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Influence Of Ginning For Paddle Roll Speed Raw Roller Saw Gin

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Abstract:

In the cotton-ginning factories of the process ginning is carried out on the saw gin. Main working body of the saw gin it is saw cylinder. The teeth of the saw cylinder come into the process chamber capture fiber from raw roller drags a grate, where it is ginning process, is formed raw roller. Ginning in the process of saw gin occur due to the difference between the angular velocities of the cylinder and saw raw roller. Reducing this gap or increase the angular velocity of raw roller causes the increase in the number of fibers that captured the saw-toothed saw cylinder, and this in turn leads to increased productivity. The main energy of the cylinder saw is spent on speeding raw roller. The paper presents the results of experimental studies in a laboratory setting the saw gin with the optical sensor. Consider the effect of the regime on the ginning speed accelerator adobe roller. The analysis of the experimental data and evidence-based use of the accelerator adobe roller saw gin.

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I. INTRODUCTION

It is known that, for a long time cotton has been considered as the main wealth of Uzbekistan. That is the reason Uzbek people call it "white gold" [1].

Originally, cotton-ginning process produces hand method. To facilitate the laborious process of ginning Eli Whitney invents a new gin, which works on a new principle and increases productivity through the use of an energy source [2].

Cotton-ginning machine H.Holmes used steel saw blades, which are used

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instead of the drum with a sharp bent pins, grate complex shape in place the kerf boards, these gridiron survived until today. Grate with an apron to form a working chamber. With these changes, become a continuous process. In 1834 Perkins suggested adjustable comb seed. This comb promotes the release of bare seeds from the working chamber. G. Clark in 1836 proposed a cast iron lining, in replacement of wooden. Lumpkil in 1909 recommended that the air eat for gin [3-5].

Improvement and construction saw gins conducted further along the path to identify the optimal geometric parameters of working bodies. This increase in the number of saw on the saw cylinder, the diameter of the saw blade and the profile of the working chamber [6-9].

In the US, there are new areas where research was conducted on the implementation of the accelerator into the working chamber, increasing the number of the saw on the saw cylinder to 177 (Hardwicke-Etter) to 128 (Lummus), 112 (Murray) and an increase in the diameter of the saw blades up to 406-457mm (Moss Gordin), profile of the working chamber (Lummus Super 88) [3-5].

Firm "Platte Lummus" proposed a new design of gin with the accelerator "Super 88". The working chamber, which has a shaft of the accelerator with saws, during rotation of the accelerator raw roller makes small reciprocating motion along the axis, thereby substitutes for teeth saw new areas. Instead of a head-mounted camera timber working rollers, and there are sprinkles rollers [3-5].

Some American manufacturers saw gin directed their research to reduce the cross-sectional area of the working chamber and thereby increasing the rotational speed achieved raw roller.

Existing saw gin increasing density of raw roller hampered seed output from the working chamber. This helps reduce the total seed pubescence, but along with it there - reducing productivity, deterioration of fiber and seeds, as well as an increase in power consumption. Because of the increase of the load on the drive motor of the saw cylinder, resulting compaction roller adobe observed frequent face in the top of the grate predetermining spinnable fiber loss when dropped raw roller to eliminate faces. Among the main drawbacks of existing ginning designs: low operational reliability; increased consumption of electricity in the rotation of the saw cylinder (75kW), especially in the start-up mode because of the large moment of inertia; low operating reliability as a result of frequent faces fibers in the upper zone grate; complexity in the operation of faces; deterioration of the fiber and seeds because of excessive density of raw roller [10].

In the process of ginning machine operation depends on the dynamic parameters of the engine assembly, including the moments of inertia, elastic, dissipative properties of the elastic member and the nature of technological loads of raw cotton. To justify these parameters is necessary to investigate the dynamics of transient and steady state operation of the accelerator machine aggregate raw of sawing gin [11].

Effective process of ginning directly depend on the design of the working chamber. In the process of construction of the working chamber shall not prevent the rotation of the roller mud. In addition, using additional devices in the chamber will increase the speed of rotation of the roller mud and it will contribute to the increasing of ginning productivity [12].

The task was to study the influence of the regime of ginning on the speed of rotation of the roller accelerator adobe saw gin. Experiments were carried out in the laboratory building of «Pakhtatozalash IIChB» laboratory installation on 30-saw gin, which copies the same laws of ginning process as regular production of saw gins [13].

During the experimental studies to examine and determine the influence of different modes on ginning rate change of the accelerator was used optical sensor. [14].

