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IMPROVING THE EFFICIENCY OF COTTONSEED HULL SEPARATION USING HIGH-PRESSURE STEAM

Qayumov Abdumalik Abdikhamitovich

Assistant, Department of Technological Machines and Equipment

Tashkent Institute of Chemical Technology

Nigmatjonov Samugjon Karimjononovich

Associate Professor, Tashkent Institute of Chemical Technologies

Sheraliyeva Ozoda Anvarovna,

Associate Professor, Tashkent Institute of Chemical Technologies

Annotation: This article analyzes ways to improve efficiency in the process of processing cotton seeds, in particular, the advantages of the technology of nuclear separation from seed husks through the use of high vapor pressure. Compared to traditional mechanical methods, the method using vapor pressure allows separation without damage to the core, reduces energy consumption, and is considered environmentally friendly. The article also covers the importance of this technology for industry and economy, including the role of Uzbekistan in the modernization of the cotton industry.

Keywords: seeds, cottonseed oil, High Vapor Pressure, Processing Technology, efficiency, core, shell, environmental safety, economic benefit, Cotton of Uzbekistan.

In cotton-growing countries, in particular in Uzbekistan, the process of processing seeds is a very important technological stage. Because the seeds contain cottonseed oil, which is important for food and industry, it is located only in the core. To efficiently process the seed, it will be necessary to separate its core from the outer shell. However, this process is not simple, since the peel of the seed is hard and the core is fragile. During separation using traditional mechanical methods, the core of the seed is often damaged or completely crushed. As a result, the level of oil intake decreases, waste increases, and the overall production efficiency decreases.

Therefore, in recent years, modern technologies based on the use of high-pressure steam have been introduced. In this way, the pollen is exposed to high-temperature steam, which softens its shell, increasing the natural separation between the nucleus and the Shell through internal pressure. Under the influence of heat, microcracks appear in the Shell, and the core is released without damage. Such an approach will not only increase the quality and quantity of products, but also serve energy efficiency. Separation of the pollen using high-pressure steam is also environmentally beneficial, as the process reduces dust and waste and improves production conditions.

With the widespread introduction of such technologies in Uzbekistan, it is possible to increase the value added in the cotton industry, increase the export of oil products and fully meet domestic demand. At the same time, this method plays an important role in the more efficient use

of cotton raw materials and in increasing economic efficiency. The seed is the seed that remains after the cotton is harvested, and it consists of two main parts: the core and the peel. The core is rich in oil and is considered an important raw material for the food industry, while the Shell has a solid structure and is used as an energy source or for other technical purposes. Since the total weight of the pollen is about 60% of cotton, its complete processing is of great economic importance.

As a result of the processing of seeds, several useful products are obtained. First of all, cottonseed oil is extracted from the seed core. This oil is widely used in the food industry, for example in cooking, in the preparation of margarine, in canned goods and in the production of cosmetics. Cottonseed oil is rich in unsaturated fatty acids and is recommended for a healthy diet. Once the oil has been isolated, the rest of the pollen, which is schroti, is taken. This mass is rich in protein and is used as feed in livestock. The Shrot is a high-quality feed for cattle, sheep, chickens and other animals, and has a positive effect on the growth and productivity of animals.

The outer part of the pollen — shell, on the other hand, is used as fuel or used in energy production through biomass, as it contains lignin. The shell is also used in some cases for fertilizer preparation, production of building materials or technical purposes. The complete and high-quality processing of seeds not only supplies raw materials to various industries, but also brings great benefits to the economy. Through this process, the scale of food production expands, an inexpensive and high-quality source of feed for livestock is created, energy is extracted from recycled waste and environmental sustainability is ensured. At the same time, the technologies used in the processing of seeds make it possible to develop local industry, create new jobs and increase export potential. For this reason, the processing of seeds is of strategic importance today for cotton-producing countries, including Uzbekistan.

Although the technology of separating the seeds from the bark using traditional mechanical methods has been used for many years, it has many problems. First of all, in this method, the seed core is often damaged. This condition reduces the efficiency of fat separation, since more and better quality fat can be obtained from the entire and healthy core. And from damaged nuclei, the amount of fat intake is reduced, which reduces the production income.

