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Cotton Separator Is Separated From The Air Flow Ways To Increase Productivity

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Abstract: This research paper discusses the issues of improving the technological process in cotton ginning enterprises and increasing the quality of cotton products by increasing the separation efficiency of the cotton separator .In this research work, the issues of improving the technological process and improving the quality of cotton products in cotton ginning factories by increasing the separation efficiency of the cotton separator were discussed.

I. LOGIN

Currently, it is of great importance to develop and apply resource-saving designs of pneumatic transport devices with high overall efficiency in the production process, as well as conduct scientific research on them, in the delivery of cotton raw materials to technological processes for preliminary processing at cotton ginning enterprises.

There are many types of separator devices used to separate cotton from the air stream . These include the SS-15, SS-15A, SXM and etc. such as types encounter possible . But of these the most wide spread and many The one used is SS-15. cotton separator is [1].

When examining previous scientific studies, it was found that as a result of the interaction of the technological process during the transportation of raw cotton, especially when the moisture content of the raw cotton is high, the mechanical impact on the air-assisted transportation device increases the breakage of the grain and ultimately the degree of fiber damage [2].

II. The problem is posed.

One of the working bodies used in the cotton ginning industry, which transports cotton from one workshop to another with the help of air, is the separator device. In the working chamber that separates the cotton transported by air from the air, one of the important issues is not to damage the cotton pieces from the air flow during the separation process and at the same time to increase the work efficiency. In the currently used separators, it is observed that the work efficiency is not at the required level due to the cotton pieces sticking to the mesh surfaces located on the two side walls of the separator working chamber. Therefore, taking into account the above, the

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designed new separator device (Figure 1) eliminates the existing shortcomings and allows to increase the work efficiency of the separation process [3;4].

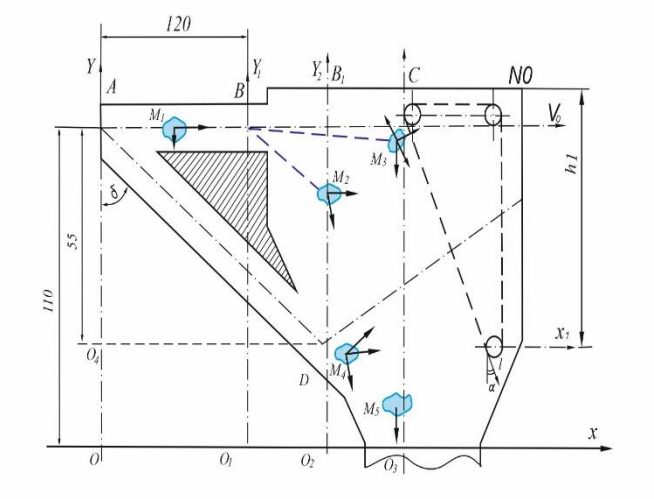

Figure 1. Improved separator working camera worker drawing

In this device, moving cotton raw material, together with air, enters the separator working chamber in two directions. The first direction is horizontal. (ABC), the second one makes an angle with $\delta$the horizontal direction (AD). The aim is to reduce damage to the cotton raw material by reducing the speed of air entering the separator working chamber [5;6].

III. Mathematical model of the problem

a) A certain part of the cotton pieces entering the separator working chamber together with the air flow enters in the ABC-horizontal direction, and the rest in the AD-oblique direction. Heavy cotton pieces moving in the ABC-horizontal direction are separated from the air and pass to the next process, while light cotton pieces hit the CL-mesh conveyor belt (Figure 1). Cotton pieces move down along the mesh surface due to their own weight. A certain part of the air flow is sucked in through the slots of the mesh surface in their own direction. The mesh surface is in the form of a conveyor belt, which moves regularly. During the separation of cotton pieces from the air, they move along the mesh surface, adhering to it. After the mesh surface and the cotton raw material have passed a certain distance, the cotton raw material is separated from the mesh surface by means of a brush drum located at the bottom. The separated cotton raw material is thrown to the bottom of the device and is discharged from there through a vacuum valve. When the cotton raw material reaches and adheres to the mesh surface, the process of cleaning the cotton raw material from small impurities in the passive state occurs as a result of the air being sucked from the mesh surface. In this process γ, the angle formed by the mesh surface plane with the vertical direction also affects the process of separating cotton pieces from the air [6;7].

b) A certain part of the cotton pieces entering the separator working chamber together with the air flow moves in the AD-angle direction . Starting from the D-section, heavy cotton pieces are separated from the air and then passed on to the next process .

Therefore, it is important to study the separation process and the laws of movement of cotton particles along the mesh surface [8;9].

Cotton pieces in the separator working chamber movement expression board differential equation we will arrange ;

a) Cotton the part cotton air using carrier pneumatic transport AB (I) range movement differential to the 0XY coordinate system relatively (Figure 2).

