INTRODUCING INNOVATIVE TECHNOLOGIES TO INCREASE PRODUCTION EFFICIENCY IN COTTON-TEXTILE CLUSTERS

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Abstract. *This article analyzes the proposed new improved type of separator equipment used in cotton primary processing enterprises, and explores the principles of operation. The main goal is to improve the quality of products of great national economic importance, increase the efficiency of the separation of raw cotton from the air flow and increase production efficiency by eliminating the existing shortcomings of the separators used in the ginnery.*

The mesh surface, located on the side of the working chamber of the separator, contributes to the separation of cotton from the air. In the article, the authors proposed to put a double mesh surface, change its shape and size, make it symmetrical about the input axis, in order to increase the usefulness of the mesh surface for faster separation of cotton adhering to the mesh. surface. The article investigates the effect of the separator on the cotton surface on the mesh surface of the double mesh surface, and as a result of the theoretical study, the trajectory of the cotton flap is determined.

Keywords: *separator, mesh surface, vacuum valve, separation chamber, raw cotton, air, inlet pipe; working chamber.*

ВНЕДРЕНИЕ ИННОВАЦИОННЫХ ТЕХНОЛОГИЙ ДЛЯ ПОВЫШЕНИЯ ЭФФЕКТИВНОСТИ ПРОИЗВОДСТВА В ХЛОПКО-ТЕКСТИЛЬНЫХ КЛАСТЕРАХ

Абстрактный*. В данной статье проводится анализ предлагаемого нового усовершенствованного типа сепараторного оборудования, применяемого на предприятиях первичной переработки хлопка, и исследуются принципы работы. Основной целью является улучшение качества продукции, имеющей большое народнохозяйственное значение, повышение эффективности отделения хлопка-сырца от воздушного потока и повышение эффективности производства за счет устранения существующих недостатков сепараторов, используемых на хлопкоочистительном заводе.*

Сетчатая поверхность, расположенная со стороны рабочей камеры сепаратора, способствует отделению хлопка от воздуха. В статье авторы предложили поставить двойную сетчатую поверхность, изменить ее форму и размер, сделать симметричной относительно входной оси, чтобы повысить полезность сетчатой поверхности для более быстрого отделения налипшего на сетку хлопка. поверхность. В статье исследуется влияние сепаратора на хлопковую поверхность на сетчатую поверхность двойной сетчатой поверхности, и в результате теоретического исследования определяется траектория движения хлопкового лоскута.

Ключевые слова*: сепаратор, сетчатая поверхность, вакуумный клапан, камера сепарации, хлопок-сырец, воздух, входной патрубок; рабочая камера.*

INTRODUCTION

In the world market, cotton fiber is one of the main products of the textile industry. The import potential of cotton fiber in the countries of the world is increasing year by year. The Republic of Uzbekistan is the world leader in cotton production and export. Therefore, cotton fiber and its processing occupy an important place in the country's economy.

MATERIALS AND METHODS

The production of high-quality fiber that meets world standards has given the experts and scientists of the field of cotton processing an important task of improving the existing techniques and technology. Increasing demands for the quality of cotton fiber requires paying special attention to the re-equipment of cotton ginning enterprises with new techniques and technologies, which is one of the most urgent problems for the textile industry, which is designed to increase the competitiveness of cotton fiber in the world market, to produce modern and technologically reliable and high-quality products.

The applied technical and technological measures must ensure timely preliminary processing and continuous, high-quality delivery of the obtained product to consumers, while not allowing the raw cotton material to be destroyed, keeping its natural properties at a high level.

In cotton gins, cotton is transported by air from the gin to the production workshop. In this process, the loss of air pressure occurs more in separators. Therefore, it is important to study the principle of operation of the separator to eliminate the shortcomings.

In the separator, the process of separating the cotton from the air is not sufficiently improved, causing defects in the fiber and damaging the seed. The shortcomings observed in the separator device in the existing pneumotransport system are the effect of the working elements of the separator on the natural properties of cotton, the formation of defects in the fiber during the separation of cotton pieces that have hit the mesh surface with the help of a strainer, damage to the seed, cotton wrapping around the shaft on which the strainers are fixed, the cotton particles one revolution from the vacuum-valve housing it is considered that it cannot fall down during the period and that defects appear as a result of the compression of the cotton between the vacuum-valve blades and the walls. Due to cotton jamming in the separator working chamber and vacuum valve, the device conveyor stops, as a result, the volume of the product produced per unit of time decreases. In the process of separation, a part of the cotton hits the mesh surface and the fiber and the seed are damaged. As a result, the price of fiber and seed will decrease. At the same time, another drawback of the existing designs of separators is the high energy consumption.

The disadvantage of the currently used separators (SS-15A longitudinal separator and SX separator) is the increase of seed and fiber damage as a result of the cotton entering the working chamber, hitting the back and side walls of the working chamber, as well as the deterioration of their quality.

