SAW FIBER SEPARATION PROCESS DYNAMIC MODELING .

Sarimsakov O.S
Namangan State Technical University
Scientific leader Professor.
Technique sciences doctor
Ahmadjonova Hamidaxon Ismoiljon qizi
Student.

Abstract . In the article The theoretical and practical foundations of the effect of changing the size of the saw tooth on the machine's productivity, and the saw speed on the amount of fiber separated during the sawing process, have been studied.

Key words . Sawn fiber separation process , dynamic modeling , cotton fiber , cotton initial work , Arraly demon machine , saw work fertility ,

Review of realated literature: The main raw material of the world textile industry is cotton fiber. According to the International Cotton Advisory Committee (ICAC), in recent years, about 23.0 - 24.0 million tons of cotton fiber have been produced in the world, and the demand for it is 24.6 million tons [1] . To meet this demand, fiber producing companies are conducting scientific research aimed at increasing the productivity of machines, improving the quality and quantity of the fiber produced, and improving the design of equipment and machines. In this direction, research is considered a priority, including the development of resource-saving, efficient designs to reduce the cost of the product being produced, and the justification of the parameters and operating modes of the working bodies. At the same time, methods for improving the quality indicators of the product during the separation of seed from the fiber are considered urgent tasks.

Large-scale measures are being implemented in our republic to develop the cotton growing sector, modernize and technically re-equip cotton ginning enterprises, increase the profitability of production and processing of cotton raw materials, as well as the competitiveness of manufactured products. New 2022-2026 In Uzbekistan's development strategy, including "... doubling the production volume of textile products, widely implementing programs to increase labor productivity in industrial sectors, reducing losses in industrial sectors and increasing the efficiency of resource use," it is important to prevent damage to seeds and fibers when separating seed cotton from fiber, to increase the efficiency of cotton cultivation and primary processing processes by maintaining the initial quality indicators of seed cotton, and to create new improved machines.

The research work carried out so far has been focused on some issues of improving the process and equipment for separating cotton fiber from seeds, in particular, improving the fiber separation process in saw gins, determining the diameter of the saw, the rational profile of the working chamber, and the optimal speed of the saw cylinder. As a result, the technique

and technology of primary cotton processing have developed to a certain extent, and the quality and quantity of the product obtained have improved.

At the same time, the problems of creating a technology for controlling the speed of the saw cylinder in accordance with changes in the size of the saw tooth on a saw gin that is resource-saving and allows preserving the natural properties of cotton have not been sufficiently studied.

Let's consider the geometric parameters of saw teeth that affect performance according to the following scheme (Figure 1).

Studies have proposed many formulas for determining the productivity of a sawmill, which show that productivity depends mainly on the speed of the saw and the efficiency of the saw.

Despite the fact that much research has been conducted on improving the saw ginning process, the problems of creating a resource-saving technology for controlling the speed of the saw cylinder in accordance with the dimensional changes of the saw tooth with a new profile on the saw gin machine, as needed, and which allows preserving the natural properties of cotton, have not been sufficiently studied.

The efficiency of a sawing machine depends on the change in the size of the saw tooth, that is, as the size of the saw tooth changes, the damage to the seed decreases.

The efficiency of a saw is proportional to the cutting ability of the saw tooth, the triangular surface on which the fiber cannot escape, ABC_1 and the linear speed of rotation of the saw (Figure 2).

a triangle ABC_1 is calculated using the following formula:

$$\begin{aligned} Q\cos\theta \pm \mu Q\sin\theta - N = 0 \\ -Q\sin\theta \pm \mu Q\cos\theta \pm F = 0 \end{aligned} \qquad (1)$$

Here is $\gamma$the angle between the relative velocity of the cotton ball and the force exerted on the arc of the saw cylinder; β– the angle between the linear velocity of the cotton ball and the radius of the saw.

Action amount change law :

$S_e - S_a = S$; and $S_e - S_a = S_r$ (2)

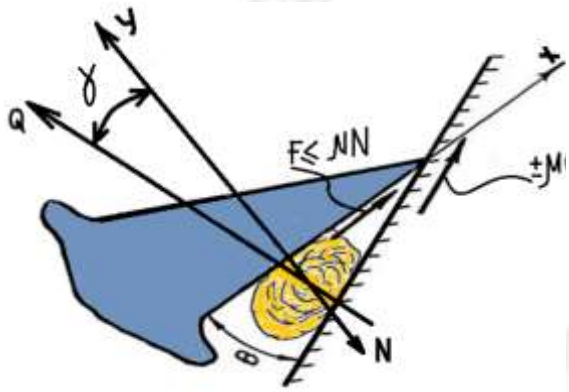

Figure 1. Diagram for determining the ability of saw teeth to engage.