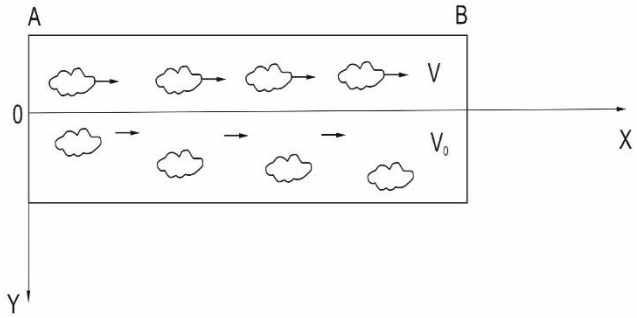

Figure 2. Cotton the part cotton air using carrier pneumatic transport system

this part cotton piece air flow - $v_0$fast gi under the influence horizontal in the direction v_p- moves with speed. AB- distance between the

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$l_0 = 110\ sm$two cotton balls piece mainly OXY-Cartesian coordinates to the system relative to OX-axis in the direction of moves .

this interval cotton the part movement differential equation D'Alembert on principle mainly as follows is written .

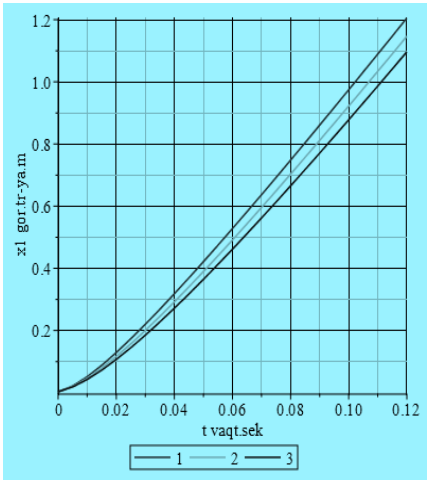
$$\begin{cases} \frac{dx}{dt} = v_p \\ m\frac{dv_p}{dt} = c(v_0 - \frac{dx}{dt})^2 \end{cases} \quad (1.1)$$

Here m is one cotton piece mass ; c- cotton to a piece impact provider air of the flow aerodynamic resistance coefficient . (1.1)-differential equations system for elementary conditions as follows is written :$t = 0: x(0) = 0, v_p(0) = 12\frac{m}{s}$;

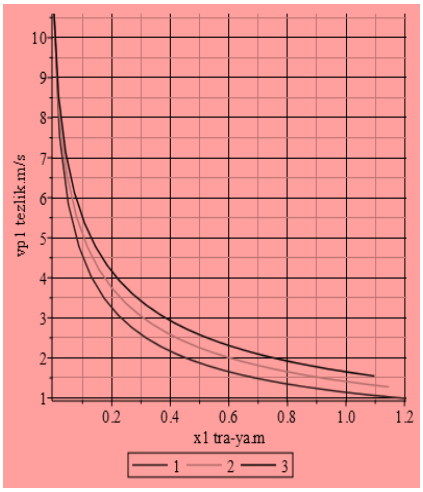
(1.1)- system numerical MAPLE-17 program in the method based on untied . Cotton the part various in the masses movement trajectory and speed time according to change The graphs are presented in Figures 3a,b.

From the graphic artist apparently, the separator is in part AB enter arrived cotton pieces mainly correct linear trajectory along It is difficult . massive cotton pieces light to the masses distance AB relative to slower pressing pass This is the process . speeds from the graph itself confirmation found . Because cotton the pieces speed to section AB If the inlet is 12m/s, then to section B equals 1.1m/s when arriving It's happening . It's heavy . massive cotton pieces speed light to the masses by 30-40 percent compared less would be That's it .

b) Cotton separator worker camera in the BC (II) range movement differential to the 0XY coordinate system relatively (Figure 4).



a)



b)

Figure 3 a,b . Cotton the part various in the masses movement trajectory (a) time according to change and movement speed (b) passed on the road garden change graphs . 1-m=0.006kg; 2-m=0.008kg; 3-m=0.01kg;

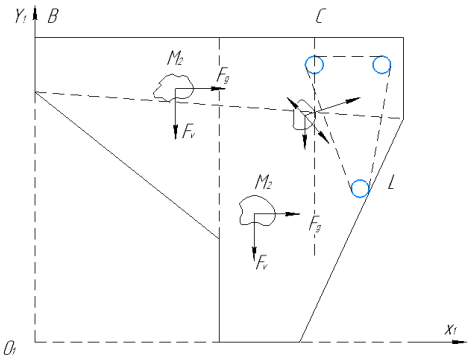


Figure 4. Cotton separator worker in the camera movement graph

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this interval cotton part , XOY - coordinates to the system relatively also horizontal (0x) also in the vertical (0y) direction moves .

