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Theoretical Study of The Aspiration System of Pollution Removed from Cotton

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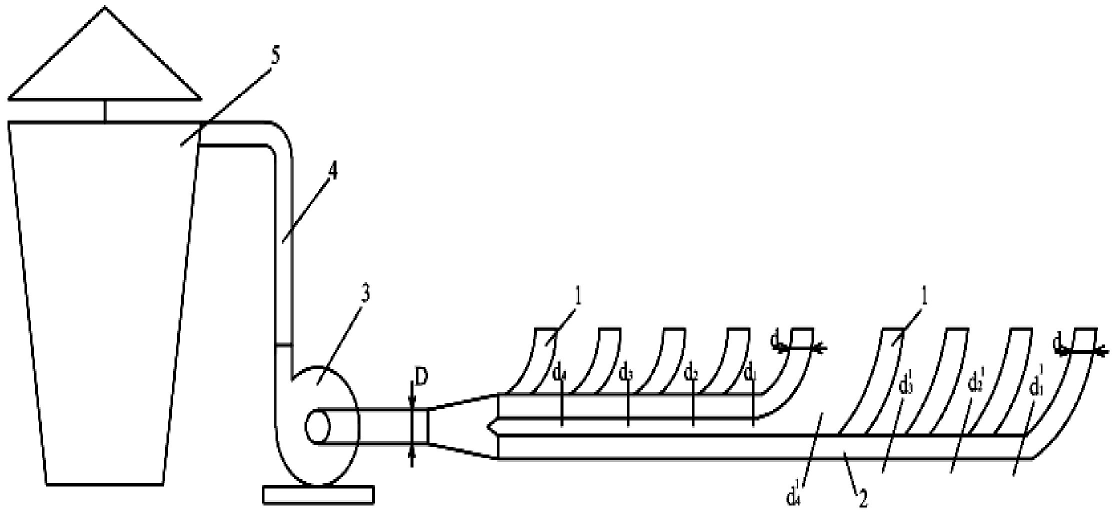
Annotatsiya: In the article, we determine the conditions for ensuring the pneumatic transfer of small impurities separated from the section of the sawed drum of the cleaners by moving steadily without stopping in the dirt hopper.

Key Words: warp, inclined surface, cotton balls, mesh surface, deviation angle, pile drum, air flow.

In the improved cleaning flow, a system of pneumatic conveying or conveyor belt conveying of debris from the 4 pile drums in the saw drum section is recommended. An existing aspiration system can be used for transfer to the cyclone.

The impurities separated from the cotton fall into the inclined drum in piled drums, move along its surface and fall into the dirt conveying pipe, where it is sucked with air and sent to the cyclone through a fan. [1].

Figure 1. UXK cleaning flow aspiration system



1-dirt pipe; 2-the main pipe that transmits pollution; 3rd fan;
4-pipe that conveys dirt to the cyclone; Cyclone 5.

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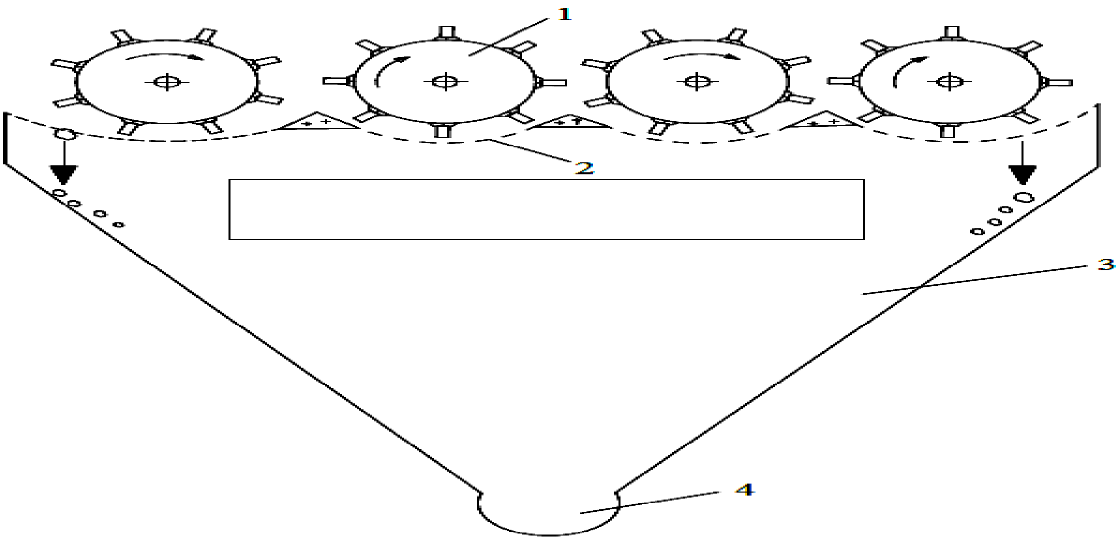
Figure 2. Overview of the aspiration system