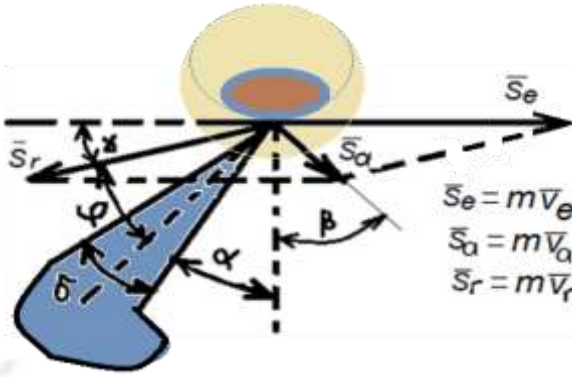

Figure 2. Cotton piece with saw teeth exposure scheme

Shock impulse saw tooth angle to the bisector projection We will determine this magnitude . sawn demon work fertility in determining high importance has . Also this size to be angry in the process breakable seeds too big for the number impact shows .

Shock impulse :

$$S_b = \text{m}\,[v_e sin\alpha_1 + v_a cos(\alpha_1 + \beta)] \qquad (3)$$

If cotton seed mechanic injury visible if so , this pointer saw rotation speed how much high if so , it is so big will be .

Shock during saw teeth cotton piece mass inside of the tooth previous edge lengthwise enter takes . In this blow time following from inequality our determination possible .

$$\text{t} \leqslant \frac{\text{l}}{v_e} \qquad (4)$$

this hit the ground time l tooth took edge length .

If the length l is 3 mm , Assume the speed is 12m/s. if we do t to the following equal will be :

$$t \leqslant \frac{1}{4000} \text{ sek.} \qquad (5)$$

From (4) and (5) saw tooth cotton to a piece in the crash blow strength as follows we find possible :

$$F_{\text{ud}} = \frac{S_{\text{B}}}{t} \text{or}$$

$$F_{\text{ud}} = \frac{m\left[v_\alpha \sin\left(\alpha+\frac{6}{2}\right)+v_a \cos\left(\alpha+\frac{\delta}{2}+\beta\right)\right]}{t} \qquad (6)$$

The following parameters acceptance we will do and we calculate :

$m = 0{,}00002\kappa z/\Lambda\cdot\cdot\ \text{cen}^2,\ \alpha = 40°,\ \delta = 20°,\ \beta = 10°$, $v_{\text{c}} = 12\ \text{s/ce}\kappa, v_{\text{a}} = 2\ \text{m/cen}, t = \frac{1}{4000}$

In that case :

$$F_{y1,\,cs.} \approx \frac{0{,}00002\left(12 \cdot 0{,}8 + 2 \cdot \frac{1}{2}\right)}{\frac{1}{4000}} \approx 768\ g.$$

Cotton fiber from seed uprooted can of power size to the following equal to :

$$S = S_{\text{n}} \text{tg}\ \psi$$

or :

$$S_s = m\left[v_e \sin\left(\alpha + \frac{\beta}{2}\right) + v_\alpha \cos\left(\alpha + \frac{3}{2} + \beta\right)\right] \times \text{tg}\left(\alpha + \frac{\delta}{2} + \gamma\right). \quad (7)$$

One fiber from seed uprooted to take for need to be If the force f is (1.2 - 3g) , one tooth with to be drunk removable fibers number to the following equal

$$n_1 = \frac{S_{\text{iep}}}{\text{f}}$$

To the above according to take visited theoretical research up to us made account of books theoretical to the base has that shows .

Take As a result of the research conducted, the following conclusions were drawn:

1. One of the factors that causes fiber breakage in the saw fiber separation process is the formation of zero thickness of the saw tooth along the saw circle. As a result, when the saw teeth impact the fiber bundle at high speed, the fibers that are in direct contact with the tooth tip are cut or broken. This is the main reason for the reduction of the average fiber length.

2. One of the factors that causes the breakage of the seed during the sawing process is the formation of the saw tooth with zero thickness along the sawing circle. As a result, when the sharp edge comes into contact with the non-fiber part of the seed, the seed coat is damaged. This reduces the germination of the seed and increases the risk of disease. During the process of removing the fiber from the seed, the fiber is pulled out with the seed coat. As a result, a non-removable defect in the fiber structure is formed - shelled fiber.

