METHODICAL WAYS OF PREPARING AND CONDUCTING EXPERIMENTS WITH AN IMPROVED DEVICE FOR REMOVING AND TRANSPORTING FLUFF IN A LINTER MACHINE

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Abstract. *In this article, during the lintering process, a small hejm ventilator design was developed, which supplied the blower air to the air chamber, a stream of which provided complete removal of the torque from the saw teeth;*

In the technological process of lintering, the effect of each linter on the complete removal of the amount, speed and uniformity of the blowing air from the flue chamber soplos has been determined;

In the process of lintering technology, the parameters of the installation of the air blower fan in the air chamber, which will be installed in the air chamber of each linter, are determined;

In the technological process of linterization, the design, basic parameters and aerodynamic operating modes of the air blower fan, which is installed in the air Chamber of each Linter, are determined.

Keywords: *linter, fluff, air chamber, aerodynamics, dynamic pressure, stand, air density fan, condenser, static pressure, grasshopper speed, seed mixer, saw angle, nozzle, experimental movement, tow, air, flow velocity, aerodynamic force, linter, supercharger, fan, pressure, pipe, aerodynamic system, saw cylinder, working chamber, exhaust pipe, seed comb, grate, drum, feed roller.*

Introduction. One of the main raw materials of the textile industry in the world is cotton fiber. Cotton fiber exporters include the United States, India, Australia and Brazil and importers include Bangladesh, Vietnam, China, Turkey and Indonesia" [1]. By improving the techniques and technologies of preliminary processing of cotton, great attention is paid to the creation of techniques that improve the productivity of equipment, cleaning efficiency, improve the quality of fiber, pollen and fluff being produced. One of the important tasks in this regard, including the creation of technical means and technologies for lintering cotton seeds, improving the quality of products, developing resource-saving techniques that increase production efficiency.

In the World, extensive R & D work is carried out within the framework of the development of new techniques and technologies, the creation of scientific foundations for the initial processing of cotton. In this regard, it is important to automate the process of operation of the linter, which is considered the main equipment of cotton ginning enterprises, increase productivity, equip the working chamber with resource-saving parts, improve the reliability of the operation of the equipment, maintain the natural quality of the seeds and fluff being produced. At the same time, the main factor in the technological process of lintering is the need to increase the productivity of work on pollen and fluff and reduce energy consumption, in order to completely remove the fluff from the Saw tooth.

In our republic, comprehensive measures are being implemented to develop the cotton sector, modernize cotton cleaning enterprises, technical re-engineering, increase the profitability of the enterprise in the initial processing of cotton and the competitiveness of the products produced. In the strategy of Action for the further development of the Republic of Uzbekistan in 2017-2021, including "...to increase the competitiveness of the national economy, ...reducing energy and resource consumption in the economy, the widespread introduction of energy-saving technologies into production..."the tasks are defined [2]. One of the important tasks in the implementation of these tasks, including increasing the efficiency of the linterization of the seed, which increases the efficiency of production and satisfies the consumer's need for seeds and fluff.

Purpose of the study:

In the process of linterization, it is necessary to completely remove the torque from the saw teeth and improve the aerodynamic system of pneumatransport transportation, develop technological and structural parameters.

Materials and methods of research. The research process used methods of theoretical and practical machine and mechanism theory, mechanics, higher mathematics and vibration theory, mathematical modeling of technological machine work processes, mathematical statistics and computational mathematics.

The main part. All planned experiments were carried out a laboratory sample of linter equipment installed in laboratory factory JSC “Pakhtasanoat scientific center” (figure 1). The laboratory linter used a 320 mm saw cylinder, a seed mixer, as in the 5LP linter, only enlarged to 180 mm in diameter, an improved variant in the scientific center (figure 1).

Taking into account that the most basic type of its technological work process is no different from the working process of the current linter equipment, it was concluded that it is possible to carry out planned experiments on the same laboratory linter.

