THEORETICAL ANALYSIS OF AN IMPROVED EXHAUST VALVE SEPARATING FROM A COTTON REGENATOR

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ANNOTATION

We will theoretically analyze one more process from the sequences in the separation of cotton waste from improved colosnik bars. Waste falling into the waste auger is discharged through the regenerator valve. When exhausting the waste from the regenerator, the valve cover is opened and air is drawn in, resulting in small waste entering the chamber and reaching the separated cotton, increasing the dirtiness of the cotton. Therefore, the improved exhaust valve is made in the form of an enlarged cone, and when its cover is opened from the exhaust collection, it reduces the intake of air from the outside by keeping the exhaust from the small base

of the cut cone closed.

When removing waste from a truncated cone valve, the density of the bottom layer is lower than the density of the top, which reduces the addition of impurities to the cotton particles as a result of air intake. As known from theoretical mechanics, we determine the compressive force applied to a material with a certain mass inside the container according to [1, 2].

$$dP = g \cdot \gamma \cdot F \cdot k \cdot dh \tag{1}$$

Here, dP - elemental pressure affecting waste mass, F - surface area, g - acceleration of free fall, k - coefficient taking into account the slope of the wall, $h_ш$ - height of cut valve, b - large base of cut valve.

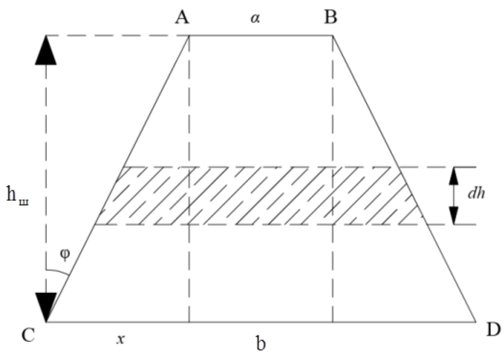

Figure 1. Schematic of a truncated cone valve.

a - we determine the expression of the dependence of the small, b - base of the truncated cone valve on the large base on the slope angle φ and its height.

$$a = b - 2 \cdot h_ш \cdot tg\varphi \tag{2}$$

Putting this expression into the coefficient, we determine the pressure force on the waste on the surface of the conical wall.

$$k = \frac{a+b}{2} \cdot h_ш = \frac{2 \cdot b \cdot h - 2 \cdot h^2 \cdot tg\varphi}{2 \cdot b \cdot h} = 1 - \frac{h \cdot tg\varphi}{b} \tag{3}$$

Putting the determined coefficient and $dP^{/} = F \cdot dP$ elementary pressure into the equation (2), we determine the pressure exerted on the waste in the conical plate.

$$dP = g \cdot \gamma \cdot (1 - \frac{h \cdot tg\varphi}{b}) \cdot dh \tag{4}$$

here, $\gamma = \gamma_0 + m \cdot P^{0.5}$ putting this equation equal to (4) into the expression, we express the pressure force on waste in cone valve regeneration in terms of height.

$$\frac{1}{\mathrm{g} \cdot \gamma_0} \int \frac{dP}{1 + \frac{m}{\gamma_0} \cdot P^{0.5}} = h - \frac{h^2 \cdot \mathrm{tg}\varphi}{\mathrm{b}} \tag{5}$$

Substituting $P^{0.5} = t$ from expression (5), $dP = 2 \cdot t \cdot dt$ we integrate this equality by putting it in expression (5).

$$\frac{2}{\mathrm{g} \cdot \gamma_0} \cdot \left[-\frac{\gamma}{m} \cdot t + \frac{\gamma^2}{m^2} \cdot \ln(1 - \frac{m}{\gamma} \cdot t) \right] + c_1 = h - \frac{h^2 \cdot \mathrm{tg}\varphi}{\mathrm{b}} \tag{6}$$

Or, by substituting the previous variable, we $P^{0.5} = t$ form the following equation.

$$\frac{2}{\mathrm{g} \cdot \gamma_0} \cdot \left[\frac{\gamma_0}{m} \cdot (\mathrm{P}^{0.5} + \frac{\gamma_0^{\,2}}{m^2} \cdot \ln(1 - \frac{m}{\gamma_0} \cdot t) \right] + c_1 - h + \frac{h^2 \cdot \mathrm{tg}\varphi}{2 \cdot \mathrm{b}} = 0 \tag{7}$$

In the initial $\mathrm{P} = 0, \mathrm{h} = 0$ condition, the pressure is equal to , $c_1 = \frac{2 \cdot \gamma}{\mathrm{g} \cdot \mathrm{m}^2}$ then

$$\frac{2}{\mathrm{g} \cdot \mathrm{m}} \cdot P^{0.5} - \frac{2 \cdot \gamma_0}{g \cdot m^2} \cdot \ln(1 + \frac{m}{\gamma_0} \cdot P^{0.5}) - h + \frac{h^2 \cdot \mathrm{tg}\varphi}{2 \cdot \mathrm{b}} = 0 \tag{8}$$