Figure 3. Pollution transfer scheme.



1-pile drum; 2-string surface; 3-dirt service; 4-dirt suction pipe

The main issue here is to ensure that the dirt is soaked without standing on the slope and goes down to the gutter.

Let's consider this issue theoretically. Dirt BC the distance of its descent from the stringed surface to non-stop movement on the surface, i.e. h, *mass* m *and slope angle* α *affects*

Angle α *value is limited and its maximum value*

$$tg\alpha = \frac{H}{0,5L - 0,5d_T}$$ *is equal to , in which*: H=1200 mm, L=1540 mm, $\alpha = 60^0$.

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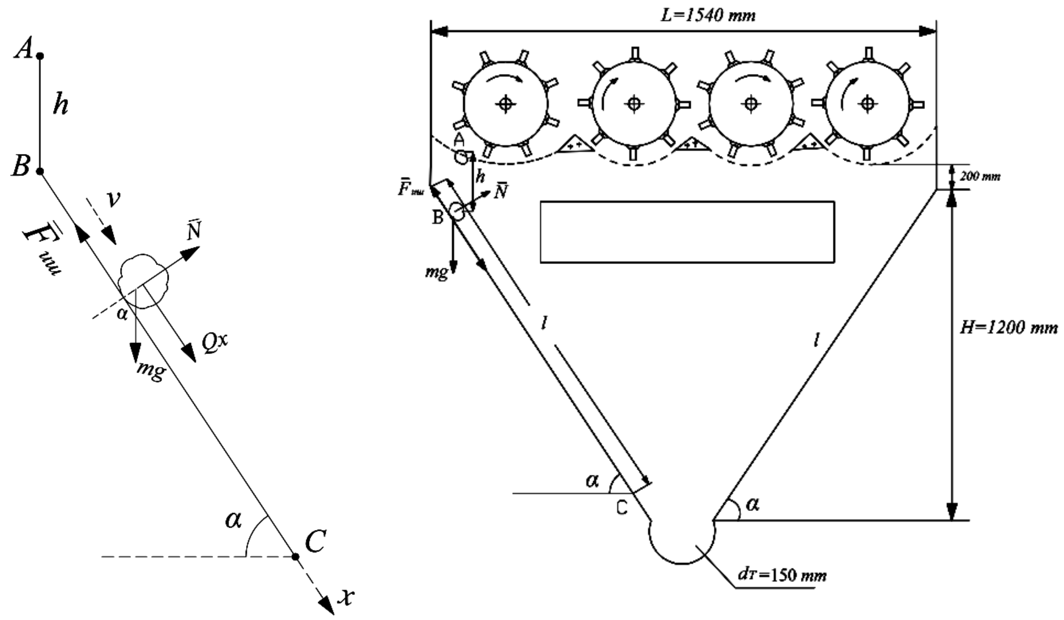
Figure 4. Forces acting on dirty mixtures moving along an inclined surface



The cotton balls are affected by the moving forces of the air flow:

$$Q = c_x \cdot A \cdot \frac{\rho \cdot \vartheta^2}{2} \qquad (1)$$

Here: C_x - the coefficient of resistance in the air flow of dirt.

