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RESEARCH RESULTS ON THE SELECTION OF THE MESH SURFACE OF A LINT-CLEANING DEVICE

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Abstract: In this article, research was conducted to improve the "Linter" machine, which removes short fibers remaining in ginned cotton seeds at cotton ginneries By technical regulation, after the cotton raw material is ginned at cotton gins, the cotton seeds are lintered in Series 5LP linters to obtain lint widely used in the textile, chemical, and pulp and paper industries. However, the current state of cotton linters does not meet the growing demands of the cotton ginning industry The need to increase the productivity of the machines, improve the quality of the produced products, save energy resources and material costs in the production of lint and seeds, improve the equipment and technologies for the linting of seeds and the cleaning of lint, the optimal parameters of the working members of new machines and their operating modes. requires conducting theoretical and experimental studies that will allow us to choose.

Keywords: linter machine, fluff, impurities, lint, brush drum, guide, mesh surface, beveled corner, supply roller, density valve, seed chamber, mixer, seed comb, coil grid, saw cylinder, lint discharge channel, die, conveyor, air chamber.

Introduction. It is necessary to create schemes of working parts of the improved machine by analyzing the work of existing linter machines developed based on the literary analysis conducted in the scientific research and the results of the research carried out in the field. Since the main working body of the machine is a brush drum and mesh surface, attention was paid to this zone.

The parameters of the machine's lint-cleaning wire surface were selected based on theoretical work. Machine productivity was maintained at the maximum condition of cleaning the outgoing lint mass, and the technological process was not affected during operation (Fig. 3.3).

The mesh surface slits that separate impurities in the lint mass are made in the form of elliptical slits that are made as small as the lint mass and increase along the direction of movement of the lint mass [47]. Because these slits are installed in a horizontal position along the direction of movement, the lint mass penetrates the mesh surface, and little by little the small impurities in it begin to fall through the slits to the auger below.

Figure 3.3. Mesh surface for lint removal

Unlike existing linter machines, the lint mass coming out of the saw drum is separated not by air, but by a brush drum and transferred to the next process. The brush drum (Fig. 3.4) firstly shoots the lint to the mesh surface in time, and secondly, it can maximally clean the saw drum from lint, which makes it possible to increase the service life of the saws up to 60 hours. It is possible to change the parameters of the newly installed working bodies depending on the characteristics of the material.

Figure 3.4. Brush drum and dirt auger

The diameter of the drum with a brush that conveys the lint can be made 250 mm, its maximum rotation speed in this case was determined as a result of research up to 1323 rpm, but 1100 rpm was chosen as an acceptable value for us. Brushed drum brushes penetrate between the drum saws of lint separator saws by the length of the saw teeth and can fully absorb any material in the direction.

One of the important aspects of the problem is to determine the shape and position of the mesh surface that will allow effective cleaning [48]. It is known that the lint product has a rather complex structure and contains a large number of small fiber particles, so the surface must be ready to clean the material with complex properties. In addition, if necessary, it is possible to change the spacing and location of the cleaning mesh surface slots.

If the type composition of the manufactured lint does not depend on the technological regime of the cotton ginning enterprise, but only on the assortment of cotton raw materials, then the types of lint are directly related to the linting regulations [49]. The possibility of increasing the range of manufactured lint is fully demonstrated in cases where the recommendations given by JSC "Pakhtsanoat Scientific Center" on increasing the production of type 2 lint are implemented. The production of lint products of type 1 has now significantly decreased, while the production of lint products of type 3 has increased almost 1.5 times. The constant increase in the demand for lint products made it necessary to re-equip the linters of cotton ginning enterprises from the technical side, to improve and install new linters with low productivity, and to revise the technology of linting gin products. In particular, many big issues remain open regarding the improvement of linter machines with the help of local resources.

In addition, at the same time, the demand for quality lint is increasing, especially in recent years, due to the increase in machine picking of cotton, which causes an increase in the state of pollution, the demand for cleaning the lint in the technological process itself is also increasing.

By increasing the productivity of lint production, the possibility of producing type 1 lint is greatly reduced, as a result of which the main part of the produced lint (73.1%) goes to type 2, its abrasion increases, and as a result, the level of contamination increases.

Methodology & empirical analysis. Lint is a fibrous mass of non-uniform length with organic and inorganic impurities as a product. Pollution can be up to 17% depending on the type of raw cotton. Based on the accepted classification, lint is divided into 3 types and 4 industrial varieties depending on maturity, staple length, contamination, and the purpose of use. For the first variety, lint maturity shall not be less than 85% as determined by the microchemical method, or 69% as determined by polar light. In terms of pollution, the lint should be according to the required norm, if the pollution exceeds the norm, it will be accepted for low grades. If the lint is designed to obtain nitrocellulose and acetylcellulose, then the contamination should not exceed the base norm, the contamination norm for industrial grades 1 and 2 is 3.5-6.9%.

