X.Xuramova, F.Raximov, R.Muradov. Paxtani yirik ifloslikladan tozalash jarayonida kuzatilayotgan muammolar tahlili. // FarPI. Ilmiy-texnika jurnali. Maxsus son №19, 2024 y.

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