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THEORETICAL ANALYSIS OF THE SEPARATION OF FINE DIRT FROM COTTON

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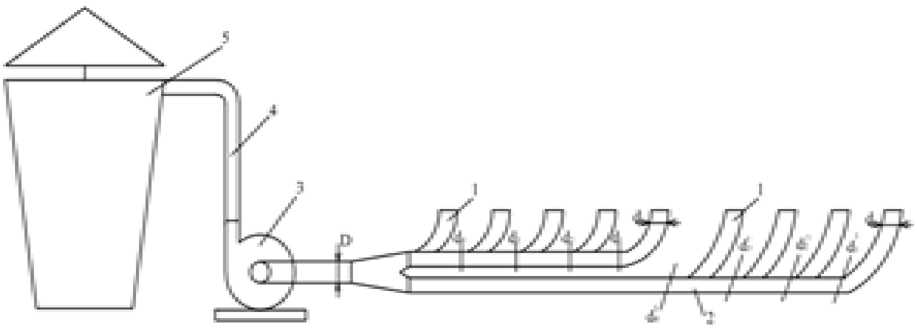
Abstract: This article discusses the issue of the distance from cotton to the continuous movement of fine dirt on the surface so that it falls on the tray from the surface of the mesh, that is, the complete separation of impurities from the weight and the angle of inclination affect. Their trajectory according to the law of motion in an inclined plane is determined. The conditions under which the stone will continue to move along the surface of an inclined plane, and small dirt will not hang in the air. Determined the air velocity by associating it with the angle of inclination of the planeConditions are met for the dirt to fall across the surface of the plane through its oblique plane movements, while the fine dirt to continue hanging motion in the air.

Keywords: cotton, separation, fine dirt, pile drums, transmission pipe.

Introduction. In the advanced UXK cleaning flow, pneumatic transmission of contaminants falling out of stacking drums contained in sections of the saw drum or a belt conveyor transmission system is recommended [1-4].

An existing aspiration system can be used to feed into the cyclone (Fig. 1).

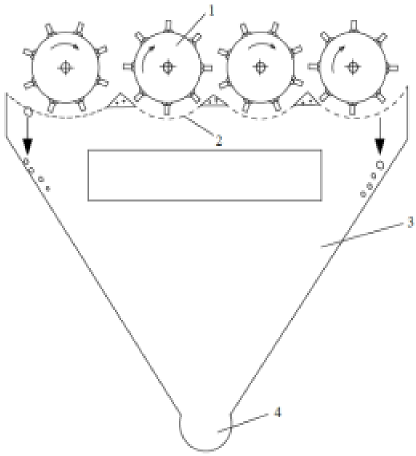
Impurities separated from cotton enter the inclined tarn in pile drums, moving it along the surface, and dirt enters the transmission pipe, in which it is absorbed by air and transferred to the cyclone through a fan (Fig. 2).



1 - dirt pipe; 2 - the main groove that removes dirt; 3 - fan; 4 - a pipe that drains dirt into a cyclone; 5 - cyclone.

Figure 1. UXK Purification Flow Aspiration System.

The main problem in this case will be the need to ensure that the dirt in then inclined tray flows down the pipe and flows down without rising up [5-6].



1-roller drum; 2-lattice surface; 3-dirt trap; 4-suction pipe for dirt

Fig. 2. Dirt transfer scheme.

Methods. Object into parts, pieces, sides, elements separated, the content of each of them was studied. Let's look at this question theoretically. The non-stop movement of dirt *BC* on the surface is affected by the distance from which it falls from the surface of the grid to the tray, that is, its weight *h* and angle of inclination α .

The angle value is limited by the maximum value to $tg\alpha = \frac{H}{L - 0,5d_T}$ equal to this H=1300 mm, L=1540 mm. $\alpha = 72, 50$

1. Equations are drawn up and the equation of dirt B at a point V_0 is obtained depending on the weight of dirt and h height. ; $V_0 = f(h)$ $V_0 = f(m)$ graphs are plotted (taking into account the impurity weight).