Due to the above, lint products should be constantly monitored for contamination. In the research work, experiments were conducted on a new cleaning surface to clean it.

Many analyses have been done on the current state of lint products [50], and many studies have demonstrated this state. The condition of the lint product after linting is given in

Table 3.1. Condition of the lint product after lintering.

Selective variety	The seed is damaged, %	Lint staple length and type, %	In Lint amount of impurities, %	Including		
				Large impurities, %	Small impurities, %	Broken seeds, %
Namangan-77 (1-variety	3,71	7/8, A	5,8	2,81	2,25	0,74
Namangan-77 (3-variety)	8,1	6/7, Б	8,9	4,46	3,08	1,36
C-65)24 (1- variety)	3,63	7/8, A	5,6	2,71	2,09	0,8
C-6524 (3- variety)	7,9	6/7, Б	8,4	4,4	2,71	1,29

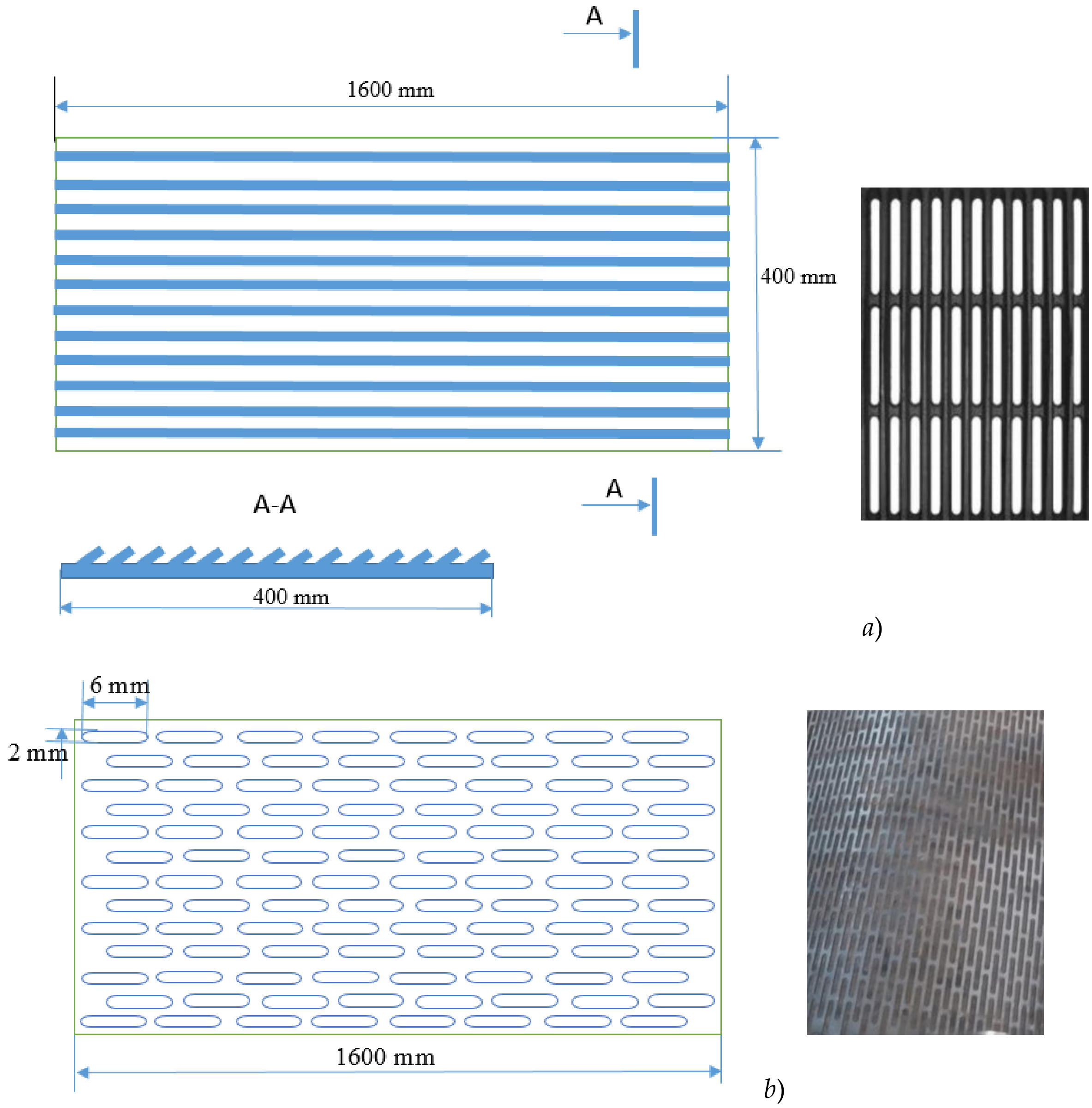
As can be seen from the table, the level of contamination of the lint may be different when processing different selected varieties of cotton, which means that the cleaning device should be checked in different conditions.

