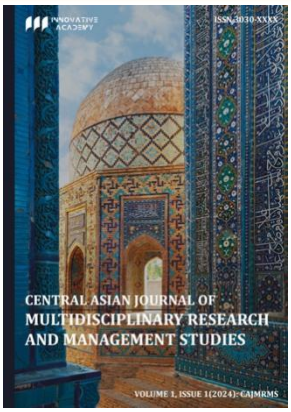

PROBLEMS IN THE ENGINEERING PROCESS AND THEIR SOLUTIONS.

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ABSTRACT

This article analyzes the process of smelting, the role and functions of the technological component of the process, and the design of the device used to accomplish the primary task. The contribution and stakes of the participants in achieving this goal are examined. This article examines the innovations scientists have made in the study of baking technology and design, which have contributed to the development of this field. Innovations introduced into the process technology and design improvements, as well as their significance, are explored. An attempt was made to identify simple and inexpensive ways to improve the technology and design of gin equipment. At the end of the study, instead of conclusions, recommendations were made for future improvements based on the findings.

Introduction

Today, production and its development are closely linked to production costs, product quality, and service life.

Production costs are inextricably linked to the simplicity, low cost, durability, energy efficiency, ease of repair, and reliability of machinery and equipment.

Product quality: the impact of equipment on the product, the quality of raw materials, the qualifications of the workforce, and production conditions.

Product life: the product's service life depends primarily on the quality and type of raw materials and the qualifications of the workforce.

The three indicators mentioned above are indicators that lead to increased purchases of manufactured products. Naturally, these indicators are also directly related to the product's application. The main application of cotton gins is cotton processing, that is, separating the cotton fiber from the seeds. Cotton is a plant adapted to equatorial climates and belongs to the shrub family. Cotton was later domesticated and grown by American farmers in South America and the United States.Cotton growing is a highly profitable industry, so it was also grown in Central Asia, Egypt, China, and India. Cotton is used as a raw material for a variety of products, and its primary use is in the textile industry, where various fabrics and materials

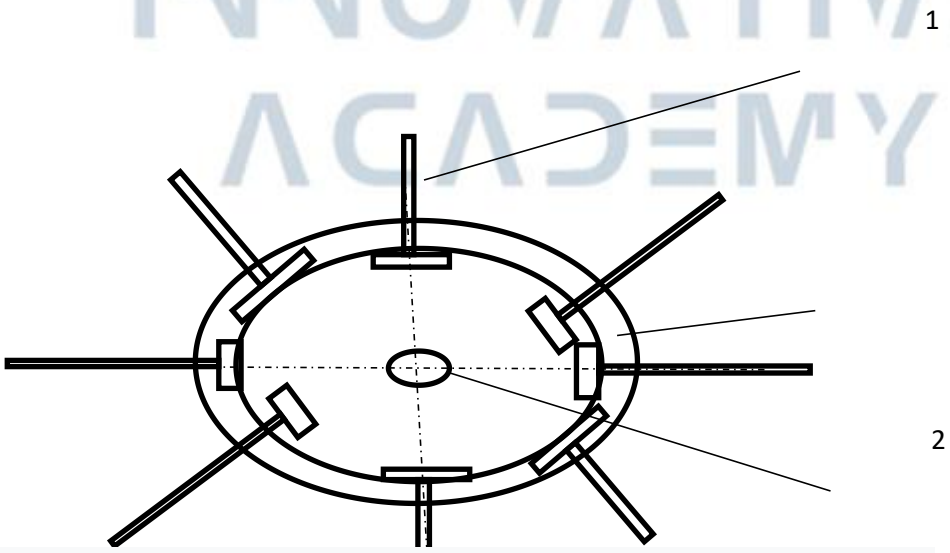
are produced. Cottonseed is considered a good animal feed and is of great importance. The shortening of the maturation period of domesticated cotton and its transformation from a perennial to an annual plant—that is, its genetic transformation—led to its transition to water-intensive crops. This, in turn, led to a decline in cotton yields and quality. As the cotton industry in the United States developed and achieved significant success, the need for cotton processing arose.

When cotton was exported, separating the seeds from the fiber became extremely important. America was the first to develop cotton storage and processing technology. Previously, cotton fiber was separated from the seeds by hand.

Analysis of cotton processing equipment.

The first cotton gin was a simple device consisting of nails driven into a board. Figure 1 shows a drum with a wooden base and a drum with nails driven into it. This design is one of the first drum designs and is considered simple, inexpensive, and compact. However, this design has several drawbacks in separating cotton fiber from seeds: the efficiency of separating the fiber from the seeds is very low, and the quality of the separated fiber from the seeds is also considered low. However, it is considered much more efficient than manual labor. As global demand for cotton and its fiber has grown, the scale of its cultivation has expanded, leading to the development of the cotton processing industry and the mechanization of production due to the high cost of manual labor.