They are determined by experience, A -the surface of a small dirt child,

ρ -density of fine dirt, ϑ -speed.

First, we present the law that represents the height of the dirty mixture falling from the string surface, considering the free fall of the dirty mixture:

$h = \frac{g \cdot t^2}{2}$ From this $t = \sqrt{\frac{2h}{g}} = \sqrt{\frac{2 \cdot 0{,}2}{9{,}81}} = 0{,}2m$ then the velocity at point V $\vartheta = \frac{h}{t} = \frac{0{,}2}{0{,}2} = 1m/sek$ will be.

Since the movement speed of the pollution masses is different, determine their initial speed at the limit of throwing them on an inclined plane at point A. Then, we determine the trajectory of the law of their movement on an inclined plane. We will consider the conditions for continuing the movement of small impurities [2-3].

The differential equation of the movement of impurities at a distance VS with respect to the OX axis is formulated as follows. Air flow is not taken into account here.

$$m \cdot \ddot{x} = F_{uu} + m \cdot g \cdot \sin\alpha \qquad (2)$$

$$F_{ish} = f \cdot N = f \cdot m \cdot g \cdot \cos\alpha \qquad (3)$$

$$m \cdot \ddot{x} = f \cdot m \cdot g \cdot \cos\alpha + m \cdot g \cdot \sin\alpha \qquad (4)$$

In this m and $\ddot{x}$ - impurity mass and acceleration, F_{ish} and f - friction force and coefficient, f =0,46 [ ], N - normal pressure, g - free fall speed, α -slope angle.

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(3) we integrate the equation twice

$$\ddot{x} = g \cdot \sin\alpha - f \cdot g \cdot \cos\alpha \qquad (5)$$

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

$$\dot{x} = (g \cdot \sin\alpha - f \cdot g \cdot \cos\alpha) \cdot t + C_1 \qquad (6)$$

We determine the speed and trajectory of impurities in the VS interval using the following equations. Using the boundary condition t_1 - In time.

Using the boundary condition (7)

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

$$l = (g \cdot \sin\alpha - f \cdot g \cdot \cos\alpha) \cdot \frac{t^2}{2} + \vartheta_B \cdot t + \frac{g \cdot t^2}{2} \qquad (8)$$

$$\vartheta_c = (g \cdot \sin\alpha - f \cdot g \cdot \cos\alpha) \cdot t + \vartheta_B \qquad (9)$$

When the angle of inclination of the dirt line = 30-45-600, the time of dirt distribution was determined using the equation and is presented in Table 1.

As can be seen from the table, the dirtiness is the beginning ϑ_B its speed at point C with speed 1,59 from m/sec 3,4 m/sek increasing to It should be noted that the rate of pollution in tarnov is B

1-jadval

Qiyalik burchagi α^0	Tarnov uzunligi l, m	Ifloslikni tarnovda bo‘lish vaqti, sek	Ifloslikni tezligi ϑ_c , m/sek
30	1,04	0,59	1,59
45	1,1	0,44	2,65
60	1,3	0,39	3,4

$\vartheta_b = 0$ m/sek can be. In it, the coefficient of friction is at rest $f = 0{,}54$ and the movement of dirt may stop. To determine the speed of impurities from point S, we perform calculations in the following order.

Tarnovni slope angle α with height H we determine the connection between (3.2.4-from the picture).

$$tg\alpha = \frac{\text{H}}{0{,}5L - 0{,}5d_T} = \frac{\text{H}}{0{,}5 \cdot 1{,}54 - 0{,}5 \cdot 0{,}15} = \frac{\text{H}}{0{,}695}$$

From this $\text{H} = 0{,}695 \cdot tg\alpha$ (d_t-the diameter of the suction pipe)

Angle α =30-45-60^0 in values respectively H=0,4-0,695-1,2m It will be. The length of the slope $l = \sqrt{0{,}483H^2 + 0{,}483} = \sqrt{0{,}483H^2 + 1}$

