# THEORETICAL STUDY ON THE IMPROVED COTTON TRAP

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## ABSTRACT

*Theoretical study of the process of operation of ginners in the development of high-efficiency structures of the ginnery, which is a key element of the device for air transport of raw cotton. Based on the results-based recommendations, it is possible to fully retain the heavy impurities in the cotton and to preserve the natural properties of the fiber and seeds.*

***Keywords:*** *Cotton, seeds, plate, heavy mixes, working chamber, grid, stone, elastic, drum, feather.*

## АННОТАЦИЯ

*Теоретическое исследование процесса работы хлопкоочистительных установок при разработке высокопроизводительных конструкций хлопкоочистительного завода, являющегося ключевым элементом устройства для авиатранспорта хлопка-сырца. На основе рекомендаций, основанных на результатах, можно полностью сохранить тяжелые примеси в хлопке и сохранить природные свойства волокна и семян.*

***Ключевые слова:*** *Хлопок, семена, пластина, тяжелые смеси, рабочая камера, сетка, камень, резинка, барабан, перо.*

**The main part**

The composition of cotton has a significant impact on the efficiency of the equipment installed in the technological process of ginneries, their continuous operation. Heavy contaminants in cotton can damage the working parts of cleaning machines and the teeth of gin and linter saws during its processing. Such a change results in damage to the seed and fibers during the separation of the fiber from the seed in the gin machine.

In cotton ginning machines, the cleaning efficiency is reduced, and more cotton particles are added to the waste. Heavy contaminants can also cause a fire to break out as a result of the impact of the processing machine on the metal working bodies . Therefore, the fact that heavy mixtures fall into the working chambers of cotton processing machines has always been in the focus of scientists and experts in the field, and they have been looking for ways to keep heavy mixtures completely in the air-carrying device.

Linear grinders are the first device that affects the technological and quality characteristics of the transported cotton, and serve to clean the cotton from foreign bodies, as well as heavy mixtures during air transportation. Our research has shown that the raw cotton hits the walls of the liner with a certain force. These bumps lead to fiber defects and a decrease in seed quality.

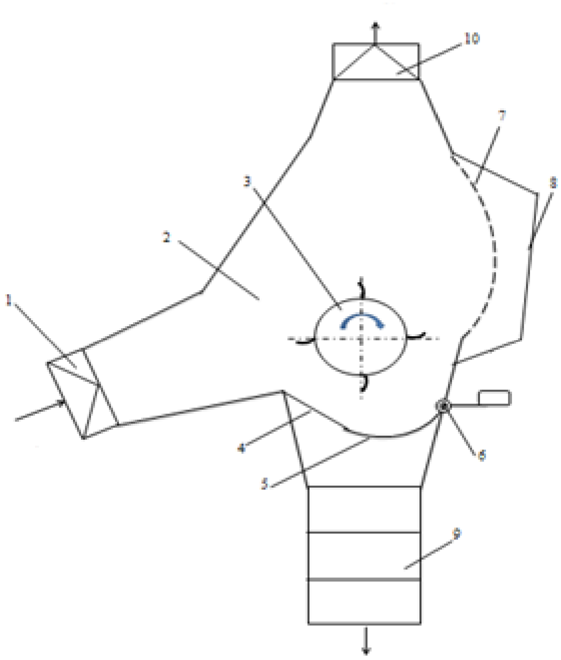

**Fig. 1. Stone device of an improved new design**

***1- inlet pipe; 2- working cameras; 3- elastic-coated blade drum; 4- router; 5-segment shaped plate; 6-hinged mechanism; 7-elastic mesh surface; 8.9- pocket; 10- outlet pipe.***

To reduce the impact force, a device with a mesh curved plate that receives and softens the impact force is installed in the working chamber of the stone.

We divide the process of beating a piece of cotton into two stages. The first stage continues until the velocities of the hitting objects equalize. Both bodies have the same U-velocity.

