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«CREATION OF TECHNOLOGY AND EQUIPMENT FOR IMPROVED CLEANING OF COTTON FROM SMALL IMPURITIES»

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cotton - Namangan-77, grade 1, moisture in cotton - 8.2%, dirt before cleaning - 2.4%, dirt after the dryer drum - 1.95%, in the proposed device after cleaning - 1.71%, the cleaning efficiency of the device increased from 15% to 20%.

Conclusion. When using the proposed device for production: the natural state of cotton is preserved, the length of the fiber and the seed coat are not damaged. In such a device, the cleaning efficiency can increase by 15-20%, and the number of neps in the fiber obtained from refined cotton can decrease by 40-60%.

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THE PROCESS OF TECHNICAL GRADES OF MEDIUM STAPLE COTTON AT GIN FACTORIES AND ITS ANALYSIS

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Abstract:

Objective. In this article, the process of processing industrial grades of medium staple cotton in gin factories and its analysis is considered. Also given is the result requirement according to the standard.

Methods. An analysis was made of the quality of medium-fiber cotton raw materials and its indicators, as well as the degree of damage.

Results. After ginning, the control of the pubescence of raw cotton seeds is carried out according to industry standards. Industry standards are reviewed and updated every five years.

Conclusion. One of the causes of seed damage is that the density of the raw material changes as it increases due to the pressure of the seed comb. It has been studied that some of the saw teeth are broken or the pegs of the seed comb are damaged, causing fibrous seed to come out of the seed. One of its main disadvantages is the mixing of seeds with fibers and seeds, which is manifested by an increase in the distance between the rods.

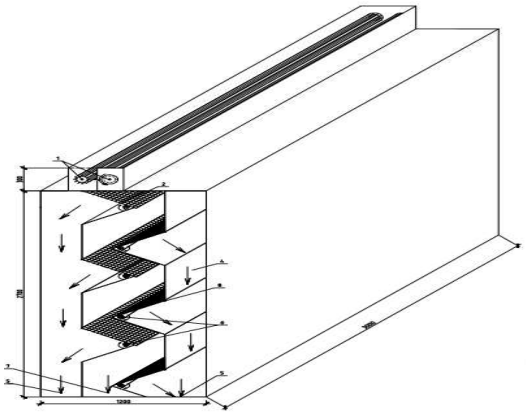
Keywords: cotton, gin, fiber, process, saw gin, type, class, impurity, effect.

Introduction. That is no coincidence that the cotton industry is at the forefront of global agriculture, requiring sustainable quality performance and broad support for initiatives. These two key metrics - quality and sustainability - often go hand in hand when designing supply chain processes. These indicators, which are the requirements of the current developing period, require the introduction of new and high-quality technologies and the improvement of existing ones. Reforming and researching the design of the cotton gin, which is considered the main link in the cotton ginning process, plays a very important role in improving the quality of cotton fiber.

The competitiveness of cotton fiber in the world market is mainly determined by the length of the fiber, its appearance and the amount of dirty waste in it. For this reason, in the technological process of primary processing of cotton, serious attention is paid to improving the quality of

The improved device, based on a new efficient technology for extracting small impurities from the contents of cotton, provides for the maximum use of the mesh surface to get rid of small impurities in the separation process, for this, a lump of cotton moving from the mesh surface to the next mesh surface 2 first falls on the protective surface (4). As a result of the feedback, the cotton gradually changes its direction.

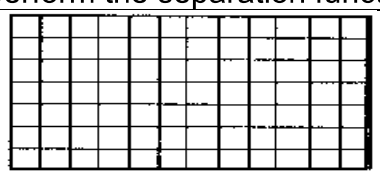
Similarly, when a wad of cotton hits a vertical protective surface, such as a wall, the cotton will rotate as it moves and, as a result of the impact, will begin to move from the wall to the surface of the 2-mesh surface. In the next flow, the cotton ball passes through 3-4-5-6 mesh surfaces of the device, collects the cleaned cotton into the falling chamber (7) and is transferred to the required places. During the separation process, the impurities contained in the raw cotton are removed from the apparatus through a special chamber (5) (Fig. 2).



1. Movement provider
2. Mesh surface (vibrating screens)
3. Protective-guiding surface
4. Protective surface
5. Impurity chamber
6. Cams (ellipsoids)
7. Moving grid surface
8. Chamber for cleaned raw cotton

Fig. 2. Spatial view of the improved cotton gin

To improve the quality of cleaning, the device provides the ability to adjust the distance between the feeder shafts (80-100 mm) and replace the mesh surfaces that perform the separation function.