3. A mathematical model of the interaction of saw teeth with the fiber and the comb was developed and analyzed, and it was found that the angle of deviation of the front edge of the saw tooth has a significant impact on the efficiency of the ginning process and the formation of defects in the fiber. While an increase in the angle of deviation leads to an increase in the ability of the tooth to grab the fiber and increase the efficiency, it has a negative effect on the fiber removal rate from the saw. Therefore, it is important to determine the rational value of the angle of deviation of the front edge of the tooth. One of the important results of the saw fiber separation machine was the need for a new gin saw design. In order to study the effect of gin saws with different cylinders on cotton cleaning and fiber quality, the developed and

manufactured types of gin saws were subjected to comparative testing on laboratory cotton ginning stands.

4. It was found that the degree of lateral sharpening of the saw teeth has a significant effect on the efficiency of the fiber separation process, while the rotation speed of the saw cylinder remains unchanged, and that a decrease in the thickness of the saw tooth tip leads to an increase in the efficiency of the process.

5. The introduction of a sawing gin with adjustable sawing cylinder speed in the production of super elite cotton allowed to reduce the mass fraction of defects and impurities in cotton fiber by 0.5%, reduce mechanical damage to the seed by 0.5%, reduce the hairiness of the seed by 0.2%, and increase machine productivity by 4.7% when processing R3 grade cotton.

Cotton to the seed saw teeth by being given blow strength to determine .

The speed of the cotton seed at the point of contact with the saw teeth is 2 - 2.6 m/s, and in a short time t_z its speed increases to 12.2 m/s. If we look at Figure 2.2, the speed of the raw material roll increases sharply in the seed comb zone itself. It should also be taken into account that the speed of the saw teeth is almost the same along the entire periphery of the saw.

We assume that one cotton seed is affected by one tooth. Then, we can say that the time t_z of the interaction of one cotton seed with one tooth lasts until the next tooth interacts with the next cotton seed. During this time, each tooth travels a distance equal to the pitch of the saw tooth. According to this:

1. $t_z = \frac{z}{v_t} = \frac{3,49}{12.2} = 2.86 * 10^{-4}\ sek.$
2. According to the law of change of momentum, the force impulse during the impact of a cotton bud and a sawtooth is determined by the following equation:
3. $m\,v - m\,v_0 = F_z * t_z$,

where, m is the mass of the cotton seed ($m = 1/7*10^{-3}$), kg; v and v_0- the actual and initial velocities of the cotton seed, m/s; F_z- the impact force, N; t_z- the impact time, sec.

4. From this we can determine the impact force,
5.
6. $F_z = \frac{mv - mv_0}{t_z}$,Putting in the numerical expressions, we get:
7. $F_z = \frac{mv - mv_0}{t_z} = \frac{\frac{1}{7}*10^{-3}(12.2-2.6)}{0.286*10^{-3}} = 4.79\ N,$

8. This is the impact force applied to a single cotton seed, which is considered a sufficiently large force. Because 2-3 N of force is enough to break the seed coat. The determined force is almost 2 times larger than that. Therefore, the high mechanical damage to the seed during the saw linting process can be explained by this circumstance. In particular, the impact of the saw teeth on the fiberless part of the seed, and repeated impacts, leads to a sharp increase in mechanical damage to the seed.

9. The proposed technical solution increases the probability of the saw teeth meeting the fiber surface each time, and the fiber bundle acts as a shock-absorbing layer. As a result, mechanical damage to the sawdust is reduced.

10.

Conclusion:

Saw fiber separation process dynamic modeling-machine constructive structure , work mode and of the material natural to the characteristics based without take cotton-cotton again work quality to increase service Optimal teeth geometry determination , saw speed adaptation and demon of the car work fertility increase according to recommendations working This is the cotton cleaning in enterprises technological processes to automation service does .

Used References :

1. The ICAC recorder. June 2021 Volume XXXIX, No. 2. ISSN 1022-6303. https://www.icac.org

2. EZ Zikriyoyev Cotton raw material primary again work (textbook).
Tashkent "Mekhnat " -1999,108b

3. Saidkhodjayev TI Arra range cotton cleaning to the process the impact study ./ / Dissertation . Possible . These . Sciences , TITLP. Tashkent, 1996 .

4. Popello AP and others . Cotton in the USA raw material working release and him/her primary again work equipment and Technology . Tashkent, 1977. 85-116.