General view of the installation and operation of the optical sensor

Optical sensor works as follows [15]. As it is known, optical sensors are arranged so that they have their own internal resistance, discharge is this resistance leads to the fact that the sensor produces a signal. The internal resistance of the sensor is redeemed in capturing light. This process is called modulation of light. After contact with the sensor to direct light, the internal resistance of the sensor decreases. Catching the light, sensor, gives the signal. That is, the sensor captures every modulation of light and sends the appropriate signals to the computer. That, in turn, with the help of a special program processes the signals and presents the data in the form of graphs. Figure 1 (in the pic.) shows the installation of the optical sensor on the shaft of the accelerator. To get the modulation of light had to use a conventional pulley 2. In the pulley 2 were drilled six holes 3. On one side of the pulley 2 was installed light source 4, in our case, this is a common light bulb. On the other side of the pulley 2 directly opposite the bulb 4, was installed optical sensor 5. At each intersection with holes 3 lines of light modulation of the light is obtained, which intersect the optical sensor 5. Every second sensor 5 detects multiple modulations, the number of holes 3 pulley 2 is calculated and is given by computer program, which in turn signals when receiving processes data, takes into account the number of holes 2 and, thus, gives the corresponding figures of the pulley 3 revolutions per second. The signals transmitted by the sensor 5 is treated with a special program on the computer. Then the computer graphics gave data showing the velocity change of the accelerator after the time, that is, using this graph, you can with sufficient accuracy to determine the speed of rotation of the accelerator.

It should be noted, determining the rotational speed of the accelerator - this means determining the rotational speed of the raw roll. As is known from the raw rotation speed of the roller gin dependent performance and product quality.

The following operations were carried out to check the reliability of the results. With tachometer, ticking measured the idling speed of the saw cylinder and paddle roll speed. Then, these measured the speed using an optical sensor. Graph obtained by idling the saw cylinder and booster cushion adobe presented himself as a straight line. It should be noted that there are various vibration; noise does not affect the accuracy of the optical sensor type.

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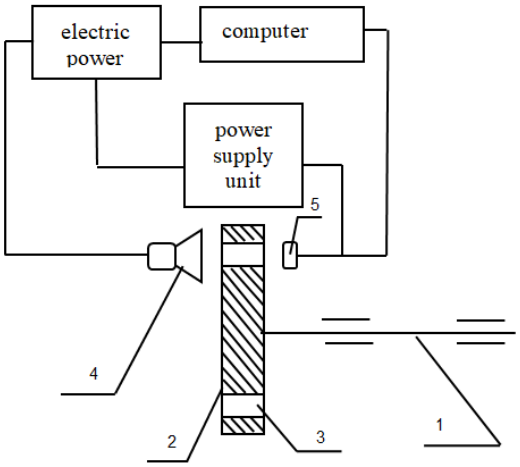
Fig. 1. Installing the Optical Sensor on the Shaft of the Roller Accelerator Adobe Saw Gin



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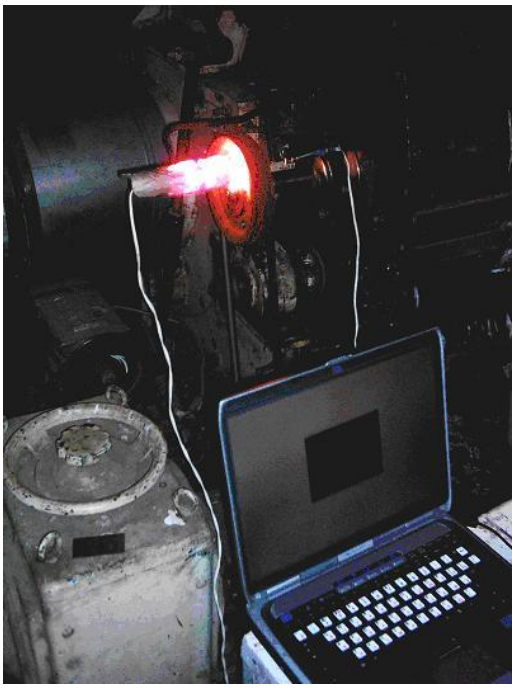

General view

working shaft; 2-pulley; 3-hole;
4-light source; 5-the optical sensor.
The scheme of the sensors

After the installation and testing, the optical sensor turned to experimental research. The task then is to study changes in the rotational speed of the accelerator compound and saw the cylinder depending on the mode of operation of the saw gin. By varying the speed of rotation of the accelerator, it changes modes of gin. When switching from one mode to another with the help of a computer program recorded idling composite accelerator adobe roller. The speed of the saw cylinder remained unchanged.