We give the expression of the dependence of the pressure of the truncated cone valve on its density and mass. We put this expression into $P^{0.5} = \frac{\gamma - \gamma_0}{\mathrm{m}}$ the equation (8)

$$\gamma = \mathrm{e}^{\ln\gamma_0 - \frac{g \cdot m^2}{2 \cdot \gamma_0} \cdot (h - \frac{h^2 \cdot tg\varphi}{b})} \tag{9}$$

Equation (9) gives the expression of the dependence of the waste on the truncated cone valve, the height of the cone, the angle of inclination, and the pressure giving the waste to the mass. This expression was analyzed graphically using the Maple program.

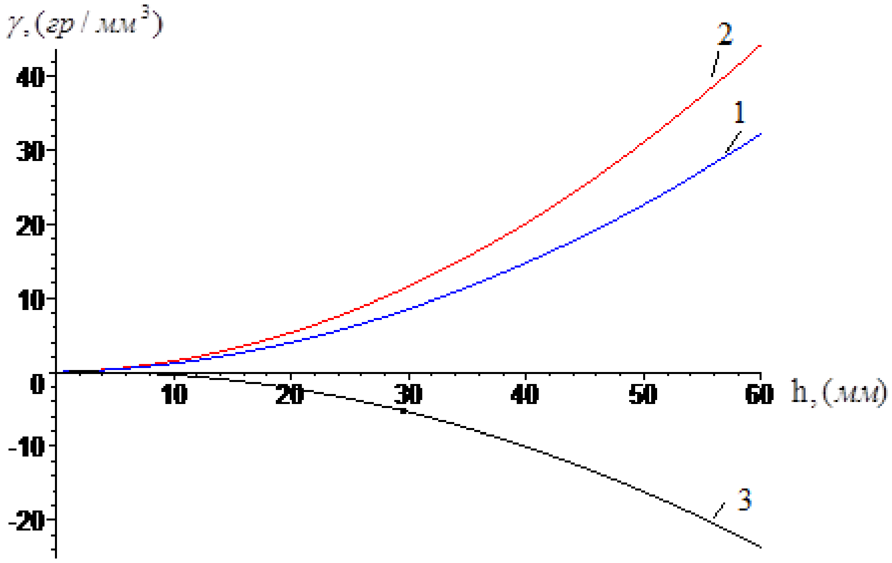

Figure 2. Graph of waste density in a truncated cone valve depending on the length of the cone angle at different values $\varphi_1=10^0$, $\varphi_2=20^0$, $\varphi_3=30^0$

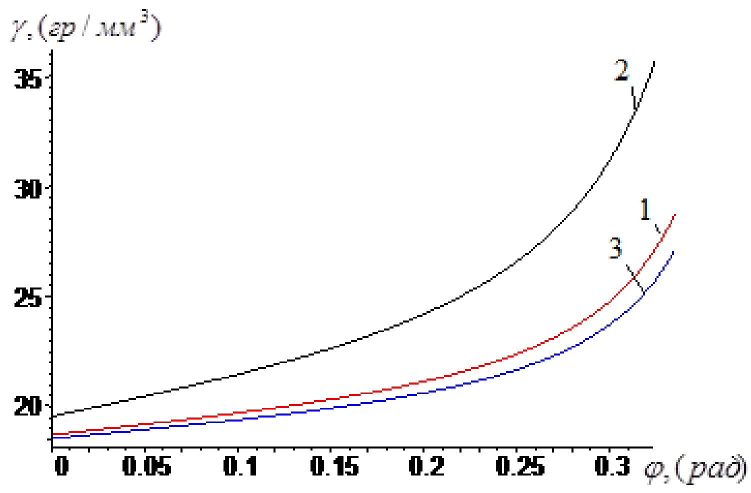

Figure 3. A graph of exhaust density in a truncated cone valve as a function of cone angle at different values of cone valve length $l_1 = 50\,мм$ $l_2 = 60\,мм$ $l_{31} = 70\,мм$

From the analysis of the above graphs, we can observe that the increase in the density of waste in the truncated cone valve at the value of the angle of inclination of the valve $\varphi_2=20^0$ and the value of the length of the valve l_2=60mm increases the density of the waste as it goes down, which in turn leads to an increase in its pressure, and blocks the air that is transferred to the inside when exhausting the waste. reduces mixing of dirty mixtures into particles.

List of used literature

1. Prisker D.M., Sakharov G.I. Aerodynamics. Moscow.: Mashinostroeniya, 1968. – S 309.

2. Yoldoshev Q.P. Methodical guide to the performance of coursework in theoretical mechanics. -Tashkent: "Uzbekistan" 1993. -151 p.