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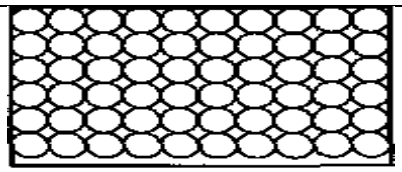

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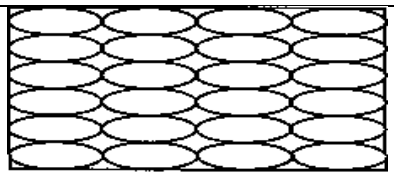

с)

Here: a) woven from steel wire; b), c) made of tin with different holes

Fig. 3. Scheme of types of vibroelasts (mesh surfaces).

Discussion. The advantage of the prepared device is that the cotton moves and cleaning is carried out by vibration of the mesh surface without mechanical impact on the fibers and seeds of the raw cotton. Due to the introduction of new technologies for the primary processing of raw cotton (cleaning with a vibration filter or separator), the natural state of cotton is preserved. In the course of practical experiments on such a device, the following results were obtained: Type of

seed defects damaged by such blows was 1.2% (with the amount of contamination before cleaning 2.5%). Damaged seeds and raw cotton, in turn, affect the yield of cotton on the farm (the yield is less by 3-5 t/ha) and its varieties, which leads to the cultivation of poor-quality cotton raw materials in the future, and ultimately to a decrease in income.

Our goal is to eliminate the above disadvantages, purify cotton from small impurities based on new innovative technology and ultimately obtain cotton fiber that meets the requirements without compromising the natural properties of cotton, reduce the amount of non-powder fibers into fibers, damage to the seed husk during cleaning. It is planned to prevent importation, provide a quality seed product in accordance with the demand for seeds obtained from cotton raw materials in the future, and carry out other positive activities.

Recent developments in this area require the use of digital technologies in all aspects. It is known that when solving industry problems, optimal solutions can only be obtained by an exact mathematical expression of the process and the creation of software tools based on this model. Mathematical modeling is a method of formalization and description of quantitative and qualitative aspects of objects, processes, events using mathematical models. The technological process (Fμ) of cleaning cotton from small impurities on the surface of a mesh surface (vibrating sieve) or a separator, as an existing object of study, is generally expressed by the following functional relationships (1). Let us express the technological process (Fμ), which took place on the mesh surface as an existing object of study, through the following functional relationships.

$$F\mu = f(\Omega_T, \Omega_I, \Omega_X) = f[(\Omega_{T1}, \Omega_{T2}, \Omega_{T3}, \ldots, \Omega_{Tn}), (\Omega_{I1}, \Omega_{I2}, \Omega_{I3}, \ldots, \Omega_{In}), (\Omega_{X1}, \Omega_{X2}, \Omega_{X3}, \ldots, \Omega_{Xn})] \quad (1)$$

Here: Ω_T - external factors (technological indicators that need to be found for a cotton gin in the horizontal and vertical directions, including the amplitude and frequency of the vibrational movement of the mesh surface, the angle of inclination, vibration and other influences that provide surface surface pulsation); Ω_I - internal factors (this factor includes parameters that indicate the internal factors of the object's properties, i.e. the physical and mechanical properties of the cotton jet, the size of the cotton jet, the parameters of the mesh surface, etc.), Ω_X - Unaccounted for factors are taken into account (combination of lumps associated with the flow of raw cotton, forming a flow of cotton as a result of the pulsating and vibrational movement of the mesh surface, and other factors). Then we can express the movement of the cotton ball on the mesh surface as the following function:

$$F\mu = \Omega_T(\alpha, \mu, \omega, A), \quad (2)$$

that is, in this case, the movement is only a (the angle formed by the mesh surface with the horizontal plane), μ (mesh surface friction coefficient), ω (mesh surface vibration frequency) depending on the parameter A (mesh surface vibration amplitude).

Results. We create algorithms and software based on the mathematical model developed above and conduct experiments using the MatLab software package using the Runge-Kutta method. Based on the obtained results, the coefficient of friction of the mesh surface is μ=1, and the angle of inclination α=26-29 degrees, the number of vibrations ω=8 Hz mesh surface. By providing such an action, the cleaning of cotton from small impurities can be effective. Therefore, such a solution is the basis for the manufacture of an acceptable version of the experimental specimen of the device we need, which cleans cotton from small impurities.

Uzbekistan's industry by more than 3 times.

As mentioned above, the production of raw cotton is at a high level, but its processing does not meet the international level. According to international experts: "The attractiveness and competitiveness of the Uzbek cotton fiber is low", the reason for this is insufficient cleaning of the cotton fiber, the presence of non-fibrous impurities and because of them the quality of the fiber does not meet the required level.

Methods. As a result of the analysis, it turned out that cotton gins of the regions and their regions of Uzbekistan, including the cotton gin of the Torakorgan district of Namangan region, mainly use cotton gins of the UHK or 1KhK type. used (Fig. 1). Even large state-owned cotton processing enterprises (American companies Platt-Lummus, Hardwick-Etter, Murray and Continental-Moss-Gordin) use drum-type drum cleaners of the original design in the cotton cleaning process.[1].