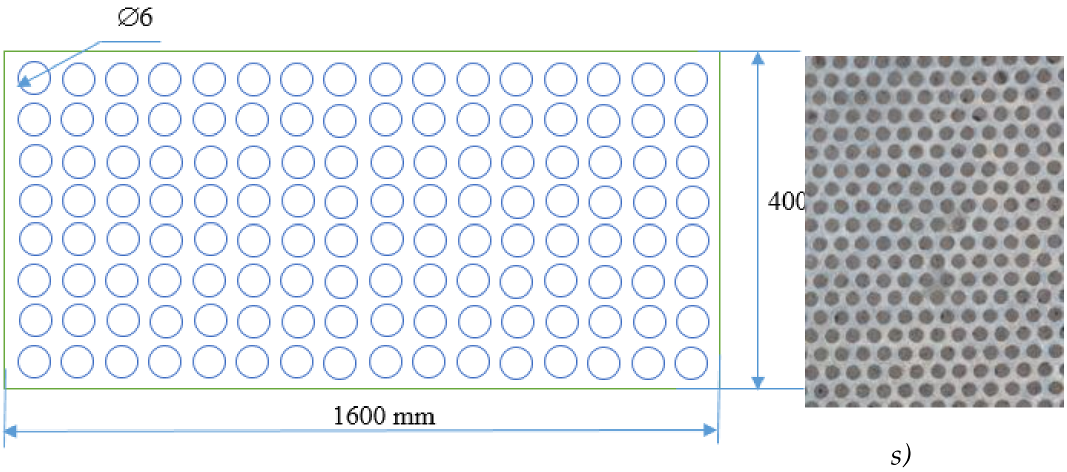
Experiments on the selection of the cleaning surface were first conducted based on mesh surfaces of three shapes (Figure 3.5) [51].

The mesh surface in option 1 consists of horizontally continuous wires, and the cleaning surface part is installed in a concave position against the direction. Based on the experimental results, its length (longitudinal) was 400 mm, and its width was 1600 mm. The distance between the wires of the stranded surface is 6 mm and they are parallel to each other (Fig. 3.5, a). When this mesh surface test device was used, it was predicted to give a very good result in terms of lint removal efficiency, the fact that the surface consists of grids in a convex position ensures good penetration of the lint mass and that fibers do not pass through the mesh slits. 'intended to provide.

The slits of the mesh surface in the 2nd option are made in an elliptical shape, and the size of the slits is 2x6 mm (Fig. 3.4, b). An important aspect of this surface is that it has a maximum useful surface for cleaning, depending on the shape of the grooves. A masked mesh surface has maximum potential for both lint removal and cleaning. When using this mesh surface, the movement of the lint mass is uniform, and cleaning efficiency and productivity are maximized. Surface clogging has been minimized as a result of the surface's desirable level of condition.

In option 3, the slots consist of round slots, and their diameter is 6 mm (Fig. 3.5). This surface is characterized by a very reliable transfer of small-shaped material. Although performance is lower on a masked mesh surface, there are no cases of the line passing through the slits of the surface and being covered on the surface.





s)

Figure 3.5. Schemes of mesh surfaces of various shapes

a) with a straight line, b) with an elliptical slot, c) with a circular slot

All surfaces are designed to be 400 mm long and 1600 mm wide in the direction of entry. Subsequent experiments were conducted to determine the effectiveness of cleaning on these surfaces. [52].

Results. In each experimental work, cotton of 2 different selection varieties working in the enterprise was used. After the experiments on one surface were completed, the surfaces were changed in time because it was possible to install a second mesh surface on the machine.

The results of the experiment are presented in Tables 3.2, 3.3, and 3.4.

Table 3.2. Surface efficiency of parallel wires

Selection of type of cotton	Airspeed m/sec	Productivity, kg/h	Brush drum rotation speed, rev/min	Cleaning efficiency, %	Lint disposal, %
Namangan-77 (1-variety)	1,8	1500 1000	1100	56 58	8 9
Namangan -77 (3- variety)	1,8	1500 1000	1100	55 56	9 11,5
C-6524 (1- variety)	1,8	1500 1000	1100	58,5 55	12,5 11
C-6524 (3- variety)	1,8	1500	1100	56,5	9

Table 3.3. The efficiency of the surface with elliptical grooves

Selection of type of cotton	Airspeed m/sec	Productivity, kg/h	Brush drum rotation speed, rev/min	Cleaning efficiency, %	Lint disposal, %
Namangan-77 (1-variety)	1,8	1500 1000	1100	55,5 56	2 2,5
Namangan -77 (3- variety)	1,8	1500 1000	1100	54,5 55,5	2 2,5
C-6524	1,8	1500	1100	56,5	2,5