Figure 1. Laboratory linterinig overview selected for conducting experiments

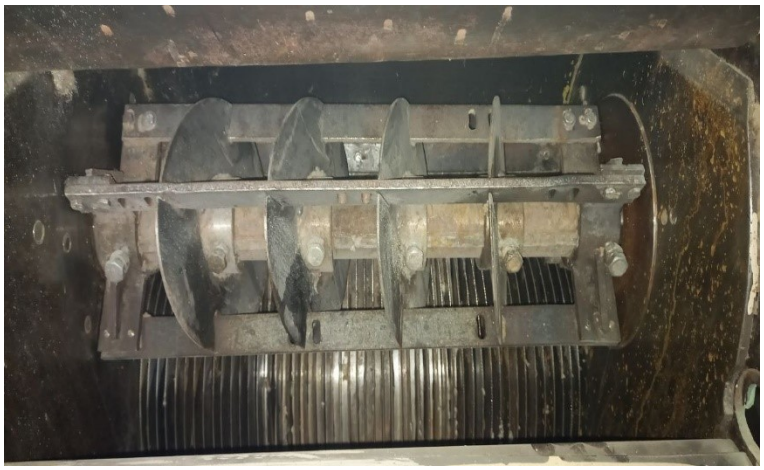

Figure 2. An overview of the seed mixer of the experimental laboratory linter.

To conduct planned experimental options, a scheme of the aerodynamic system of the selected laboratory linter was developed (figure 3). A ventilator with a small charge, capable of providing up to 1.0 m3/h of air consumption, was mainly purchased for the developed aerodynamic scheme. At the "RIM USTAXONASI" LLC under the scientific center, the necessary extensional parts, pipes were prepared and a laboratory stand was assembled, which was indicated in the scheme.

The technological process of lintering the seeds of an experimentally assembled laboratory stand is as follows (figure 3): through the supply system of the linter equipment, the feathered seeds are directed to the working Chamber of linter 1. Using the linter's seed mixer, a tangled roller is formed in the working chamber, when the saw cylinder rotates, its teeth scrape off the fluff from the feathered seeds [1]. The system of removing and transporting torque from the teeth of the saw cylinder of the linter consists of blower 2 and absorber 3 fans, blower 4 and suction 5 pipes, through which the torque removed from the saw teeth enters the torque condenser 6. The torque condenser is separated from the torque at 6 and falls on the torque collection pad from the slanted Tarn mounted on its base. Polluted air is cleaned using cyclone 8 da. Control of the laboratory stand of the linter equipment is carried out through the control panel 9.

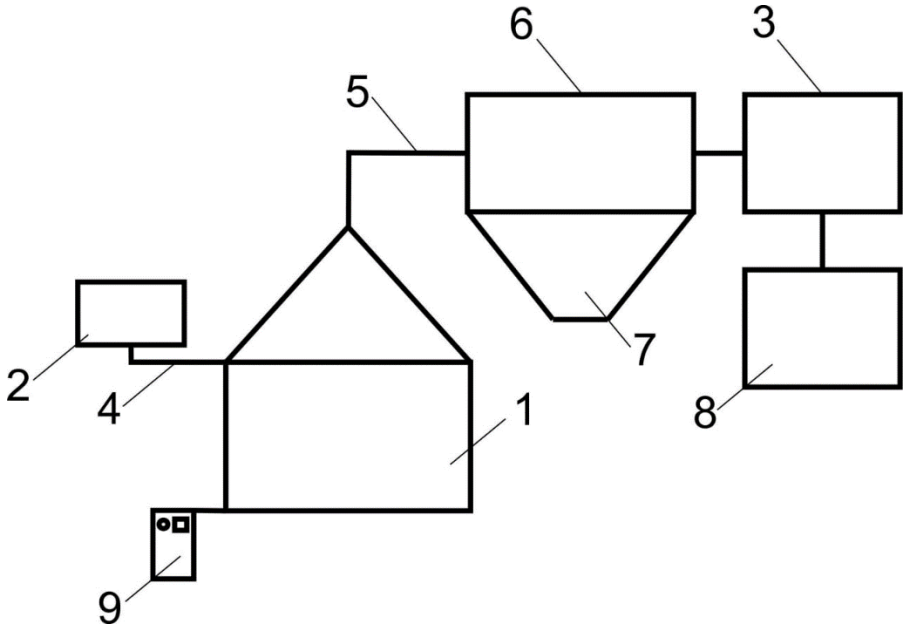

Figure 3. Scheme of a laboratory linter stand developed for conducting experiments

In experiments, the intensity of the supply of seeds to the working chamber in order to ensure the specified constant loading of the linter equipment saw cylinder and thus create the same operating modes when comparing the studied parameters, was adjusted and regulated by the ammeter included in the circuit of the electric motor of the spark mixer. In all experiments, it was ensured that the load of the electric motor was maintained at a nominal value.