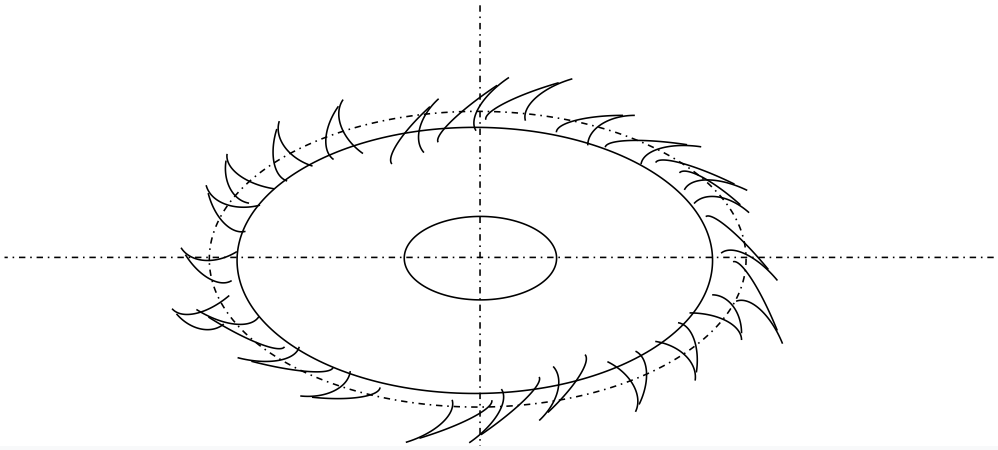
Figure 1 shows a drum with a nailed board; this design was later improved and replaced with saw drums. Scientists and engineers conducted extensive research to improve its performance and efficiency. To improve the efficiency of cotton gins, saw blades began to be used instead of nails. Figure 2. Saw blades are made of metal and mounted on a shaft. Spacers are placed between the saw blades. Saws pull the cotton fiber through bars called grizzles, separating it from the seeds. The separated seeds are separated from the fiber on one side of the bar, and the fiber on the other, and separated into individual pieces.



1-Fig. Drum. 1-nail. 2-drum. 3-shaft.

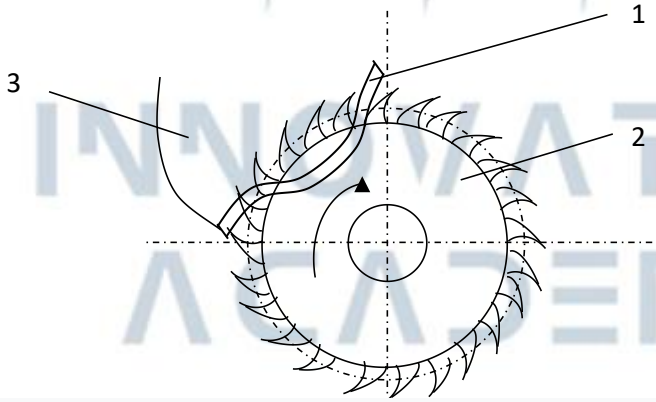
As the key components of cotton gins improved, the efficiency and productivity of the ginning process increased. However, other problems began to arise. The problem was that the cotton fiber could not be completely separated from the seeds in a single pass of the drum. Therefore,

it became necessary to improve the working chamber of the ginning machine to ensure complete separation of the fiber from the seeds.



2-fig. Saw blade

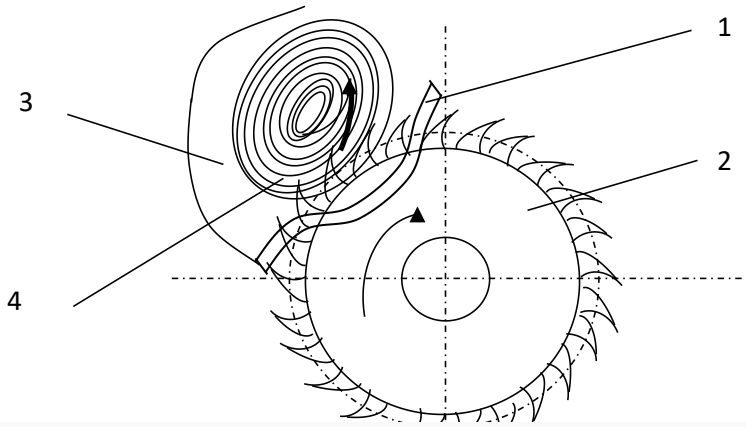
Figure 2 shows a saw blade with teeth cut along the edge and a groove in the middle for attaching the blade to the shaft. The problem is that the saw's working area is very small, so the grid, figure 2 shows a saw blade with teeth cut along the edge and a groove in the middle for attaching the blade to the shaft. The problem is that the saw's working area is very small, so the grid, the grid, or mesh, is mounted on one side of the saw blade, so that only the portion of the blade facing the grid is processed. This can be seen in Figure 3, where the saw is connected to the mesh.