In the course of further observations, it turned out that, on the one hand, although cleaning devices based on a drum with pins have a good cleaning effect, on the other hand, due to the mechanical effect of the drum pins on cotton fiber and seeds, it was found that this significantly affects its natural properties, that is, the cleaned cotton ball is broken into smaller pieces (1 cotton ball contains 7-12 seeds), i.e. 1 lump is divided into 7-12 parts. In addition, the damage rate of cleaned cottonseed is 0.4 percent. This in turn causes about 0.2% fiber defects. These 0.2% defects in some cases lead to a drop in fiber quality from high to good or from good to medium, which leads to a decrease in the price of sold fiber by 30-40 thousand soums per ton. This can provide significant (750-800 million soums) economic losses for an enterprise producing 20-25 thousand tons of cotton fiber per year [2].

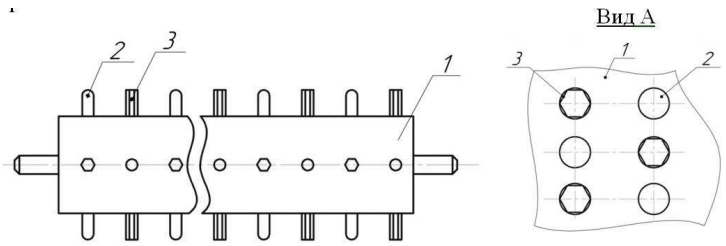

Fig. 1. Peg drum used in a cotton gin. Here: 1- drum; 2- faceless hammers; 3-6-sided hammers. It leads to an increase in the cleaning efficiency of devices based on peg drums - up to 20%

According to the data obtained by experts as a result of analytical experiments at the cotton ginning plant of the Mingbulok district of the region, the proportion of defects and impurities in the composition of cotton fiber (Namangan-77, 1 - grade and good) is: impurities - 0.5%, fibers with seed husks - 0 .8%, broken seeds - 0.5%, with immature seed fiber - 0.5%, a fragment of immature fiber - 0.1%, tangled fibers - 0.1%, only 2.5%. In addition, the percentage of rejects and impurities (type 1) as a percentage by class: high - 2.0%; good-2.5%; average-3.0%; simple-4.0; impurities amounted to 5.5%. From the above data, it can be seen that the percentage of defects and impurities in the fiber increased with the change in classes.

On the basis of the above data, it can be said that peg drum cleaners not only cause damage to seeds and economic damage, but also negatively affect the further stage of development of seeds extracted from seeds under the influence of mechanical shocks. The percentage of

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Abstract:

Objective. Cotton gins are used for ginning in regional cotton gins and clean districts of Uzbekistan using ginning devices of UK or 1XK type and pile-drums of their original design. Damage to the natural properties of cotton in the cleaning wound (the seed is destroyed and the length of the fiber is reduced) in the general protocol, it is possible to ensure a loss of 750-800 million soums per year to the cotton ginning plant. To eliminate this damage, we presented a new improved device (pic. 2).

Methods. In order to develop the optimal version of the improved cotton cleaning device, the factors that affect it during the cleaning process: a (angle formed by the mesh surface with the horizontal plane), μ (friction coefficient of the mesh surface), ω (vibration frequency of the mesh surface), A (vibration amplitude of the mesh surface) based on such parameters, a mathematical model was created (expression 1-2). Based on these expressions, a program was created using MatLAB files.

Results. A theoretical experiment was conducted using the Runga-Kutta method. Based on the obtained results, it was graphically observed that the movement of the piece of cotton on the surface of the mesh surface is uniform in cases where the friction coefficient of the mesh surface is μ=1, the angle of inclination is 26-29 degrees, the number of vibrations is ω=8 Hz, and the amplitude of vibrations is A=20 mm.

Conclusion. On the basis of the parameters obtained above, it will be possible to make an acceptable version of the experimental copy of the device for cleaning cotton from small impurities (2 - picture). Information about the difference and effectiveness of this device from previous devices is presented in the article.

Keywords: raw cotton, mathematical model, separator, vibrating sieve, impurity, seeds, defect, cotton gin.

Introduction. Cotton is the economic backbone of our country. The fact that Uzbekistan ranks sixth in the world in cotton cultivation, private initiatives in the industry create ample opportunities to deepen international standards and reforms, bring cotton industry products to international markets, further develop international cooperation in the industry, as well as widely attract investments from large international branded enterprises in the textile industry.

It is known that in connection with the announcement by the international committee of the Cotton Campaign of the end of the boycott of Uzbek cotton in recent years, interest in our cotton and the products of our textile industry has been growing in other consumer countries. The global cotton market is expected to reach US$46.5 billion by 2027, with a CAGR of 2.74% between 2020 and 2027.

According to experts, an increase in the consumption of cotton fiber in Uzbekistan is expected in the near future. Today, our country has developed a program for the development of textile and light industry in Uzbekistan. It is planned to increase up to 80% of the total production for the processing of cotton fiber and increase the export potential of

CONTENTS

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