During the tests of the linter, the productivity was determined by the weight of the jinned seeds weighed on the scales for each option and the duration of the linterization process of these seeds. During the linterization process, the amount of torque scraping from the jinned seeds was calculated from its measured khaki mass relative to the initial mass of the seeds. The density of the pollen wall in the working Chamber of the linter equipment was calculated relative to the size of the working Chamber of the pollen mass in the working chamber.

To determine the quality indicators of the resulting fluff, each of the obtained samples in one variant was performed using the current standard and instructions in the laboratory conditions of the scientific center. In the laboratory, it was found that the mass fraction of defects and foreign impurities of the fluff product obtained in the taxa, damaged the seeds and residual fluffiness.

For the reliability of the experimental data obtained, an experimental sample of the linter was equipped with a ballpoint pen in its blowing air pipe to regulate the required static pressure in the air chamber (figure 4). The static pressure in the air chamber of the linter equipment was determined in accordance with the existing methodology and related measuring instruments.

Figure 4. In the laboratory stand, a blower fan and a ballpoint pen are installed in the blower pipe, making the linter appear a static pressure adjustment system in the air chamber

The rotation speed of the linter equipment seed mixer is 500 rpm/min rpm/min. it was equal to [7], the saw cylinder was 730 rpm/min, the output of the Saw to the working chamber on the crankshaft grille was ensured to be equal to 35 mm, that is, no different from that of the current 5LP linters.

The transmission of pollen to the working Chamber of the linter equipment was regulated by the linter's feeder. For each repetition of experiments, the same feathered seeds were used in

the amount of 50 kg. Each variant of the experiment was performed in three iterations. Before the start of experiments on the linter, the planned necessary adjustments were made according to the options of experiments (for example, changing the amount of air, changing the static pressure and etc.).

The density of the feathered seed valig in the work Chamber of the experimental linter was determined by weighing the amount of seeds in the work chamber on the scales in its stable set operating State. To do this, we used the standard camera of the linter equipment with a charge equal to 0.13 m^3.

Two options for removing the fluff from the Sawtooth in the laboratory linter and determining the effect of the blower fan (the parameters of the air supplied by it) on the transport processes in the pneumotransport:

A) the saw cylinder saw of the linter equipment shows the torque removed by the saw teeth and the linterized seed in the aerodynamic operation mode, in which the blower and absorbent air fans are used together;

B) the indicators of torque removed by saw teeth and linterized dust removed by saw teeth in the aerodynamic operating mode when only a suction vent fan was used from the saw cylinder saw teeth were determined and compared.

In this case, the amount of fluff is determined when linterizing the linter with the same medium of the linter comb, the amount of fluff when linterized seeds are linterized, the residual fluffiness of the linterite, the amount of fluffing the linter to the base of the linter equipment, the duration of the linterization process.

In order to increase accuracy when measuring the amount of spray air in the laboratory stand of the linter equipment, a 1500 mm long straight pipe was installed after the spray fan, and the air consumption in the same pipe was determined using the following expression [4]:

$$Q = SV \qquad (1)$$

Here: S - is the transverse cross section of the pipe at the location being measured, M^2;

V- is the velocity of the debris passing through the pipe being measured, m / s.

or: $$Q = S\sqrt{\frac{2H_g\, g}{\gamma}} \qquad (2)$$

Here: H_g H_g – dynamic pressure, kg / m^2;

γ - air density, kg / m^2;

g – free fall acceleration, m/s^2.

If we take the values of and g as constant, it will be possible to determine the consumption of the blowing air from the following expression:

$$Q=\frac{4{,}22\, S\sqrt{H_g}}{3600} \quad m^3 / hour \qquad (3)$$

The dynamic pressure of the air in the pipe was measured with a micromanometer of U shape.

The amount of air in the entrance to the air chamber of the linter equipment was adjusted using the necessary chisels using a barrier on the fan side of this straight-line pipe.

For example, if the amount of air injected into the linter's air chamber would be equal to 0.4 m^3/s, the average dynamic pressure measured in a pipe of 300 mm diameter would be 4.78 kg/m^2.