3-fig. Working area. 1-grate, 2-saw blade, 3-working chamber.

As Figure 3 shows, only one side of the saw blade is within the working area, while the main part is not. This is due to the different shapes of the saw blade and the grate. The saw pulls the fibers out of the wood, and the saw blade's round shape allows this process to be repeated continuously. The grate is fixed to hold the seeds and is attached to one side of the saw. To ensure complete separation of the cotton fiber from the seeds, a barrier is installed in the wall of the working chamber, as a result, the cotton seeds are held in the working chamber until they are completely separated from the fiber, and then rotate in the working chamber until they are completely separated from the fiber, forming a roll of raw material. The saw itself rotates the roll of raw material and repeatedly approaches the gin saw. As the saw rotates, the cotton moves, and the wall of the processing chamber, blocking the movement of the cotton,

pushes it away. As a result, the cotton rotates within the processing chamber, forming a raw roll. This is shown in Figure 4.



4-fig. Working area. 1-grate, 2-saw blade, 3-working chamber, 4-raw roller.

Figure 4 shows that as the saw rotates, the incompletely separated seed from the fiber forms a roller of raw material, which rotates in the opposite direction to the rotation of the saw drum. The roller of raw material continues to form until the grain is completely separated from the fiber, and the completely separated seed is discarded. To date, leading scientists in Uzbekistan in the field of cotton processing have conducted numerous scientific studies aimed at improving the working chamber, increasing the service life of saw teeth, and increasing the efficiency and productivity of the ginning process, and have achieved excellent results. Among them, H. Akhmadkhodjaev, R. Muradov, O. Sarimsakov, J. Ergashev, A. Juraev, and other scientists conducted numerous studies and achieved great success.

Modern problems of livestock farming:

The problem of complete separation of fiber from seeds was solved by forming a raw roller, but subsequently, as a result of the formation of the raw roller, the following problems began to arise:

1. Rapid wear of saw teeth due to increased load on the saw from the raw material roller;

2. Additional and unexpected process stoppages due to jamming of the raw material roller in the workpiece chamber;

3. The raw material roller used for harvesting hinders the productivity of the process;

4. Due to the formation of raw material lumps, the seeds located at the base are crushed, leading to fiber and seed defects;

5. Increased efficiency and productivity due to the high moisture content of low-grade cotton;

Let's consider the causes of the above problems:

1. Saw teeth wear out quickly due to the increased load on the saw from the raw material roller;

During the operation of the cotton gin, a raw material roller forms in the working chamber, leading to a large accumulation of cotton in the chamber. The weight of the cotton acts on the saw drum, which exerts pressure on the saw teeth. The increased friction is, of course, due to

the increased weight. Furthermore, since the center of gravity of the raw material shaft is variable, the saw drum is subject to inertial forces generated by gravity. As the rotation speed changes, the saw drum is subject to inertial forces that change over time. This inevitably leads to vibrations in the drum shaft. All of this negatively impacts the quality of the process.

2. Additional and unexpected process stops due to the raw material roller getting stuck in the working chamber;

During operation of the device, as we have already mentioned above, the raw material feed roller moves at a certain speed; the speed of the raw material roller must correspond to the rotation speed of the saw drum. If this sequence is violated, that is, when the rotation speed of the saw drum increases, the speed of the raw material feed roller must also increase accordingly, but when the cotton moisture content changes, the rotation speed of the raw material feed roller decreases, and the amount of cotton in the working chamber increases. As a result, the saws do not have time to comb the cotton, and the roller mechanism for feeding the raw material becomes compacted and gets stuck in the working chamber. This phenomenon causes the machine to stop. As a result, workers stop the machine and perform a series of operations to ensure complete grinding of the raw material. Such stoppages lead to a decrease in production efficiency.

3. The feed shaft hinders process productivity;

The feed shaft's rotation must be aligned with the saw drum's rotation, as mentioned above. Для повышения производительности устройства необходимо увеличить скорость вращения промежуточного барабана. Однако в этом случае также необходимо увеличить скорость вращения вала подачи сырья.