Experimental studies of the impact of the regime on ginning raw speed accelerator roller

Experimental studies were carried out on raw cotton with a moisture content of 9.9%, a blockage of 0.86%, 0.26% and mechanical damage of seeds 2.3%.

For the reliability of the results of research four replicates were carried out in each experiment. All experiments were performed under identical conditions, on a constant approximate to the maximum. Only change the speed of rotation of the composite accelerator elastic sleeve.

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Experimental studies have shown that while the speed of the composite accelerator and sawing gin cylinder vary according to certain laws.

In addition, we were interested in the time, the so-called start and stop. Start time - this is the period of time during which the motor is gaining momentum until the desired mark. Stop time - this is the period of time during which the motor stops completely (Figure 2).

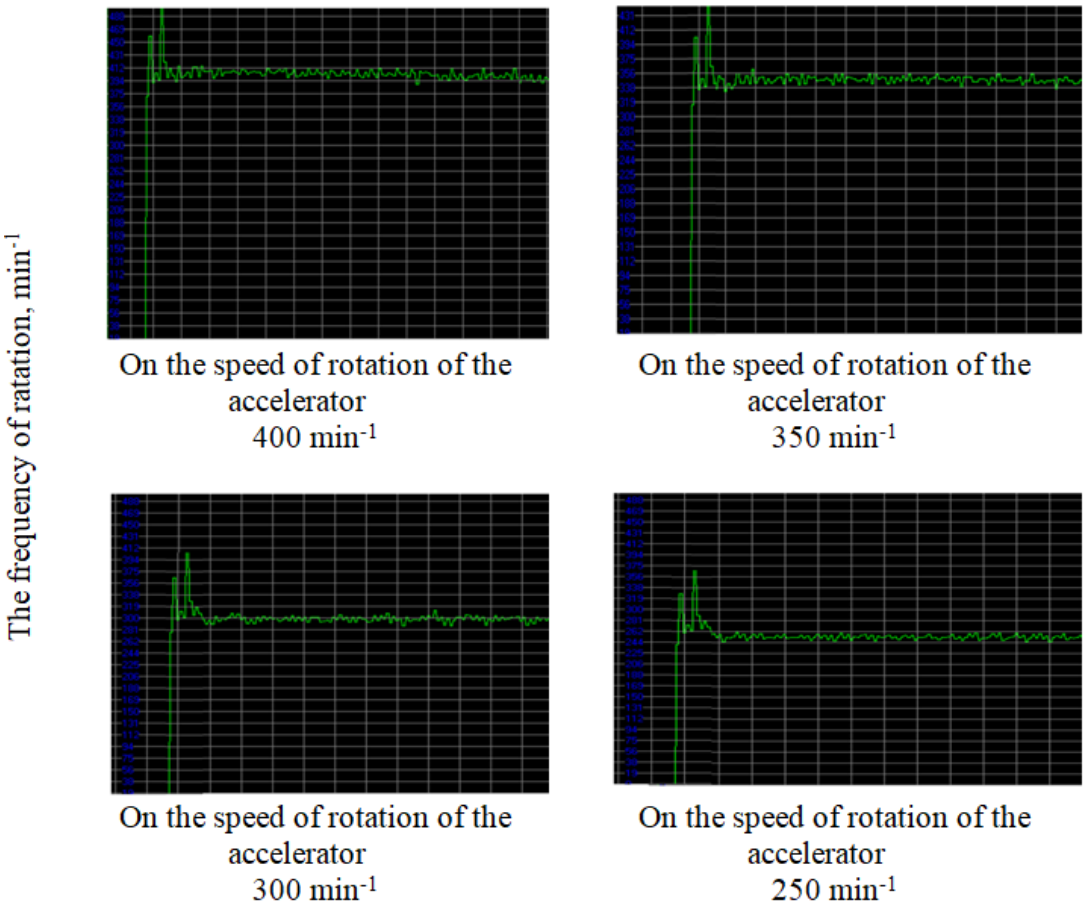

Fig.2. Changes in the Frequency of Rotation of the Roller Accelerator Adobe Saw Gin Obtained Using an Optical Sensor

As expected, the start and stop of all cases were different. The values obtained for the start time of the accelerator and the saw cylinder are shown in Table 1.