Then, the process moves to the second stage, which indicates the end of the stroke. In this case, the segment V $_1$ acquires a velocity. the reflective mesh surface acquires a velocity of V $_2$. According to the law of conservation of momentum.

$$m_1 V_1 - m_1 U = m_2 V_2 - m_2 U \qquad (1)$$

Here: $V_1, V_2$ - the speed of the cotton ball and the reflector after the impact ; $V_1, V_2$ - the speed of the surface of the cotton piece and the return net before the impact; $m_1$ -piece weight; $m_2$ - the mass of the mesh plate reflector of the object to be struck; $S_1$ and $S_2$ the impulse reaction of bodies during loading. (In step 1) in (2.1)

$$U=\frac{m_1V_1+m_2V_2}{m_1+m_2} \quad (2)$$

It is $V_1 = U_{зарб} = U_H \cos\alpha_0 \cdot \cos\varphi_0$ known from the initial conditions that ( $U_H$ – бошланғич тезлик ) for the impact process, the equation forms a value perpendicular to the surface of the body forming the velocity of the body being struck . In this case ( $V_2 = 0$ ) has no return speed. Considering all the steps:

$$U=\frac{m_1 \cdot U_H \cdot \cos\alpha \cdot \cos\varphi_0}{m_1+m_2} \quad (3)$$

Let us consider the 2nd stage of the collision process. It is known that during a shock, the force pulse changes to a magnitude n, which is called the recovery coefficient. We write the law of conservation of momentum separately for each body.

$$S_{11} = -nS_1, \quad S_{12} = -nS_2 \quad (4)$$

Here: $S_{11}$ and $S_{12}$ are the impact reaction momentum of the bodies during loading (in stage 2 of the impact process), the n-impact coefficient.

Substituting the actions of the pulses, we obtain:

$$\begin{cases} m_1U_1 = m_1U = -n(m_1V_1 - m_1U) \\ m_2U_2 = m_2U = -n(m_2V_2 - m_2U) \end{cases} \quad (5)$$

$V_2 = 0$ We form the final equation taking into account :

$$\begin{cases} U_1 = (1+n)U - n \cdot V_1 \\ U_2 = (1+n)U \end{cases} \quad (6)$$

Substituting operations U and $V_1$, we obtain the following from the last equation:

$$U_1 = (1+n)\frac{m_1U_H \cdot \cos\alpha_0 \cdot \cos\varphi_0}{m_1+m_2} - nU_H \cdot \cos\alpha_0 \cdot \cos\varphi_0 =$$

$$= U_H \cdot \cos\alpha_0 \cdot \cos\varphi_0 \left[\frac{(1+n)\cdot m_1}{m_1+m_2} - n\right] = \frac{m_1 - n\cdot m_2}{m_1+m_2} \cdot U_H \cdot \cos\alpha_0 \cdot \cos\varphi_0$$

$$U_2 = (1+n)\frac{m_1U_H \cdot \cos\alpha_0 \cdot \cos\varphi_0}{m_1+m_2} = \frac{m_1(1+n)}{m_1+m_2} \cdot U_H \cdot \cos\alpha_0 \cdot \cos\varphi_0 \quad (7)$$

Thus, the return velocities of the fragments form the final equation as follows:

$$U_1 = \frac{m_1 - n\cdot m_2}{m_1+m_2} U_H \cdot \cos\alpha_0 \cdot \cos\varphi_0$$

$$U_2 = \frac{m_1(1+n)}{m_1+m_2} U_H \cdot \cos\alpha_0 \cdot \cos\varphi_0 \quad (8)$$

It can be seen from the equations that the cotton piece has a low velocity because the return mass exceeds the piece mass. In this case, the higher the initial velocity $Un$, the smaller the angle $\alpha_0$ of inclination $\varphi_0$ of the inlet pipe and the smaller the return, the higher the velocity of the post-impact cotton piece. The maximum return speed after the stroke is taken $\varphi_0$=0, when the speed of the cotton swab corresponds to the normal direction of the mesh surface at the point of impact .

The differential equation for the motion of a piece of cotton after it has been separated from the reciprocating curved mesh plate, i.e., after the impact process.

According to Newton's second law, the system of differential equations of motion of a piece of cotton and additional heavy mixtures, separated from the reciprocating curved mesh plate, is written as follows.

The differential equation for the motion of a piece of cotton after it has been separated from the reciprocating curved mesh plate, i.e., after the impact process.

$$\begin{cases} \begin{cases} m_1\dot{V_x} + kV_x + k_x(U_{x0} - V_x)^2 = 0 \\ m_1\dot{V_y} + kV_y - k_y(U_{y0} - V_y)^2 = m_1 g \end{cases} \\ \begin{cases} m_{1t}\dot{V_{xt}} + k_{xt}(U_{x0} - V_{xt})^2 = 0 \\ m_{1t}\dot{V_{yt}} - k_{yt}(U_{y0} - V_{yt})^2 = -m_{1t} g \end{cases} \end{cases} \qquad (9)$$

Where: $m_1, m_{1t}$ - mass of cotton and heavy mixtures, respectively , k- coefficient of elasticity of the cotton piece, $k_x, k_y$ - coefficient of aerodynamic resistance of air acting on the cotton piece horizontally and vertically, $k_{xt}, k_{yt}$- aerodynamics of air acting on heavy mixtures horizontally and vertically , respectively resistance coefficient.