However, since the feed roller speed does not increase, productivity cannot be increased in this case. This is especially noticeable with low-grade cotton, as the high moisture content of low-grade cotton leads to a decrease in feed roller speed.

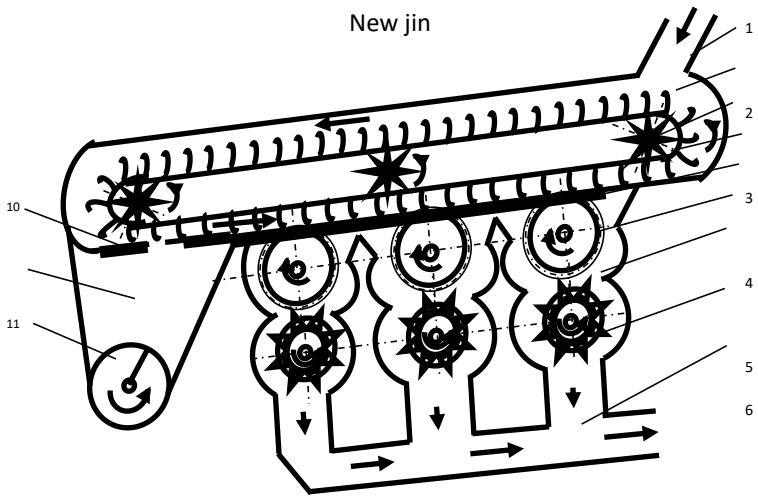
4. As a result of the operation of the raw roller, the seeds located in the lower part of the raw roller are crushed, which leads to defects in fiber and seeds; when the raw roller rotates in the working chamber, it is inevitably affected by the teeth of the saw, and the seeds, the grains located at the bottom of the raw material roller are crushed between the saw and the roller, which leads to the formation of fibers with seed coats and crushed and cracked seed coats, resulting in numerous fiber defects.

5. Low-grade cotton has a high moisture content, which reduces efficiency and productivity;

As mentioned above, the rotation of the roller mechanism must be matched to the rotation speed of the saw drum. If the alignment is disrupted, the roller mechanism jams. Due to the high moisture content of low-grade cotton, the roller mechanism's rotation speed decreases and its weight increases, inevitably leading to a decrease in productivity.

Solution.

It turned out that the above problems arise due to the quality of the raw materials. Raw material quality not only determines the process but also becomes an indispensable issue when improving the device. Therefore, researchers worked on a gin device that operates without regard for raw material quality by modifying the technological process. As a result of this research, the following multi-stage gin device was proposed:



5-fig.

1-inlet; 2-working chamber; 3-pulley; 4-needle belt; 5-grit; 6-saw cylinder; 7-working chamber for saws; 8-brush drum, 9-outlet for fiber, 10-outlet for seeds, 11-seed exit point, 12-auger.

The device shown in Figure 5 operates without forming a cotton roll. For this purpose, the working chamber is equipped with a conveyor for feeding cotton to the saw drum. The conveyor receives the cotton and feeds it to the saws. The saws, in turn, separate the fiber from the seeds and perform the cleaning process. The main innovation is the ability to place multiple saw drums in the work chamber to increase productivity. To avoid increasing the saw drum's rotation speed, its speed can be increased. Of course, the rotation speed of the saw drum here must be several times higher than the conveyor speed. This is because the device must rotate at high speed to completely clean the cotton. This was impossible with existing devices due to the nature of raw material processing. The main problem with the new device is the small working area of the saw drum. This new device will stimulate further research aimed at addressing a number of other issues related to improving saw drum performance.

Conclusion.

Cotton processing plants face many challenges, and equipment design and process engineering aimed at improving its design, ease of use, and maintainability are of great importance in solving them. Moreover, this requires high technological productivity and efficiency. This is currently one of the main objectives of scientists. Over the past 100 years, Uzbekistan has accumulated vast experience and scientific potential in the field of cotton processing. There are great resources and sufficient opportunities here to achieve great success in this area and become a leader in the world. Simplifying the design and operating technologies of cotton cleaning equipment, making changes to their operating technology and design, increasing the productivity and efficiency of the equipment, and ensuring their economic feasibility are among our most important tasks. If the device, the solutions for which are presented in the article, is used in production, the enterprise will be able to achieve greater results. I hope that through a thorough study of devices and technologies across all

enterprise processes and the application of simple, cost-effective, efficient, and productive technologies, the industry's development and production potential will increase in the future.

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