(1- variety)		1000		57,5	2,5
C-6524	1,8	1500	1100	53,5	3
(3- variety)		1000		54,5	2,5

Table 3.4. The efficiency of the surface consisting of circular grooves

Selection of type of cotton	Airspeed m/sec	Productivity, kg/h	Brush drum rotation speed, rev/min	Cleaning efficiency, %	Lint disposal, %
Namangan-77 (1-variety)	1,8	1500 1000	1100	48 51	2 1,5
Namangan -77 (3- variety)	1,8	1500 1000	1100	37 42	1,5 1,5
C-6524 (1- variety)	1,8	1500 1000	1100	48,5 51	2 1,5
C-6524 (3- variety)	1,8	1500 1000	1100	39,5 42	2,5 2

a) *b)* *s)*

Figure 3.6. The state of lint and impurities in production

a) Lint condition before cleaning, b) Small impurities in lint, c) Condition of cleaned lint

From the results of the conducted experiments, it can be seen that each cleaning surface was developed based on the parameters obtained based on theoretical studies. From the experiments presented in Table 3.2, it was determined that the cleaning efficiency of the mesh surface made of parallel wires is much higher (55-57%) In LSA, it was found that the amount of lint product added to the dirt from this type of mesh surface is quite significant (up to 12.5%). Therefore, in subsequent studies, surfaces of other shapes were tested.

In Table 3.3, the results on the elliptical mesh surface gave the expected efficiency (55-56%) and the amount of product that passed through it was not very significant (2.5-3%), depending on the operating conditions. depending on the possibility of prevention. From the results of the experiments conducted on the mesh surface with round slits in Table 3.4, it can be seen that although the chance of the product getting into the auger through the slits is high (1.5-2%), the cleaning efficiency is also not high (maximum 51%). it turned out.

From the above results, the ellipsoid mesh surface of option 2, which is more reliable and has less material consumption, was selected for the new linter machine. Depending on the production conditions, the use of the mesh surface of the 3rd option can also be effective in cleaning the lint, but it is necessary to take into account the cases of product loss [53].

It is desirable to mass-produce the device with a mesh surface, which gave good results in the experiment, and use it in production. Thus, a cleaning surface with elliptical grooves was selected for the production design, which worked well.

In the operation of the cleaning device of the linter machine, it is also important to direct the lint mixture to the mesh surface to clean the lint mass. Therefore, a controlled router was also used in the experiments (Fig. 3.7). That is, the main part of the lint mass separated by the brush drum installed at the outlet of the linter machine does not come directly to the cleaning surface. Therefore, a guide is installed on the path of movement of the ribbon, which is located at a certain angle along the direction and directs the mass to the upper part of the surface. In this case, the mass crawls over the surface and is maximally cleaned of impurities.

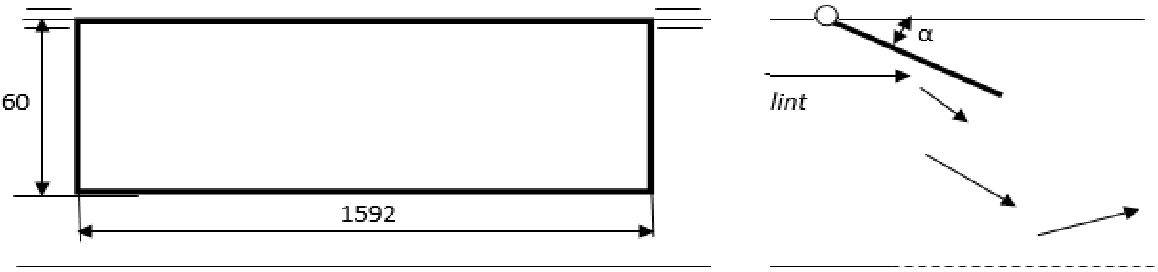


Figure 3.7. Router circuit

In the production process, the angle of inclination of the router is of great importance. Therefore, during the experiments, the position of the router was changed, and the results were recorded according to the position. In addition, during the technological process, the length of the guide and the change in the angle of inclination were controlled. The results of the experiment conducted on an elliptical surface are presented in Table 3.5.

From the results of the experiment, it was determined that the optimal position of the slope angle is 300, and it is recommended to select this value for further research. Based on these results, recommendations were made to create a linter machine recommended for production.

Conclusion. The obtained results showed that the optimal values of the factors affecting the cleaning surface of the Linter machine are: Brush drum rotation speed, 1100 rev/min; Angle of inclination of the guide, 30 (α), grad; When the length of the mesh surface is 400 mm, we have achieved a cleaning efficiency of 55.1%.

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