Angle α =30-45-60^0 putting the values into the equation $l = 1{,}04 - 1{,}11 - 1{,}3$ m It will be (3.2.8) putting the values into the equation t. We will determine the time

$$t^2 + \frac{\vartheta_b}{g\sin\alpha - f \cdot g\cos\alpha + \frac{g}{2}} \cdot t - \frac{l}{g\sin\alpha - f \cdot g\cos\alpha + \frac{g}{2}} = 0;$$

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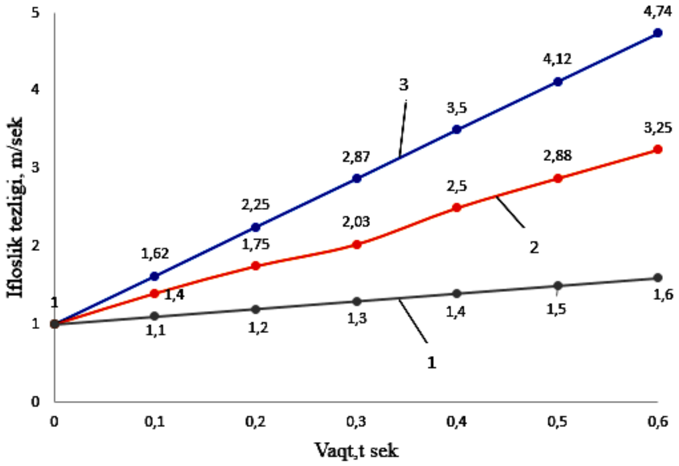
$$t_{1,2} = \frac{\vartheta_b}{2\left(g\sin\alpha - f\cdot g\cos\alpha + \frac{g}{2}\right)} \pm \sqrt{\frac{\vartheta^2}{4\left(g\sin\alpha - f\cdot g\cos\alpha + \frac{g}{2}\right)^2} + \frac{l}{g\sin\alpha - f\cdot g\cos\alpha + \frac{g}{2}}}; \quad (10)$$

Figure 5 shows the time variation of the pollution rate in the range BC, in which $\alpha = 30^0$ that the pollution rate is low, If $\vartheta_b = 0$ in any case, the movement of pollution can be stopped, $\alpha = 45$ and 60^0 and it was observed that the contamination rates increase satisfactorily in the BC range.



$1\text{-}\alpha_1 = 30^0$; $2\text{-}\alpha_2 = 45^0$; $3\text{-}\alpha_3 = 60^0$

5- fig. A graph of the impurity rate versus time in the interval BC

It is known from mechanics that the movement of an object on an inclined plane is possible only when the angle of inclination is greater than the angle of natural deviation of the object.

Therefore, based on these considerations, experimental tests were conducted. In order to determine the angle of natural deviation of dirt, a heap was formed by throwing the dirt from the top, and the angle of its deviation was determined. (Figure 6)

Angle of natural deviation of pollution $\beta = 42^0$ formed

Figure 6. Angle of natural deviation of fine dirt

Based on the results of theoretical analysis and practical experience, the slope angle of the slope $\alpha = 50^0$ was accepted as In this case, there will be a distance of 70 cm between the shell of the sawed drum section with the dirt pick, and it will be possible to carry out current repair work.[4-5]

Aerodynamic calculations of the air aspiration system were carried out in order to determine the conditions for the non-stop movement of the dirt released from the pile drum on a sloped surface. As a result, the slope angle of the sewage system, the diameters of the pipes of the sewage transfer system, the air consumption were determined, and the fan was selected.

Conclusion

1. In a theoretical study conducted in order to determine the conditions for ensuring the pneumatic transmission of small impurities separated from the saw drum section in the dirt hopper, the slope angle and air consumption of the dirt, which ensure the movement of dirt without stopping in the dirt, were determined.

2. Based on various considerations, experimental tests were conducted. Angle of natural deviation of pollution β In order to determine the dirt, a pile was formed by throwing it from the top This is how we determine.

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