$h =$ 20-30-40-50 см. f_{cop}=0,54 coefficient of friction

2. An equation is constructed for dirt BC in the range (in the case when weight is taken into account), the velocity at the point C is determined V_C

$V_C = f(\alpha)$; $V_C = f(m)$; $V_C = f(l)$ graphs are being compiled

$$m_1 = 4,47 \cdot 10^{-6} gr; \; m_2 = 6,46 \cdot 10^{-6} gr; \; m_3 = 13,95 \cdot 10^{-6} gr$$

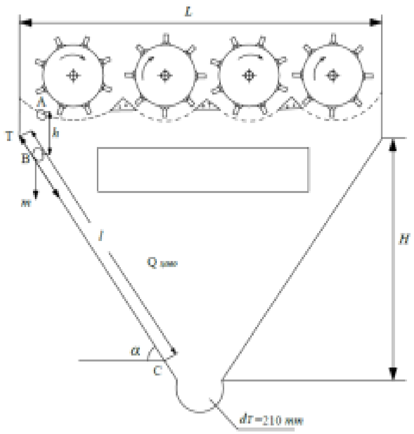


Figure 3. Forces acting on dirty impurities moving along an inclined surface.

Cotton stains are affected by the driving forces of cotton stains under the influence of air flow: $Q = c_x \cdot A \cdot \frac{\rho \cdot \vartheta^2}{2}$

Here: c_x - coefficient of resistance under the influence of a weak flow of polluted air. They are determined experimentally A-slightly polluted lump surface, ρ- slightly polluted density, ϑ- velocity.

Let's first give the law of the dirty mixture, which represents its height when falling from the surface of the grid, taking into account the fact that the dirty mixture falls freely

$$h = \frac{g \cdot t^2}{2}$$

Results. Since the rate of excitation of dirty weights is always different, we define them as the initial velocities ϑ at the limit of the transition to the inclined plane at point *A*. Then we determine their trajectory according to the law of motion in an inclined plane. Let's look at the conditions under which the stone will continue to move along the surface of an inclined plane, and small dirt will not hang in the air. As a result, we determine the air velocity by associating it with the angle of inclination of the plane. Next, we determine the trajectory of the stones at point *B*. We construct differential equations of equilibrium of dirty mixtures along the *OXY* axes.

The differential equation for the action of dirt *BC* at a distance we relative to the axis *OX* is constructed as follows.

$$\mathrm{m} \cdot \ddot{x} = Q_x - F_{uu} + \mathrm{m} \cdot \mathrm{g} \cdot \sin\alpha \quad (1)$$

$$F_{uu} = f \cdot N = f \cdot m \cdot g \cdot \cos\alpha \quad (2)$$

$$m \cdot \ddot{x} = C_x \cdot A \cdot \rho \frac{\vartheta^2}{2} - f \cdot m \cdot g \cdot \cos\alpha + m \cdot g \cdot \sin\alpha \quad (3)$$

(3) we integrate the equation twice

$$\ddot{x} = \frac{1}{2}\frac{C_x \cdot A \cdot \rho \cdot \vartheta^2}{m} + g \cdot \sin\alpha - f \cdot g \cdot \cos\alpha \quad (4)$$

From the initial condition, $(\dot{x})_{t=0} = \vartheta_B\,;\ x_{t=0} = 0$ we determine the integrable constant
$(\dot{x})_{t=0} = \vartheta_B \Rightarrow C_1 = \vartheta_B$

$$\dot{x} = \left(\frac{1}{2}\frac{C_x \cdot A\rho\vartheta^2}{m} + g \cdot \sin\alpha - f \cdot g \cdot \cos\alpha\right) \cdot t + C_1 \quad (5)$$

By moving dirt in the *BC* range, we determine the velocity and trajectory using the following equations [7-10].

Using the boundary condition in t_1 –time

$$x = \left(\frac{1}{2}\frac{C_x \cdot A \cdot \rho \cdot \vartheta^2}{m} + g \cdot \sin\alpha - f \cdot g \cdot \cos\alpha\right)\frac{t^2}{2} + \vartheta_B \cdot t + \frac{g \cdot t^2}{2} \quad (6)$$

boundary condition $(\dot{x})_{t=\tau} = \vartheta_c\,,(x)_{t=\tau} = L$

$$\vartheta_c = \left(\frac{1}{2}\frac{C_x \cdot A \cdot \rho \cdot \vartheta^2}{m} + g \cdot \sin\alpha - f \cdot g \cdot \cos\alpha\right) \cdot \tau + \vartheta_B \quad (7)$$

$$L = \left(\frac{1}{2}\frac{C_x \cdot A \cdot \rho \cdot \vartheta^2}{m} + g \cdot \sin\alpha - f \cdot g \cdot \cos\alpha\right) \cdot \frac{\tau^2}{2} + \vartheta_B \cdot \tau + \frac{g \cdot t^2}{2} \quad (8)$$

Discussion. Using equations (7) and (8), the conditions for the continuation of the movement of g in the plane by means of their movement in an inclined plane are expressed in the following equations.