Also, the placement of the mesh surface in front of the inlet tube increases the probability of the cotton hitting this surface. The main reason for this is that most of the air is drawn through the mesh side of the inlet pipe. As a result, breakage of seed and deterioration of fiber quality increases. In addition, due to the increased contact of the cotton with the mesh surface, the possibility of the fibers coming out with air and small impurities increases. In the SS-15A separator, 25% of the total cotton has been proven to hit the mesh surface.

Based on the above, it has been shown that the problem of studying and improving the work of the separator, in particular, in the pneumotransport system, is currently relevant. Based

on the study of ways to reduce fiber and seed damage in the process of separation, equipping cotton ginning enterprises with improved separators of a new design that is energy-saving, ensures the preservation of natural parameters of seed and fibers, and thus is economically effective, is the main task of the authors' research work. Based on the physical and mechanical properties of cotton, the process of separating cotton from dusty air has been researched in theoretical and practical ways.

The newly proposed improved cotton separator reduces damage to cotton, separates it from air better, and increases the possibility of cleaning from small impurities. Improving the quality of the product, which has great technological and economic significance, and improving the efficiency of the air transport process are considered to be one of the most important issues.

Modern technologies are distinguished from previous technologies by the degree of modernization. That is why it is necessary to constantly modernize the technologies in the enterprise. The authors were able to increase the useful surface of the mesh surface of the separator by creating new structures (Fig. 1).

RESULTS

Based on the above analysis, the authors developed a new effective separator design. The task of this separator is to work while keeping the natural properties of the cotton without damaging the seed and fiber during the process of air separation.

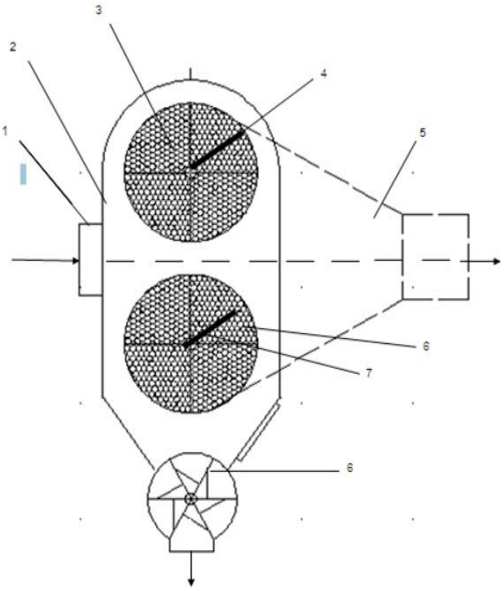

Figure 1. Improved cotton separator (IAP20180570)

1-inlet pipe; 2nd working chamber; 3-upper mesh surface; 4- upper mesh surface cleaner; 5- air outlet pipe; 6-lower mesh surface; 7- lower mesh surface cleaner; 8- vacuum valve

As a result of the suction of the air in the air pipe by the operation of the fan, the cotton material moves with the air flow and enters the working chamber (2) through the inlet pipe (1) to the separator, and the cotton falls to the vacuum valve (8) under the influence of its inertia. A part of the cotton sticks to a pair of circular mesh surfaces (3, 6) on one vertical plane at both ends of the working chamber. Adherent cotton on the mesh surface is separated with the help of clamps 4, 7 and is lowered into the vacuum valve 8. The doubling of the useful surface of the circular mesh surface ensures that the extraction of small impurities in the cotton is twice as

much. Also, due to the increase in the useful surface of the mesh surface, the amount of suction force decreases. This, in turn, reduces the amount of fiber added to dirty mixtures.

Variation of air velocities and air consumption at the inlet and outlet mesh surfaces in the separator working chamber

It is known that the movement of the air stream VDD1V1 is symmetrical with respect to the OX-axis and exits the grid surface in the form of a triangle OVD. An artificial vacuum is created according to ODD1-triangular cross-section, and the cotton separated from the air hits the back wall of the working chamber due to the force of inertia and goes to the next process. According to the ratio of the surfaces of the triangles, 50% of the cotton raw material entering the working chamber is directly directed to the back of the working chamber. The remaining 50% moves with the air mixture towards the mesh surface. It adheres to the mesh surface, is separated using a scraper, and goes to the next process. Let's consider the change of air flow speed and consumption on the OVD-triangular surface.

Calculation of air velocity and flow rate in the direction of the OX axis (horizontal).

x- in the x section $\upsilon_x -$ the surface on which the velocity is placed $S_x -$ we count:

$$S_x = 1м \cdot \frac{D-x}{D} \cdot h_0 = \frac{(1-x)\cdot 1{,}7}{2} = 0{,}85(1-x)$$

Here: $0 \le x \le D = 1$

$$\begin{cases} \upsilon_x = \dfrac{S_x}{S_x^0} = \dfrac{0{,}85(1-x)}{1{,}7}\upsilon_{AB} \\ Q_x = S_x \cdot \upsilon_x \end{cases} \qquad (2.17)$$

$\upsilon_{AB} = 1{,}78\, м/с$

$\upsilon_{AB}^y = \upsilon_{AB} \cdot \cos\varphi$

$0 \le \varphi \le \varphi_0$

$x = 0 : да \qquad \begin{cases} \upsilon_x \approx 0{,}89\, м/с \\ Q_x \approx 0{,}75\, м^3/с \end{cases}$

$x = d = 1м \;\; да: \qquad \begin{cases} \upsilon_x = 0 \\ Q_x = 0 \end{cases}$

Speed and air consumption will be 0.