Table 1. Changes in the Speed of Rotation of the Accelerator, the Start and Stop at Different Modes of Ginning Proses

The speed of rotation of the accelerator (min^{-1})		Start time (s)		Stop time (s)	
idling	under load	accelerator	the saw cylinder	accelerator	the saw cylinder
200	196-204	1,62	2,65	8,9	13,1

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	193-201	1,64	2,5	9,0	13,2
	195-205	1,68	2,65	9,1	13,3
	196-205	1,67	2,55	9,2	13,2
average	195-204	1,65	2,59	9,05	13,2
250	246-252	1,75	2,45	8,7	14,1
	246-254	1,74	2,5	8,8	14,2
	245-253	1,75	2,45	8,6	14,3
	246-257	1,76	2,5	8,7	14,2
average	246-254	1,75	2,47	8,7	14,2
300	296-305	1,81	2,4	8,1	15,1
	297-303	1,8	2,4	8,3	15,2
	298-302	1,81	2,35	8,2	15,3
	297-303	1,7	2,45	8,1	15,2
average	297-303	1,78	2,42	8,17	15,2
350	349-354	1,82	2,4	8,4	16,1
	348-353	1,83	2,35	8,5	16,2
	346-351	1,83	2,45	8,4	16,3
	349-354	1,81	2,5	8,5	17,2
average	348-353	1,82	2,4	8,45	16,45

II. ANALYSIS OF THE EXPERIMENTAL DATA

Analyzing the obtained data as a result of the accelerator under load, without affecting the raw bead saw cylinder. That is, when the working chamber is raised. Here it should be noted that under load impact on the saw cylinder raw roller also

affects the start time of the accelerator adobe roller. These data show that when the rotation speed of the accelerator 200min^{-1} to 350 min^{-1}, respectively, the start time increases from 1.65 sec to 1.82 sec.

Next, we can consider the start time of the accelerator for the effect of the saw cylinder on raw roller. As seen in the data they differ from each other. It should be noted a decrease start time at which the velocity of rotation of the accelerator 200÷350 min^{-1}, respectively, starting time also increases from 1.61 sec to 1.78 sec. This time is less than the start time, without affecting the saw cylinder. The impact of the saw cylinder has a positive effect on the startup accelerator adobe roller.

The difference between the start time of the accelerator raw roller without impact and influence of the saw cylinder because the raw platen further receives the rotational movement of the saw cylinder, which in turn has a positive effect on the process run.

In the next stage of the analysis, it is considered varying the speed of the accelerator when the motor stops. It also must be taken into account the impact of the saw cylinder, it should be noted that under load impact on the saw cylinder raw roller also affects the stopping time of the accelerator adobe roller, so this time is reduced when the speed of rotation of the accelerator from 200min^{-1} and 350 min^{-1} while stopped, respectively, from 7.9 sec to 8.7 sec.

Next we can consider data obtained by the accelerator operation under load, without impact on the raw bead saw cylinder. That is, when the working chamber is raised. These data show that when the rotation speed of the accelerator

200min^{-1} to 350 min^{-1}, respectively, while the stop growing from 7.5 sec to 8,5sec.

Comparison can note the time difference to stop the accelerator with aglance and nonmetering of the saw cylinder. As seen from the table data the impact of the saw cylinder has a positive effect on the stop of the accelerator adobe roller. This difference is explained by the fact that under the action of the saw cylinder on raw roller, the latter receives an additional rotational movement of the saw cylinder. When stopped, this factor affects the braking process. Because the stop time of the saw cylinder more than the stopping time of the accelerator. After pressing Stop the machine, the impact of the saw cylinder continues 13-16 sec. Time that affect the raw roll continues. In addition, the mass of raw roller centrifugal force also affect the time to stop the rotation of the accelerator.

In addition, we have been tasked to study the deviation, change the speed of rotation of the accelerator operating. As is known in the theory that the additional load speed of the rotating parts of the machine unit changed. Analysis of data obtained during the experimental laboratory studies correspond to the data obtained during the theoretical studies. From Table 1 it is seen that during the gin under load (with the raw roll) rotation speed of the accelerator is not stable. Changes occur in the positive or in the negative side. This suggests that during ginning raw roller rotates with varying velocities. As we know the speed of rotation of the roller gin raw without accelerator affects only the speed of rotation of the saw cylinder. In our case, in addition to the saw cylinder at this rate affects the speed of rotation of the accelerator adobe roller. One can assume without impact on the raw accelerator roller spacing would speed several times higher. Such ginning of the process will certainly affect the quality of products as well as on the ginning process conditions, ie the car or you can say the load on the saw cylinder is loaded and shipped in every second. Implementation of the accelerator in the center of the working chamber leads to the stabilization of raw rotation of the roller.

Figure. 3. The drive intervals varying the speed of the accelerator in the form of histograms, which are constructed using arithmetic data obtained during the experimental laboratory research.