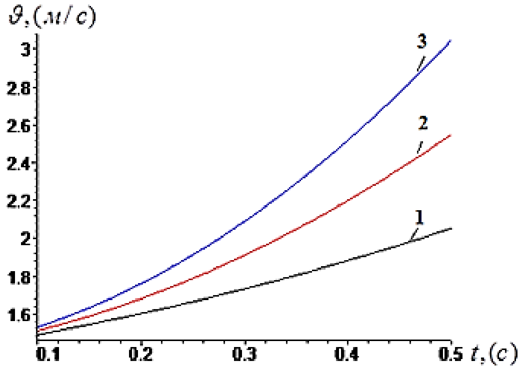


Figure 4. In the *BC* range in the inclined plane, the velocity of dirt movement on the graph is time-bound and at different weight values.
analysis ($m_1 = 13.95 \cdot 10^{-6}$ *гр* , $m_2 = 6.46 \cdot 10^{-6}$ *гр* , $m_3 = 4.47 \cdot 10^{-6}$ *гр*)

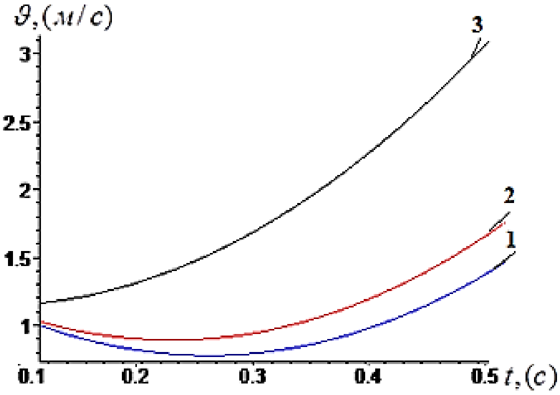


Figure 5. In the *BC* range, the velocity of dirt moving in an inclined plane is determined by a graph depending on time and the angle of inclination at different values.

analysis ($\alpha_1 = 52.2^0, \alpha_2 = 62.2^0, \alpha_3 = 72.2^0$)

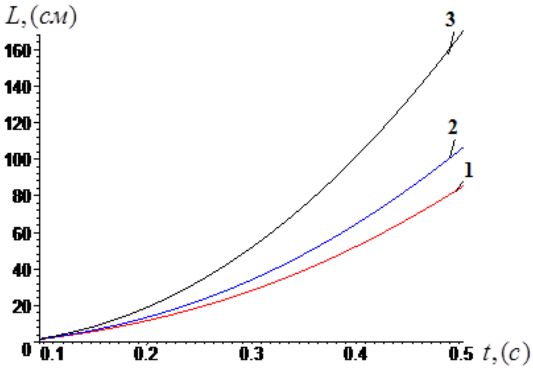


Figure 6. In the *BC* range, the motion of dirt in an inclined plane is set by a graph depending on time and weight at different values.

analysis ($m_1 = 13.95 \cdot 10^{-6}$ гр, $m_2 = 6.46 \cdot 10^{-6}$ гр, $m_3 = 4.47 \cdot 10^{-6}$ гр)

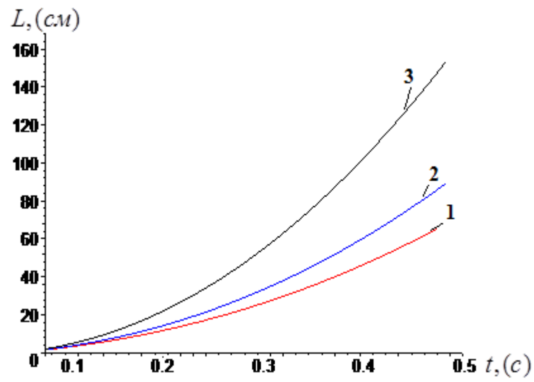


Figure 7. In the *BC* range, the movement of dirt in an inclined plane is set by a graph depending on time and angle of inclination at different values

analysis ($\alpha_1 = 52.2^0, \alpha_2 = 62.2^0, \alpha_3 = 72.2^0$)

Conclusion. Conditions are met for the dirt to fall across the surface of the plane through its oblique plane movements, while the fine dirt to continue hanging motion in the air.

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C O N T E N T S

PRIMARY PROCESSING OF COTTON, TEXTILE AND LIGHT INDUSTRY