Airspeed:

$$V = Q/S, \text{ m/s} \qquad (4)$$

The amount of absorbent air from the linter equipment was ensured to remain unchanged for the raw options in the amount equal to 0.4 m^3/s, based on the recommendation [5] developed by the "Pakhtasanoat scientific center" JSC. According to the same recommendation, it was recommended that the spray air included in the linter equipment be up to 6.5 m/s in speed. Using the information provided in this recommendation, the speed, dynamic pressure of the spray vent, which is being introduced into the linter equipment in the recommended scheme, was studied.

The data obtained as a result of studies in laboratory conditions is presented in Table 1.

Table 1

The results of determining the indicators of the spray Basin in the proposed scheme

Order number	Air transmission method	Dimensions of the air transmission pipe		Dynamic pressure, kg/m^2	Airspeed m/s	Air consumption, m^3/s
		diameter, mm	Cross-sectional surface, m^2			
1	air sprayer fan	250	0,049	5,74	8,16	0,4
2		300	0,0706	4,78	5,66	0,4
3		350	0,0962	4,098	4,15	0,4

It turns out that we can assume the diameter of the pipe injecting the spray air into the linter equipment to be close to the values 300mm the speed of the vent when the spray air consumption is equal to 0.4 m^3/s.

Because Table 1 data shows that while the diameter of the spray pipe increases to 8.16 m/s when the spray air speed is less than 300 mm, the spray air speed decreases to 4.15 m/s when it is greater than 300 mm.

Using the same results obtained, we took the diameter of the air spray pipe to be equal to 300 mm for our subsequent experiments. It was also accepted that the amount of air absorbing the linter equipment from the air chamber through the windpipe was equal to 0.4 m^3/s. The consumption of spray and absorbent air was adjusted by means of barriers located in the air-conducting pipes.

A ventilator was used to carry out the experimental options, with an estimated air consumption of 1.0 m^3/s. The fan parrage has a rotation speed of 1500 rpm./ min. is equal and is used using an electric motor of 2.2 kW. In experiments carried out in laboratory conditions, a feather technical seed was used, which was obtained from the initial processing of C-6524 breed of cotton grown in the Boka District of the Tashkent region. The indicators of the used technical seed are presented in Table 2.

Table 2

Indicators of the initial technical pollen detected in the laboratory of the scientific center

Cotton product		Indicators of the initial technical seed, %			
Type		Residual fluffiness	Mechanical damage	Filth	moisture
selection type	Industry type				
C-6524	I	10,5	3,8	3,1	9,8
C-6524	IV	12,0	4,6	4,3	10,1

To study the amount of torque obtained during the linterization of the spray air and the effect of the linter equipment on the productivity of work, the amount of spray air was gradually changed from 0 to 0.6 m^3/s. In this case, the task was performed to completely linter the captured 50 kg of technical pollen.

In order for the quality of the technical seed obtained during the lintering process to meet the standard requirements, the seed comb of the linter equipment was placed in the middle position [6]. The resulting fluff and pollen products were determined by the mass ranging from electronic scales. In the experimental variants, the fluffy Ham that spilled on the base of the linter equipment was collected and added to the main fluff, without stirring. The actual performance of the linter equipment was determined by determining the time of operation of the linter with a stopwatch.

The results of the study of the amount of torque obtained during the linterization of the spraying air and the effect of linter equipment on performance are presented in tables 3 and 4.

Table 3

The results of the study of the amount of torque obtained in the process of lintering the spraying air and the effect of linter equipment on performance (C- 6524 variety, I-Industrial variety)

Naming indicators	Installed amount of spray air consumption, m^3 / s			
	0	0,2	0,4	0,6
Productivity of work on the transfer of linter machine seeds, kg / mach.hour	228/760	238/794	255/850	260/866
Working productivity on linter machine fluffing, kg / mach.hour	9,07/30,24	9,54/31,8	10,46/34,88	10,46/34,88
Chubby staple length, mm	7/8	7/8	7/8	7/8
Chubby output, %	3,4	3,42	3,5	3,5

The fraction table shows the results calculated for a 48-bit laboratory linter, and the fraction table shows the data calculated for a 5LP linter.

