Resource-Saving Technologies And Technical Means Of Separation Of Grain Waste

Djakhangirova G.Z., Associate Professor of Technical Sciences,

PhD, Tashkent Chemical-Technological Institute;

Eshkobilova M.Sh., Karshi Engineering-Economics Institute

Abstract

Keywords:

Article Received: 18 October 2020, Revised: 3 November 2020, Accepted: 24 December 2020

In recent years, certain work has been carried out in the direction of reforming the country's agriculture, in particular, to improve the system of public administration, to widely introduce market relations, to strengthen the legal framework for relations between entities that produce, process and sell agricultural products, to attract investments into the industry, to introduce resource-saving technologies, as well as providing agricultural producers with modern technology. [1]

From 2012 to 2018, per capita production of fruits and vegetables increased from 417 kg to 609 kg, meat and dairy products - from 242 kg to 354.4 kg. As a result, due to production growth, the supply of domestic raw materials increased 1.5 times for wheat, 2 times for fruits and vegetables, and 1.5 times for meat and milk. [2] One of the solutions for the further development of the food industry, achievement of priorities for the development of the domestic consumer market, in particular saturation with high-quality and safe food products, as well as export growth, is the implementation of technical re-equipment and modernization of food industry enterprises using energy-efficient and resource-saving equipment.

Agricultural production in Uzbekistan is one of the strategic sectors of the economy, designed to ensure a sustainable supply of the population with the necessary quantity and quality of food. Cereals are one of the main agricultural products. Important food products are produced from grain: flour, cereals, bread and pasta. Increasing grain production is the main task of agriculture.

Analysis of production technologies, purification of grain materials allows us to conclude that one of the important ways to increase grain harvest is to reduce its losses during reception, storage, separation of high-grade grain and grain impurities from grain waste received at enterprises for receiving, storing and processing grain (ERSPG) .

During the period of massive grain supply, grain-receiving enterprises face the task of placing, storing and sorting waste. Usually they are placed in open areas, where they are stored until additional work and sale. During this time, the waste begins to self-heat and loses its quality. Wastes obtained from the processing of various crops with different moisture content and content of useful grain are often placed together, which leads to partial or complete loss of nutrients contained in them. If we take into account that in terms of nutrient content, waste is close to such grain fodder as barley, oats, corn, then their safety is of great practical interest.

Wastes from wheat cleaning were taken as the object of research.

The amount of waste at flour mills varies annually within a fairly wide range and depends on many reasons: on the conditions of grain growth, the level of agricultural technology and measures to reduce the contamination of fields, on the method of harvesting and weather conditions during it.

However, the data on the quantitative and qualitative indicators for the harvesting and cleaning of wheat showed that the amount of suitable waste in the amount of grain mixtures is 6-8%, and the amount of unusable (humus waste and dead litter) - 4-6% of the gross harvest.

The content of useful grain in waste at the enterprises of the agro-industrial complex and at the grain-receiving enterprises remains high and in some years their number can be significant, therefore, the grain-receiving enterprises must have everything necessary for their complete safety and effective use.

When harvesting grain for the enterprise, not only the amount of waste has changed, but also the species and quantitative composition of their components. As a result of preliminary cleaning of grain in grain cleaning machines, a large amount of organic impurities - 30-50%, weed seeds - 30-40% fell into waste. The composition of the grain impurity was dominated by puny, green grains, the content of which reached 10-15%. The main grain in the waste contained 10-20% (due to the large amount of unhilled ears).

As a result of primary processing, waste with a similar content of components is now released on currents in grain harvesters, and in the grain supplied to grain-receiving enterprises, mainly difficult-to-separate impurities remain.

During the primary cleaning of grain on grain cleaning machines, two fractions of waste are obtained. The first fraction contains useful grain more often up to 2%. If the grain mass contains a large number of shriveled and pitted grains, the content of useful grain in this fraction can be up to 10% or more.

The second fraction, obtained by passing through a sowing sieve and descending from a sorting sieve, contains from 20-30 to 40-45% of useful grain.

Moreover, when leaving the sorting sieve, from 30 to 50% of unhilled spikelets are released by weight.

The grain, which has undergone primary processing on currents, is delivered to grain-receiving enterprises with a trash content of 0.3-1.2%. When processing it at grain-receiving enterprises, a large amount of waste is obtained. [3, 4, 5]

An analysis of the operation of grain cleaning machines at grain-receiving enterprises showed that in recent years, when cleaning wheat, grain mixtures and by-products have been isolated from the grain mass. Waste of the 1st and 2nd category when cleaning grain in the stream are rarely obtained. Most often they are isolated when sorting grain mixtures and by-products.