In addition, mechanical methods require a lot of energy. This high energy consumption not only increases production costs, but also reduces overall profitability. For this reason, this process, which is not technologically modern, is also considered economically inefficient.

Another important problem is that the quality of the separation is low. Often the Shell does not completely separate or intermingle with the core. This condition has a negative effect on subsequent processing stages, for example, the need for additional filtration and cleaning work in the production of oil. This complicates the process, increasing the time and cost again.

Also, the process of processing by traditional mechanical methods is slow in most cases and produces great noise. This leads to the fact that production enterprises do not comply with modern environmental and sanitary labor standards. Working conditions can be unfavorable, negatively affecting the health of workers. It is these problems that drive the industry to introduce innovative, modern and energy-efficient technologies. New technologies based on the use of high vapor pressure are playing an important role in overcoming these shortcomings.

The use of high vapor pressure is increasingly used as a modern and effective approach to the processing of seeds. The method involves pre-processing the pollen with high-temperature steam. As a result, the outer shell of the pollen softens, and the internal pressure increases. Under the influence of this pressure and heat, microcracks form in the structure of the seed. These cracks

weaken the natural bonds between the seed core and the shell, making them much easier to separate from each other.

The heat-treated seed comes to a" steam-cooked " state, and when separated by mechanical methods, the core is practically not damaged. This then serves to increase the quality and volume during the oil extraction process. Also, this technology leads to a simplification of the work process at the separation stage, energy saving and an increase in production productivity. Built on the basis of high vapor pressure, this technological solution was developed based on physical and technical sciences. It allows deep processing of agricultural products. This method is relevant not only for its economic efficiency, but also for its environmental safety, and has several times the advantage compared to traditional technologies.

The technology of processing pollen, which works on the basis of high vapor pressure, has a significant positive effect in the industrial and environmental sectors. First of all, this method reduces product waste. In traditional methods, the seed core is damaged in most cases, causing losses in fat extraction. However, in Steam-treated seeds, the core is separated in a holistic and clean state. This increases the efficiency of the feedstock and makes it possible to get the maximum profit.

From an environmental point of view, this technology is much more convenient. In the process of grinding and separating the pollen in the traditional way, a large amount of dust and solid waste is formed. In steam-assisted systems, however, pollination is minimal, while the volume of waste is drastically reduced. This plays an important role in preventing environmental pollution around the industry. Energy efficiency is also high. Steam energy can be reused through a closed cycle rather than a single cycle. By maintaining heat and using it in other technological stages, energy consumption decreases, which reduces production costs and increases overall profitability.

In addition, the method of processing with high vapor pressure is based on modern technologies, which makes it possible to automate the production process. This reduces human labor, increases production rates, and ensures the stability of product quality. Thus, this innovative approach is seen in the cotton industry as a solution that has not only economic, but also environmental and technological advantages.

As one of the world's leading cotton producers, Uzbekistan produces millions of tons of raw cotton annually. This huge resource has great economic potential not only in the form of fiber, but also in the form of seeds. By processing the seeds with modern, efficient methods, it creates a significant value added to the national economy of the country. The extraction of high-quality cottonseed oil from the core not only strengthens the food industry, but is also an important factor in ensuring food safety. At the same time, the quality and exportability of processed products ensures the production of competitive goods for foreign markets. This will expand Uzbekistan's export potential and increase foreign currency revenues.

The use of technologically advanced solutions accelerates modernization in the agricultural and cotton industries, making it possible to widely implement modern production systems. This not only increases productivity, but also serves the country's long-term development strategy by creating new jobs, providing energy and environmental sustainability.

In conclusion, technological solutions using high vapor pressure are taking the process of processing cotton seeds to a new level. This method is more efficient than traditional methods, increasing the quality and quantity of products, optimizing energy and resource use. For such cotton-growing countries as Uzbekistan, this innovative approach is not only economically beneficial, but also plays an important role in ensuring environmental sustainability. Through

technological modernization, the processing sector can become a competitive and export-oriented system.

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