(9) -The initial conditions of the system of differential equations:

$$V_x(0) = U_{x0}; V_y(0) = U_{y0}; V_{xt}(0) = U_{xt0}; V_{yt}(0) = U_{yt0}; \qquad (10)$$

Since the movement of a piece of cotton after separation from the return curved mesh plate is nonlinear, the system of differential equations is solved in the MAPLE-17 program in a numerical way.

(9) -The results obtained under the initial conditions of the system of differential equations are shown in Figure 2.

As can be seen from the graphs, the cotton and heavy mixtures that entered the stoning chamber continued to move upwards and the cotton particles continued to move upwards and the heavy mixtures downwards into the pocket. It is known that heavy mixtures fall into the pocket without reaching the working surface of the working chamber. Small mixtures hit the working surface of the working chamber after reaching the mesh surface. The coefficient of rotation of the mesh curved plate or the elastic property of the plate material have a large effect on the impact process.

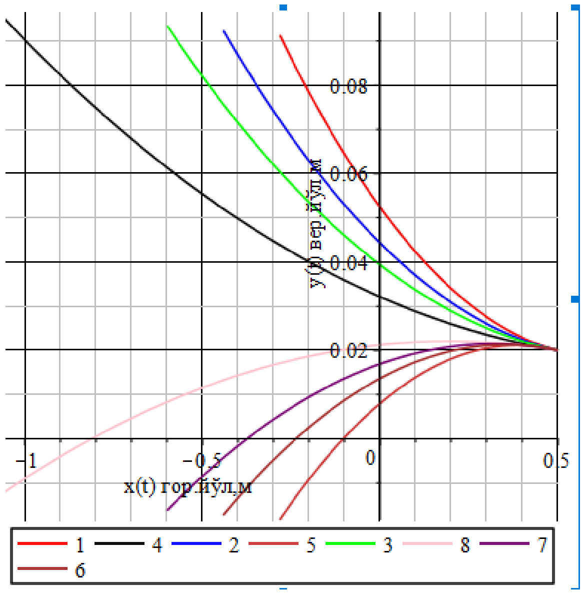


**Fig. 3. Laws of post-shock movement of cotton and heavy mixtures entering the trapping chamber.**

At a small value of the velocity return coefficient -n of the lattice curve, the impact process is soft, while at a large value it is sharp. (Graphs 1-4 and 5-8, Figure 3).

In the graphs, the velocity return coefficient of the receiving and softening mesh curve plate of the impact force is n = 0.5; 0.6; 0.7; 1; Graphs 1-4 refer to a piece of cotton, and graphs 5-8 refer to heavy mixtures.

## CONCLUSION

1. The physical and mechanical parameters of the mixtures in the movement of cotton and heavy-duty mechanical system stone in the working chamber were determined.
2. Graphical representations of the laws of variation of the motion and velocities of heavy mixtures of cotton in the vertical direction together, depending on the coordinates on the abscissa axis.
3. As a result of the continuity of the aerodynamic driving force of the air flow , the decrease in velocities does not exceed 10-13 percent, as can be seen from the graphs obtained, their velocity decreases with increasing mass of cotton pieces, the mathematical model of the problem is correct.

4. After separating the cotton piece from the return curved mesh plate, i.e. the movement after the impact process, a differential equation was constructed and solved numerically in the MAPLE-17 program.

**REFERENCES**

1. R.Muradov , F.Rakhimov, Kh.Kasimov, A.Karimov Theoretical Study Of The Movement Of New Impurities And Heavy Impurities THE AMERICAN JOURNAL OF ENGINEERING AND TECHNOLOGY, *Volume02 Issue07 July 2020*
2. R.Muradov, A.Karimov, F.Rakhimov,, Kh.Kasymov Ways to reduce the fall of a piece of cotton in the pocket on the stone device Mechanical problems 2020 y.
3. R.Muradov, A.Karimov, F.Raximov, Kh.Kasimov “Theoretical study of the movement of new impurities and heavy impurities” The American journal of engineering and technology, 2020 y.
4. R.Muradov, A.Karimov, F.Rakhimov, Kh.Kasymov Ways to reduce the fall of a piece of cotton in the pocket on the stone device Mechanical problems 2020 y.