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IMPROVING THE SEPARATION OF FIBER FROM THE SAW WITH THE HELP OF A BRUSHED DRUM IN A SAWING MACHINE

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Abstract

In the saw gin machine, which is the heart of the cotton gin, the working efficiency of the gin increased by improving the separation of fiber from the saw teeth using a brush drum.

Keywords: Saw, genie, machine, cotton, technique, product, fiber, air chamber, construction.

Introduction

Decree of the President of the Republic of Uzbekistan dated January 21, 2022 "On measures to promote deep processing and production of finished products with high added value in textile and sewing and knitting enterprises and their export" and January 16, 2021 decrees of November "On measures to regulate the activities of cotton-textile clusters" and PF-2 dated January 13, 2023 "Supporting the activities of cotton-textile clusters, textile and sewing - Decree of the Cabinet of Ministers dated August 30, 2022 "On measures to fundamentally reform the knitting industry and further increase the export potential of the industry" This dissertation research is aimed at the implementation of the tasks defined in the decision on changes and additions aimed at creating favorable conditions for state support and increasing their interest and other regulatory legal documents related to this activity. serves at a certain level [3-7].

Saw gin is the main technological machine of the cotton ginning enterprise, and its task is to separate the cotton fiber from the seed. Seeded cotton is dried to the condition of moisture in drying-cleaning and cleaning shops and after it is cleaned

of impurities, it is sent to the main building of the enterprise for ginning (separation of fiber). Until now in ginning of cotton with medium fiber seeds at cotton ginning enterprises; 4DP-130, 5DP-130, DPZ chainsaw machines are being used.

Improving the process of air-assisted fiber separation. Installation of a new device for removing fiber from saw teeth. In modern sawmills, mainly air-blasting devices are used to separate the fiber from the saw. The main technological parameters of these devices are defined as follows:

$$Q = fV = af\sqrt{\frac{2gH_{\partial}}{\gamma_X}}; \qquad f = l \cdot S; \qquad H_{\partial} = \gamma_x \frac{V^2}{2g};$$

$$d = \frac{R_E \cdot v}{V} \quad V = \sqrt{\frac{2gH_{\partial}}{\gamma_{XB}}} \qquad V = \varphi\sqrt{H_{cm}(T+t)}$$

where: – dynamic air pressure;
- specific gravity (density) of air;
V- speed of air;
g-free fall acceleration;
Q-air consumption;
f- cross-sectional surface of the air injection slot;
l and S-air spray slot cross-sectional dimensions;
Re=5*105- Reynolds number;
T=2730 K- the temperature of the air at 0 C on the Kelvin scale;
t-air temperature on the Celsius scale;
α-air uneven distribution coefficient α-0.96;
Hcm- atmospheric pressure, 760 mm Hg column.
v-the coefficient of air viscosity is 171.9*10-3 cm2/sec.

Demons equipped with a device for air supply from above work with a static pressure of 200 mm.water column (2000 Pa), when the width of the slot is 5 mm, the speed of air exit from it is 57.2 m/s.

The power required to remove the fiber from the saw tooth is 0.069 kW, or 7.8% of the active air power. An air blower can also be said to draw and collect air from between saw blades.

Requirements for air-spraying fiber removal devices:

a) The slot for air injection should be placed in relation to the saw in such a way that the gap between its air-releasing circle and the saw is equal to 3 mm. The maximum gap between them should be equal to the maximum air direction on the surface of the saws.

b) It is necessary to reduce the air gap to 4-5 mm.

Diameter of the circle of the air deflector:

d=Re.v/Ve;

where: Re=2.105-5.105- Reynolds number;

v - kinematic coefficient of elasticity of air;

velocity of air exiting the nozzle slot.

Cotton from the PD suppliers is lowered into the working chamber through the conveyors, where it is affected by the teeth of the saw cylinder and forms a roll of raw material. The teeth of the saw cylinder hook the cotton fibers in the raw material shaft, bring them between the colosniks and pull them from the surface of the seed. The fibers from the saw teeth are separated by the air flow coming out of the nozzle at a speed of 55-65 m/s and transferred to the fiber cleaning machine through the common fiber pipe [7-10]. The width of the slits in the working part of the colosniks is 3.2 mm. is not larger than , the seed cannot pass, the spinning seed joins the cotton roll and continues to rotate until all the fibers are separated. The seeds separated from the total fibers lose their ability to work, separate from the seed fiber shaft and fall to the surface of the colostrum and down through it. Table 3.2.1 shows the static pressure in the air chamber of the gins and the air consumption for removing the fiber from the saw teeth.

