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Increasing the efficiency of fiber cleaning by improving the process of removing cotton fiber from the teeth of the saw

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Abstract. It is known that the saw cylinder is the main working organ in the cotton ginning process. The process of ginning occurs as a result of the cotton raw materials entering the gin roll box and meeting the rotating saw teeth. In the roll box, the cotton raw material rotates like a gin saw, forming a mass roller consisting of fully depilated and partially depilated seeds. The density of this mass shaft increases towards the center of the roll box. As a result, due to the formation of a crack between the roll box and the ribs, the depilated seeds move downward under the influence of their weight and are separated from the gin machine.

Keywords: fiber, seed, rib, roll box, air nozzle, air speed,

Sign in. The nodes and working surfaces of the technological equipment used in the initial processing of cotton should be of high quality, that is, their surface smoothness should be 7-class accuracy.

The results of scientific research and experiments conducted by our scientists show that during the initial processing of cotton, damage to fibers or knots of equipment occurs not on the main surfaces, but on the surfaces that transition from one form to another (Sarimsakov O. SH., 2018).

Methods. When using saws polished with various abrasive materials, it was observed that fiber damage increases as a result of the reduction of the edge radii of the passing surfaces (r=0.1 mm) (Sulaymonov, Inamove, & Yuldashev, 2022).

Interconnection of fibers with working surfaces academician R.G. The following scheme was studied by Makhkamov et al. and the following scheme was proposed. The theoretical results of this model were confirmed in the experiment and the following equation was given to determine the contact pressure force acting on the fiber for the proposed scheme:

$$N_n = \frac{3{,}24 \cdot k \cdot P \cdot (t \cdot Q \cdot N)^{0.8} \cdot (n \cdot D)^{0.8}}{e^{0.8} \cdot 10^5},$$

$$Пр = \frac{1}{Па \cdot Пв},$$

In this,

$$\delta = П_{\delta} \cdot \frac{1}{2} \cdot \sqrt[3]{\frac{9}{4} \cdot \eta^2 \cdot E \cdot \kappa \cdot P^2}$$

R is the tension between two compressive bodies.

If we look at the results of the research, in the connection of medium-fiber cotton varieties with the passing surfaces, damage to the fibers is observed in the contact zone between the fiber and the passing edge, at the edge with a radius of r_m = 0.1 mm, under contact pressure conditions of R_0 = 40-50 N/m ^{2}.

that the permissible contact pressure for thin fiber cotton is in the range of 70-90 N/m

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(Tursunov, Yuldashev, & Madiyarov, 2022)[2].

When evaluating the above dimensions and surface smoothness, it is necessary to take into account the friction of two components, taking into account the important aspects of the interconnection of fibers and working bodies.

The low mechanical properties of fibers compared to solid bodies (working bodies) lead to their damage (Madumarov, Jurayev, & Yuldashev, 2022).

Results. The process of separating the fibers from the seed is a complex mechanical process, which takes place in the position that ensures the proportionality of the saws, the raw material roller the colossal grid, and the seed combs. For the fibers to be separated from the seed, the raw material must have a certain density, which in turn causes rapid wear of the working organs, so the saws are repaired or completely replaced every 48-50 hours, and the ribs every 3-4 months. (Madumarov, Xoshimov, Qurbanov, & Yo'ldashev, 2022).

Ginning is the process of separating the fiber from the seed. According to the principle of influence on seed cotton, ginning is divided into sawing and rolling (Yo'ldashev X. S, 2022).

To prove the necessity of non-stop and objective adjustment of the working modes of the gins, basic and technological characteristics were determined and initial researches of their control methods were carried out (Yo'ldashev, Inamova, & Sarimsakov, 2023).

The productivity of the roll box of the saw gin is theoretically determined by the following formula:

$$П = \frac{Q}{\tau_{ўр}} A, \qquad (2.10)$$

in this $П$ - fiber performance of the roll box;

Q - weight of the raw material;

$\tau_{ўр}$ - the time of average division of fiber and seed in the roll box;

A – an invariable characteristic of the demonization process.

Formula (2.10) shows that the productivity of the roll box can be increased by increasing the weight of raw materials or by reducing the average time of fiber and seed in the roll box. However increasing the weight of the raw material leads to an increase in the cross-sectional area of the camera. As a result, additional frictional forces of the raw material and the walls of the roll box are formed, which slows down its movement (Yo'ldashev, Xoshimov, & O 'rinboyev, 2021).

The density of the raw material is the most important factor determining the quality of fiber and seed extracted from seed cotton during the ginning process. Levkovich B.A., Baydyuk P.V., Roganov B.I., Gulidov N.G., Tillaev M.T., Fazildinov S., Khudaykulov N.Kh., Usmanov H.S., Safarov N.M. . researches in the field of sawmilling conducted by

During the ginning process, the mass and density of the raw material are determined by the dynamic balance between the seed cotton being processed and the amount of seed and fiber in the ginning products. This dynamic balance is set by the operator during the approximately 15-minute running time at the beginning of the ginning process (Yuldashev, Inamova, Qobilov, & Abduxaliqov, 2021). During the technological process, random changes in the provision of dynamic balance, a decrease in the ability of the gin due to factors such as tooth jamming, changes

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in the content, physical and technological parameters of seed cotton, i.e. changes in elasticity and friction force as a result of changes in the amount and composition of moisture, foreign additives, constantly affect and disrupt the balance. (Yuldashev, Abduraximov, Inamova, & Mirgulshanov, 2021). When the disturbance of this balance is within the possibility of self-balancing of the density of raw materials, the fiber separation process is stabilized by switching to a new mode, otherwise, the technological process will be disturbed and raw materials may get stuck in the chamber if operative measures are not taken. Depending on the nature of the situation and the speed of development, the measures taken to prevent this may be to reduce the supply, to stop it, and, as a last resort, to stop the demon from turning over the raw material, and start the technological process again.

Summary. There are no technically, economically, and technologically acceptable ways to operationally control all of the above-mentioned factors that change the dynamic balance between supply and output in gin. Therefore, it is necessary to deal with the mass and density of the raw material itself. However, none of the mechanical, electromechanical and electronic sensing devices created for operational control of the density of raw materials fully meet the most necessary technological requirements, such as sensitivity, accuracy, and reliability, and therefore were not used in practice. By the production experience confirmed in some scientific studies, the density of the raw material is evaluated according to the consumption power of the saw cylinder electric motor or its stator load current in the operational state. However, the quantitative and qualitative indicators of the relationship between the density of raw materials and the load current of the electric motor stator have not been expressed in scientific research.

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