When cleaning grain on the separator, four fractions of waste are obtained: the descent of the sorting sieves; undersowing sieves; heavy aspiration (sediment in the aspiration chambers) and light aspiration.

All these fractions are characterized by a different type and quantitative content of components attributed to the main grain, grain and trash impurities.

In the descent of sorting sieves, useful grain contains from 0 to 3%. Basically, this is normal grain, isolated from unmilled ears.

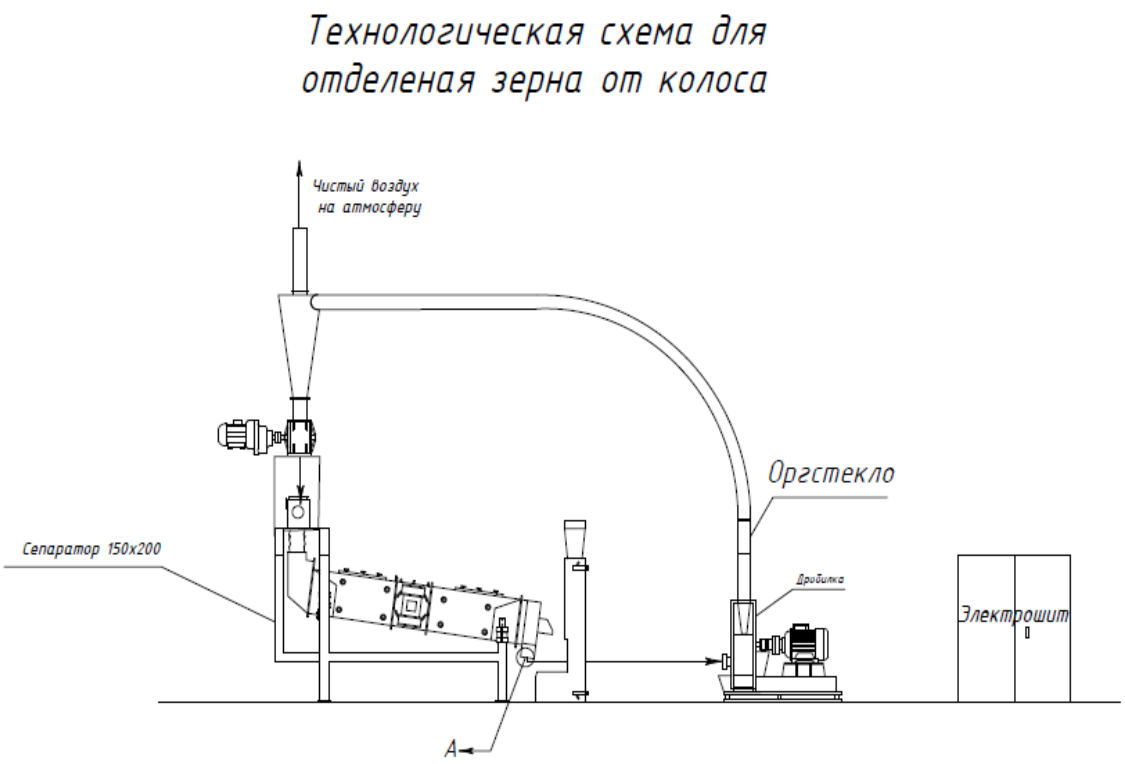
The highest content of useful grain (up to 91.2%) is characterized by the passage of the under-sowing sieve due to the grain of broken, shriveled and normal fine grain of the main crop.

Existing grain cleaning technologies predetermine the release of a large amount of grain waste. At the same time, the descent from the upper sieves and mixtures of the descent from the upper sieves and the sifting of the under-sowing sieves in the receiving air-sieve grain cleaning machine contain up to 18-23% of unmilled spikelets, up to 24% of normal grain and 0-15% of fine grain. This grain waste is not used efficiently. [6, 7, 8]

The trend of using simple grain cleaning machines for waste treatment is exhausting its possibilities. For high-quality waste separation with the possibility of separation, final threshing of spikelets and separation of mineral impurities, new modern technologies for the separation of "complex" grain waste are needed, which provide the specified agricultural requirements with minimization of the reduced costs of separation.

We recommend the systemic cleaning of grain waste with the possibility of separation, final threshing of ears and separation of mineral impurities.