Indicators

DP-130

4DP-130

5DP-130

Static pressure in the air chamber, mm. water above

180-200

380

220

Air consumption for fiber extraction, m'/s

0.6-0.8

up to 0.8

up to 0.8

Static air pressure in the short pipe connecting the fiber cleaner, mm. water above

0.5

0.5

0.5

Air consumption for waste transportation, m3

0.2-0.3

0.2-0.3

0.2-0.3

As can be seen from the table, the air speed (50-65 m/s) is 4-5 times greater than the rotational speed of the saw cylinder (12 m/s), the air consumption is 0.8 per second, and the consumption is 2880 m3 per hour. As a result, the electric energy consumption is 5-6 kW/h for one fan, 10-12 kW for 2 fans, and it increases to 22-30 kW/h as a result of the efficiency of the electric motor and fan and the fact that the hermeticity is not well maintained. we can.

Without deviating from the initial idea, the following technical solution was developed in consultation with qualified specialists in order to reduce air and energy consumption when removing fiber from saw teeth. This solution is based on closing a part of the air injection slot while maintaining other parameters, which is done by installing a rubber stopper of a certain width at the corresponding distance between the saws.

The scheme of the developed defibering device is presented in Fig. 1. In the new device, a steel plate bent in the form of an arc is fixed to the upper wall of the air nozzle so that it corresponds to the middle of the distance between the saws. A rubber plate with a thickness of about 2 mm is attached to its back surface, and a rubber band with a thickness equal to the width of the air injection slit is attached to its front surface. As a result, part of the slot is closed and air is sprayed only between the rubber plugs. The distance between the plugs depends on its width, and it was decided to determine it experimentally.

Figure 1. 3D view of a device that removes cotton fiber from saw teeth using a brush drum.

Another operational issue has been resolved on this device. Its essence lies in the fact that it is difficult to change the size of the air-spraying slot in fiber stripping devices and to ensure the required accuracy. To solve this problem, a center cylinder was installed instead of a guide brush installed at the bottom of the slot. To change the slot size, use this cylinder

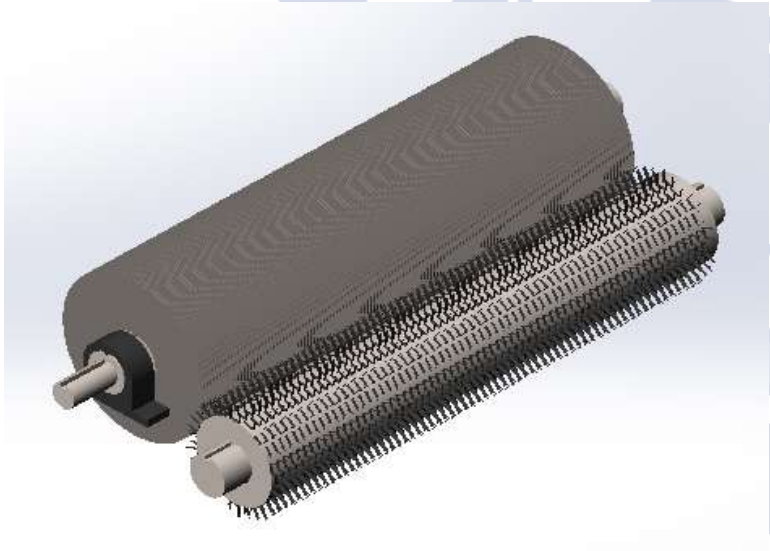

Figure 2. A view of a device that removes cotton fiber from saw teeth using a brush drum with a saw cylinder.

It is rotated around the eccentric axis, and when a slot of the required size is provided, it is fixed to the side wall with a threaded connection by means of a washer-fixer.