This without cotton to the left F_{gor}– air flow horizontal aerodynamic power and F_{ver}- vertical weight power impact will . That is

$$F_{ver} = mg, F_{gor} = c(0.7v_0 - \dot{x})^2 (1.2)$$

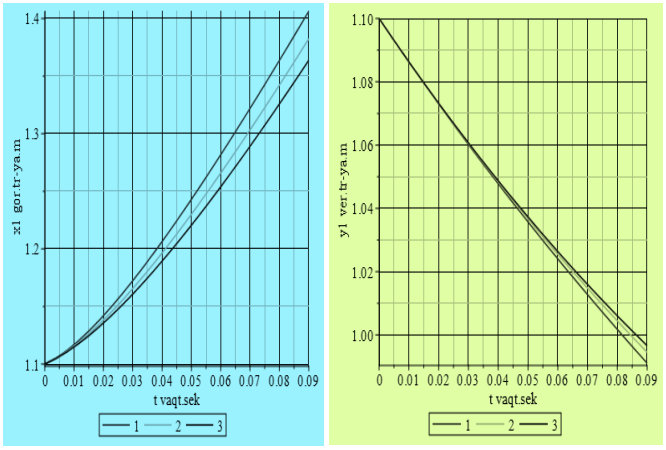
Cotton the part movement law as follows is written :

$$\begin{cases} m\ddot{x} = F_{gor} \\ m\,\ddot{y} = F_{ver} \end{cases} \quad (1.3)$$

(1.3) For start conditions as follows is written .

$$\begin{cases} x\,(0) = 1.1m \\ V_x(0) = 1.1m/s \end{cases} \quad \begin{cases} y\,(0) = 0 \\ V_y(0) = 1.4m/s \end{cases} \quad (1.4)$$

(1.4)- system numerical MAPLE-17 program in the method based on untied . Cotton the part various in the masses movement trajectory and speed time according to horizontal and vertical in the direction change The graphs are presented in Figures 5a,b .



5- a,b - picture . Cotton the part various in the masses movement trajectory (a- horizontal in the direction , b- vertical in the direction) time according to change graphs . 1-m=0.006kg; 2-m=0.008kg; 3-m=0.01kg;

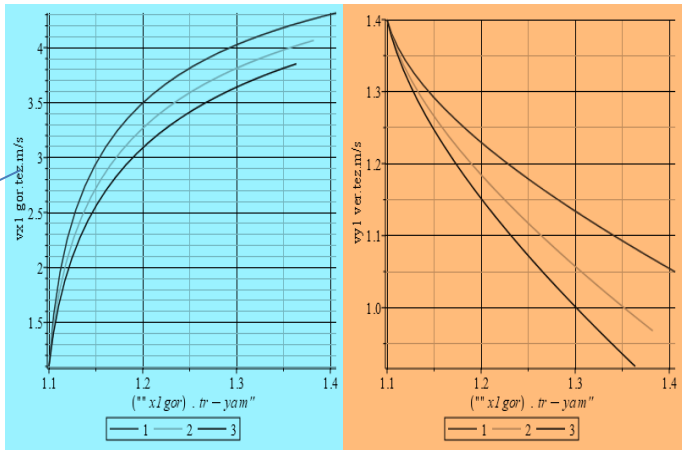


Figure 6 a,b . Cotton the part various in the masses movement speeds to the trajectory (a- horizontal in the direction , b- vertical in the direction of) garden change graphs . 1-m=0.006kg; 2-m=0.008kg; 3-m=0.01kg;

From the graphic artist apparently so that the separator is in the BC part enter arrived cotton be varnishes horizontal and vertical trajectory along moves . Heavy massive cotton pieces light to the masses relatively mainly vertical in the direction curve linear trajectory along next to the process passes , on the contrary light massive cotton pieces and CL is net to the surface is hit .

This process speeds from the graph itself confirmation found . Because cotton the pieces speed BC part pressing from 14m/s to 1.1m/s during the transition is decreasing .

X- rays

1. In the new device, the two-way movement of cotton raw materials, together with air, into the separator's working chamber was theoretically studied.
2. Raw cotton horizontal (ABC) and forming an angle with $\delta$the horizontal (AD) in the direction movement differential equations compiled .
3. Raw cotton horizontal (ABC) and forming an angle with $\delta$the horizontal (AD) in the direction movement differential equations numerical in the MAPLE-17 program solved .
4. By solving the differential equations of motion of cotton raw materials in the horizontal

(ABC) and the direction forming an angle with the horizontal (AD), the laws of δchange in the trajectories and velocities of cotton balls depending on different masses were obtained .

5. The purpose of this is to reduce damage to the cotton raw material by reducing the speed of air entering the separator working chamber.

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