Technological scheme for the separated grain from the spike



Clean air atmosfere

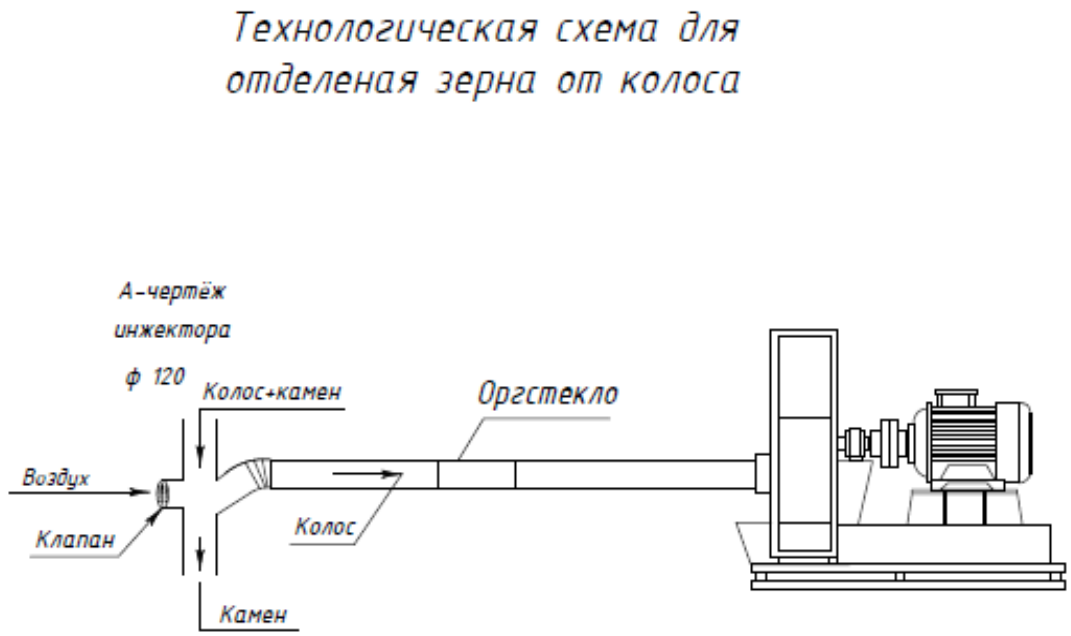
Separator 150x200 Plexiglass

Crusher

electrosheet

The system analysis carried out within the framework of the problem being solved, revealed (taking into account the known limitations) the main ways of increasing the efficiency of in-line cleaning of grain waste: intensification of pneumatic separation of grain waste, high-quality separation of unmilked ears, their re-threshing, an increase in the efficiency of separation of grain and small trash from dimensions on sieves.

Technological scheme for the separated grain from the spike



A-Drawing of the injector

Spike+stone Plexiglass

Air Spike

Valve

Stone

The aim of the research is to identify the main directions and substantiate rational resource-saving technologies and technical means for separating grain waste at enterprises for receiving grain storage and processing, ensuring their highly efficient utilization.

The implementation of the goal of the work will allow us to identify new patterns in the functioning of private technological operations in various grain cleaning machines when separating the original grain heap of various structures of aggregates for grinding spikelets and cleaning this heap, to evaluate the rational combination of private technological operations in the unit.

In conditions of intense competition among enterprises, the most important factor of production is to reduce the cost of production and improve the quality of work, which is directly related to the development and implementation of fundamentally new working bodies and machines. This requirement is of particular importance for the intensification of widespread technological processes, which include the separation of grain mixtures. When harvesting, storing and processing grain, more than 35-40 million tons of grain are separated annually in our country alone. With such a huge scale of work, even a slight improvement in the separation process can give a significant economic effect.

Equipping agriculture with high-performance harvesting equipment increases the intensity of grain supply to grain processing enterprises. The need to increase the efficiency and productivity of the separating machine fleet is also

caused by the imposition of more stringent requirements for the quality of grain supplied for processing at the enterprises of the milling, cereals, brewing and fat-and-oil industries. The importance of the problem of intensification of separation processes becomes especially obvious if we take into account that the costs of post-harvest processing and storage of grain make up from 40 to 60% of the total costs of its production.

In the process of solving the set tasks, it is necessary to form a set of private technological operations of the cleaning units of the unit for seed cleaning of grain with fractional technology.

The criterion for the optimality of the optimized systems, with known or predicted technical and economic indicators of their elements (machines, working structures.) And the system as a whole, is the reduced costs for cleaning a unit of grain mass, determined by the performance of the unit and standard economic indicators (structural optimization). This approach makes it possible to formulate the target function - minimization of the reduced costs of grain cleaning while ensuring the separation of "business" fractions (grain, fodder and other waste) from grain waste with specified technological restrictions on their quality.

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