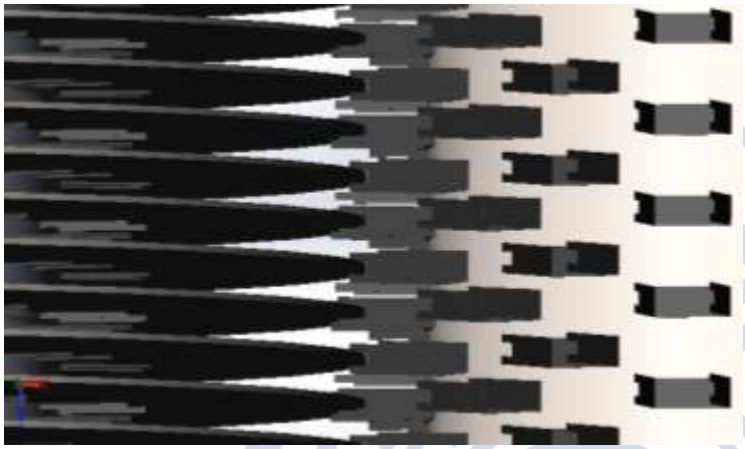

Figure 3. A view of a device that removes cotton fiber from saw teeth using a brush drum with a saw cylinder

The rubber plate on the back acts as a barrier between the saws and prevents air or fiber from passing between and under the saws. Therefore, its width is close to the distance between saws-16 It is desirable to be around mm. The starting and ending part of this plate is the zone where the teeth of the saw pass. Then, this plate cannot block the passage of the fiber. Also, in the case of ejection, air is absorbed from the outside, mainly from the place where the saw teeth pass, and this also facilitates the removal of the fiber from the saw teeth. Also, arc-shaped plates create a protected corridor for the movement of air and fibers between saws, and the mixture of fibers and air is forced to move along this corridor. The use of the new defibering device significantly reduces the process air and energy consumption and ensures complete and guaranteed removal of the fiber from the saw teeth.

Cost-effectiveness calculation from the introduction of a new device

The selling price of the fiber in the basic and introduced options depends on the amount of defects and impurity in it. According to UzDSt 604:2016, it is divided into five classes depending on the amount of defects and impurities in the fiber. The difference between classes is from 0.5% to 3.5%.

According to the obtained data, the amount of defects and impurities in the fiber after gin is reduced by 0.5%. For the base, we accept ordinary first grade first grade fiber. When we reduce the amount of defects and impurity in the fiber accepted by us by 0.5% and the difference between normal and medium grade is 1.0%, in the implemented option, 50% of the fiber will raise its grade and its average value from 6781940 soums

$6781940 \cdot 0{,}5 + 6847150 \cdot 0{,}5 = 6814545$ will increase to soums.

The analyzed cotton gin produces 2913 tons of fiber per year. Its basic and current price is as follows:

$C_{m1} = 2913 \cdot 6781940 = 19755791{,}2$ *thousand soums,*

$C_{m2} = 2913 \cdot 6814545 = 19850769{,}6$ *thousand soums.*

We pour the received account information into the economic efficiency calculation formula;

That is, the annual economic benefit from the introduct

$$Э = [(C_1 + E_н \cdot K_1) - (C_2 + E_н \cdot K_2) \cdot A] + (Cm_2 - Cm_1) =$$
$$= [(75031{,}17 + 0{,}15 \cdot 96580) - (78456{,}28 + 0{,}15 \cdot 103180) \cdot 1] +$$
$$+ (19850769{,}6 - 19755791{,}2) = 90563{,}3 \text{ минг сўм}$$

ion of a sawed gin straightener in a two-gin battery is 90563.3 thousand soums, or 45281.6 thousand soums per year for one gin, or 31089 soums per 1 ton of fiber produced (for 2017 calculated).

The prices of fiber produced using the basic and introduced equipment for an enterprise producing 9,246 tons of fiber per year are as follows:

$Ц_1 = 9246 \cdot 4235310 = 3915967626\ 0$ *so'm* $= 39159676{,}260$ *thousand soums*

$Ц_2 = 9246 \cdot 4658841 = 4307564388\ 6$so'm $= 43075643{,}8\ 86$ *thousand soums*

Conclusion

In conclusion, in order to reduce the energy consumption in the extraction of cotton fiber from saw teeth, the part of using a brush drum in the process of ginning and extracting fiber from saw teeth was developed and the advantage of this work was presented in accounting works.

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