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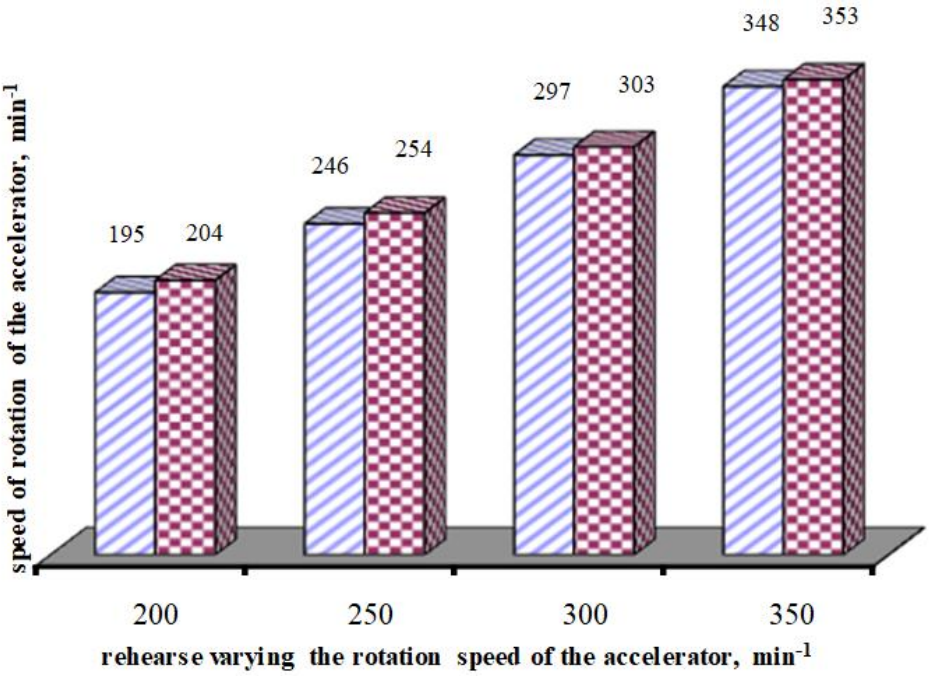

Fig.3. Intervals Speed Changes Depending on the Accelerator Ginning of the Mode with The Accelerator

The first pair of columns corresponds to the values where the nominal speed of the accelerator was 200 min^{-1}. The interval between the maximum and minimum values is nine units. Deviations from the nominal value in the negative direction 5 min^{-1}, and in a positive way 4 min^{-1}. The fourth pair of columns corresponds to the values where the nominal speed is a maximum of 350 min^{-1}. In such a case the rotation speed deviation from the nominal value of the negative side 2 min^{-1}, and the positive side 3 min^{-1}. At this rate mainly affects the mass density of the raw roll. Since all experiments were conducted under identical conditions. Just change the speed of rotation of the accelerator. Analyzing the histogram may be noted that the spacing changing the rotational speed or the accelerator can say deviations from the nominal values with increasing rotational speed of the accelerator is reduced. Analysis of the data shows that increasing the rotational speed of accelerator has a positive effect on the interval deviation. From the histogram it is seen that with increasing speed of rotation of the accelerator from 200 min^{-1} to 350 min^{-1} interval deviation decreases, respectively, from 9 min^{-1} and 5 min^{-1}. This suggests that the accelerator has a positive effect on the process of working the saw gin.

III. CONCLUSION

Thus, it may be noted that when using ginning accelerator raw rotation speed of the roller stabilize. This, in turn, influence the process of ginning. With stable raw roller rotation improves the yield of bare seeds, filling the saw tooth cylinder fiber, which leads to increased productivity and improved product quality.

Experimental studies using an optical sensor receiving the laws of motion of the accelerator and the saw cylinder gin in transient conditions start and stop, as well as in the steady state.

Revealed that an increase in the speed of rotation of the accelerator 200 min-1 to 350 min-1 during the start of the

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accelerator is increased from 1.62 to 1.81 with a cylinder of the saw from 2.5 to 2.65 seconds. At the same accelerator speeds under load stop comes from 8.45 seconds to 9.05 seconds, and stops for the saw cylinder and from 13.1 to 16.45.

The dependences of the starting time of the accelerator by increasing its speed. Revealed that with increasing load on the accelerator during acceleration system delayed start time on nonlinear patterns, the more load, the greater the acceleration of the accelerator.

Obtained according to comparative changes in amplitude oscillation speed accelerator from its nominal value. Revealed that with increasing speed accelerator for nonlinear patterns decreases the fluctuation rate.

The difference between the experimental and theoretical values obtained swing speed accelerator is (5,2 ÷ 10)%.

The dependences of the time change in the function of the accelerator stop its rotation speed.

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