As can be seen from the results of the experiment presented in Table 3, it turns out that by introducing the recommended amount of spray air into the air chamber of the linter equipment, it is possible to increase the work productivity of ham on the transmission of linter equipment, Ham on the extraction of fluff.

When the data from table 3 was analyzed, it turned out that the performance of lintering the linter equipment by injecting the spray air into the air chamber in the recommended amount, that is, 0.4 M3/s, was 255 kg/hour, the working performance of the linter equipment by pollination was 10.46 kg/hour. When the linterization process was carried out with a absorbent air, only 0.4 M3/s, without injecting the linter equipment into the air chamber with a spray air, the working productivity of the linter equipment for grafting was 228 kg/hour, and the working productivity of the ham for obtaining fluff was 9.07 kg/hour. This means that if the linter equipment is linterized and the linterization process is carried out, the linter equipment can be achieved by 10.58% of the work productivity of the linter equipment grafting compared to the process of linterization with the absorber Basin alone, the ham work productivity increase by 13.29% of fluffing can be achieved.

Table 4

The results of the study of the amount of torque obtained in the process of lintering the spraying air and the effect of linter equipment on performance (C-6524 variety, IV-Industrial variety)

Naming indicators	Installed amount of spray air consumption, m^3/s			
	0	0,2	0,4	0,6
Productivity of work on the transfer of linter machine seeds, kg / mach.hour	212/708	222/742	234/780	236/786
Working productivity on linter machine fluffing, kg / mach.hour	9,39/31,3	9,72/32,4	10,68/35,6	10,74/35,8
Chubby staple length, mm	6/7	6/7	6/7	6/7
Chubby output, %	3,96	3,98	4,0	4,05

Similar results were obtained in the process of lintering technical seeds of the C-6524 variety, IV-Industrial variety. According to the analysis of the results in Table 4, in the process of lintering the IV-industrial grade technical seed, it turns out that the linter equipment can be achieved by 9.4% of the productivity of the work on the transfer of linter equipment to the seed, compared to the process of linterization with only the absorber air, if the linter.

According to the analysis of the data presented in tables 3 and 4, it was found that the lintering process by injecting a spray ditch of 0.6 m^3/s was not significantly increased compared to the lintering process performed by injecting the linter's equipment into the pit, and the working productivity of the dam xam was not significantly increased by injecting a spray ditch equal to 0.4 m^3/s. It was observed that when the lintering process was carried out by introducing a spray vent with an installed amount of 0.6 m^3/s, a part of the torque was poured into the base of the linter equipment, which was removed from the saw drum. This condition, on the other hand, can negatively affect the quality of linter fluffing. For this reason, it is advisable that the linterization process is carried out by introducing an amount of spray air into its air chamber equal to 0.4 m^3/s in order to increase the productivity of the linter equipment in terms of pollination and fluff extraction.

Conclusions.

It can be observed that the batteries of linters of the 5LP, which are currently being used in the main cotton cleaning enterprises of our Republic, do not use blower VTS-8 fans, which are applied to remove the fluff from the Saw tooth. The consequence of this is that during the linterization process, complete removal of the torque from the saw cylinder teeth is not provided. A piece of torque can be observed re-entering the working chamber with saw teeth. During the linterization process, there is no complete transportation of torque in pneumatic tubes due to the uneven distribution of the pressure and amount of airflow supplied by the absorbent fan to the air chambers, and there are cases of fluff deposition at the base of each linter.

When the use of linters produced in foreign countries in maxillary cotton ginning Enterprises is assumed, it is observed that the process of moving seeds out of the chamber is accelerated as a result of the use of specific profile colosniks in the working chamber, despite the

fact that their productivity is much less than in the technical description. But even because the speed of rotation of the saw cylinder in linters is on average 1000 - 1200 ayl/min, It can be noted that damage to it in the process of linterization of the seed has led to an increase in the degree of pollution of the fluff, and seed linterization in such linters is not allowed.

It was found in the experiments that when the air chamber of the linter is supplied with spray air in the amount of 0.4 m3/s, the amount of fluff poured into its bottom decreases and the amount of fluff transported to the fluff condenser reaches 99.4%. It is also not recommended to increase the amount of spray air above 0.4 m3/s, because the amount of spray air exceeds the amount of suction air, and it was observed that fluff removed from the teeth of the saw cylinder is sprayed onto the linter base.

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