OY-ўк (υ_y perpendicular to) change in air consumption:

υ_y - perpendicular section of velocity;

S_y - we calculate:

$$S_y = H \cdot \frac{y}{h_0} м^2 = \frac{y}{h_0} м^2$$

speed:

$$\upsilon_y = \frac{S_y}{S_{у.ф.ю.}} \upsilon_{AB} \cdot \sin\varphi$$

Here: $S_{y.ф.ю.}$- useful part of the mesh surface; $S_{y.ф.ю.} = 0{,}043\ м^2$; $h_0 = 0{,}85\ м$; $\sin\varphi_0 = 0{,}79$; $\upsilon_{AB} = 1{,}78\ м/с$.

$$0 \le y \le h_0 = 0{,}85\ м$$

In this case:

The speed will have this expression.

$$\upsilon_y = \frac{y}{0{,}85 \cdot 0{,}43} 1{,}78 \cdot 0{,}79\ м/с$$

$$y = 0 : да \quad \begin{cases} \upsilon_y = 0; \\ Q_y = 0; \end{cases}$$

gives the value of the velocity at the center point - 0.

$y = h_0 = 0{,}85\ м$ - velocity on mesh surface

$$\upsilon_y = \frac{0{,}79 \cdot 1{,}78}{0{,}043} \approx 32 м/с$$

This speed corresponds to the speed at the time of the experiment conducted at the Kosonsoy cotton ginning enterprise.

$$\upsilon_y^{таж} = 31\ м/с$$

$$\upsilon_y^{наз} = 32\ м/с$$

Air consumption:

$$Q_y = S_y \cdot \upsilon_y = 0{,}043 \cdot 31\ м/с = 1{,}43\ м^3/с$$

If we take into account that the grid surface is equally spaced on both sides of the separator.

$$Q_{чикиб}^{наз} = 2Q_y = 2 \cdot 1{,}4 = 2{,}8\ м^3/с$$

So, we can see the equality of air consumption entering the separator working chamber and leaving the mesh surfaces.

$$Q^{таж} = 2{,}4\ м^3/с$$

$$Q_y^{наз} = 2{,}8\ м^3/с$$

$\Delta Q = 0{,}46\ м^3/с$ - we can see that the difference in air consumption increases partly due to the additional air intake from the vacuum valve and the openings left open. Additional vertically mounted double mesh surfaces in the new improved separator device direct the moving cotton particles to the DD_1 section along the cross section OBD - triangular surface.

The novelty of the proposed improved construction is that the useful mesh surface is paired, and symmetrical about the input axis, its shape and dimensions have been changed. These double mesh surfaces allow the air-exposed cotton material to easily separate from the mesh surface and reduce the cotton material clogging. Cotton particles entering the separator working chamber change their direction from the OY-axis direction to the OX-axis direction with the help of double mesh surfaces and move towards the vacuum valve. The amount of raw cotton reaching the mesh surface is reduced and air absorption is improved. Also, in the working

chamber, it is easier to remove cotton pieces from the mesh surface with the help of squeegees, and the work efficiency of the separator increases.

DISCUSSION

In order to increase the usefulness of the mesh surface in the separating chamber of the improved cotton separator device, a double mesh surface has been added, the shape and dimensions have been changed. That is, its useful mesh surface is paired and it is arranged symmetrically with respect to the input axis, and the diameter of the holes of the lower mesh surface is two times smaller than the diameter of the holes of the upper mesh surface. The rest of the mesh surfaces are located on both sides of the working chamber in the form of circular mesh surfaces, which serve to quickly and easily separate air from the cotton. This arrangement of the mesh surface provides an entirely new way of separating cotton from the air. Another advantage of this proposed separator is that it does not require additional energy to operate

Based on the analysis of scientific research works, a working scheme of a new cotton separator was prepared. The advantage of this device is that the mesh surface in the separator working chamber is modified by placing the mesh surface upwards, so the air direction is changed and the chance of the cotton meeting these mesh surfaces is reduced.

CONCLUSION

In conclusion, it can be said that the research conducted on the improvement of the construction of the pneumoseparator and the new constructions created provide opportunities to increase the efficiency of the process of separating cotton from the air flow.

As a result, it ensures the separation of cotton from the air flow without damaging the cotton fibers and seeds, without affecting the quality indicators of the cotton. It also helps to clean small impurities. Clogging in the working chamber of the cotton separator, loss of free fibers is prevented. Cotton raw material and seed damage is reduced, and fine impurities in the cotton are extracted. The efficiency and utility of the separator will be doubled and the energy efficiency will increase

As a result of the theoretical study of the movement of cotton in the working chamber of the separator, it was possible to determine the movement trajectory of the cotton piece.

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