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OPTIMIZATION OF STRUCTURAL AND PARAMETRIC SCHEMES OF MACHINES FOR PROCESSING OILSEEDS IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT OF AGRICULTURAL ENTREPRENEURSHIP

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Abstract: The study examines the optimization of structural and parametric schemes of oilseed processing machines as an important factor in the sustainable development of agrarian entrepreneurship. Special attention is paid to the introduction of energy-efficient equipment that reduces electricity consumption and production costs. Modernization of press equipment improves oil yield, productivity, and product competitiveness in domestic and foreign markets. The research highlights the importance of state support and green financing programs for implementing innovative technologies. These measures strengthen the export potential and economic security of Ukraine's agro-industrial sector.

Keywords: oilseed processing, energy efficiency, technological modernization, agrarian entrepreneurship, export potential.

The oil and fat industry is one of the leading sectors of the food industry. The development of the vegetable oil market is one of the key areas of the agro-industrial complex of Ukraine, which forms a significant share of foreign exchange earnings and determines the state's position in the global food market. Its main products are vegetable oil (food and technical), as well as proteins for food and feed. Food vegetable oil is used as a regular and in pure (unchanged) form as a component of many goods (margarine, frying fat, mayonnaise, etc.). In Ukraine, sunflower is one of the most common agricultural crops. This is due primarily to the high profitability of cultivation, the possibility of effective sale of both seeds and vegetable oil. Currently, two methods are used to extract oil from sunflower seeds - pressing and direct extraction. However, the cost of producing oil by pressing is 8–10 times lower compared to extraction [1]. In the context of the instability of the energy market and the need to comply with international environmental standards [2]. Optimization of structural and parametric schemes of machines for processing oilseeds in the context of sustainable development of agricultural entrepreneurship is of particular importance [3]. The introduction of energy-efficient technologies ensures not only a reduction in the cost of production and an increase in oil yield, but also allows you to expand the range of export-oriented products with high added value - meal, protein concentrates, biofuels, phosphatide components, etc [4]. Based on this, it can be argued that the optimization of structural and parametric schemes of machines for processing oilseeds in the context of sustainable development of agricultural entrepreneurship is a relevant way to

strengthen the export competitiveness of our state. Fig. 1 presents the main ways to implement energy-efficient equipment for oilseedprocessing.

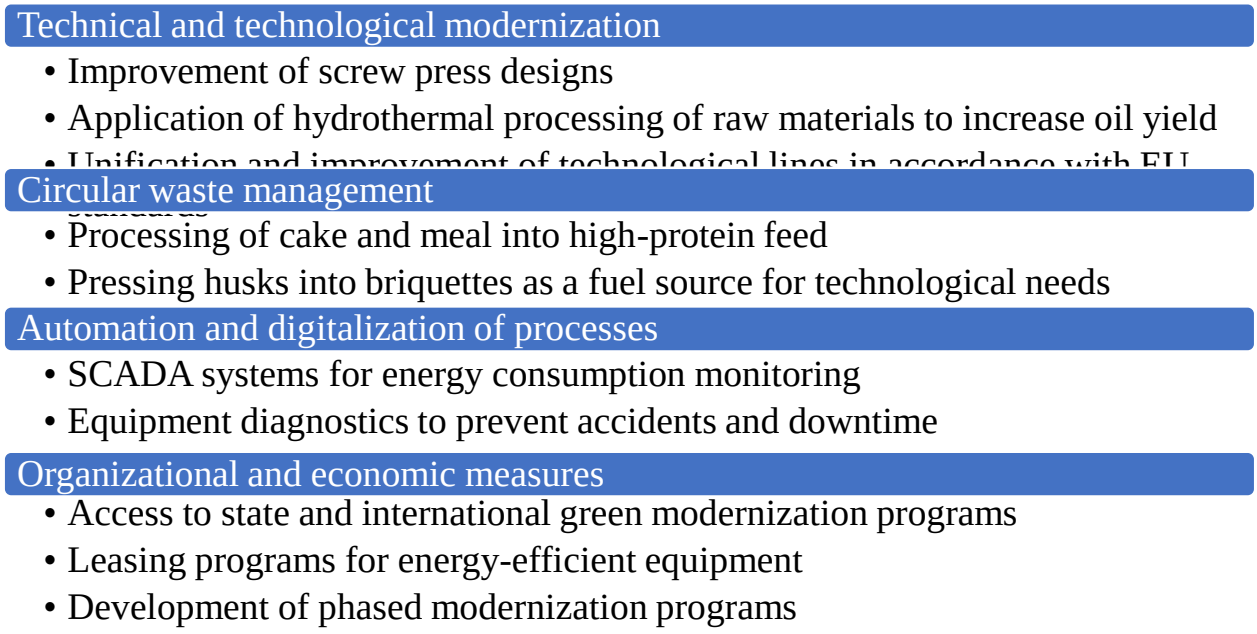

Figure 1 – **Ways to optimize structural and parametric schemes of machines for processing oilseeds in the context of sustainable development of agricultural entrepreneurship**

The analysis of the characteristics and application of press equipment in different countries of the world showed that the principles of operation and the working process are the same. The use of domestically produced oil presses in farms with small volumes of oilseed processing and the optimization of structural and parametric schemes of machines for processing oilseeds in the context of sustainable development of agricultural entrepreneurship indicate a number of shortcomings, which include low oil yield per pass, increased time spent cleaning the press from clogging, which contributes to a significant decrease in the productivity of the device and the need to manually push the cake from the bunker into the receiving and preparation chamber during repeated pressing due to its poor flowability. Therefore, the optimization of structural and parametric schemes of machines for processing oilseeds in the context of sustainable development of agricultural entrepreneurship and the introduction of energy-efficient equipment for processing oilseeds makes it possible to eliminate these shortcomings. An example of the use of such equipment is an energy-efficient oil press is presented on fig. 2 [6].

The analysis of theoretical aspects of the pressing process allowed us to determine the main technological parameters, which include the speed of rotation of the screw shaft, the degree of pulp capture by the first turn, the physical and mechanical properties of the pulp and the degree of wear. Optimization of structural and parametric schemes of machines for processing oilseeds in the context of sustainable development of agricultural entrepreneurship and the study of these parameters and the introduction of research results into industrial production of press equipment will eliminate problematic issues when used in the technological process of oil production [5]. Thus,

technological renewal of oilseed processing enterprises is an important tool for strengthening the foreign economic security of Ukraine, contributing to increasing export stability, risk diversification and reducing dependence on imported energy carriers. Research on ways to optimize structural and parametric schemes of machines for processing oilseeds in the context of sustainable development of agricultural entrepreneurship and the introduction of energy-efficient equipment is an urgent task of agriculture and an important factor in the formation of a competitive agricultural sector of the state.

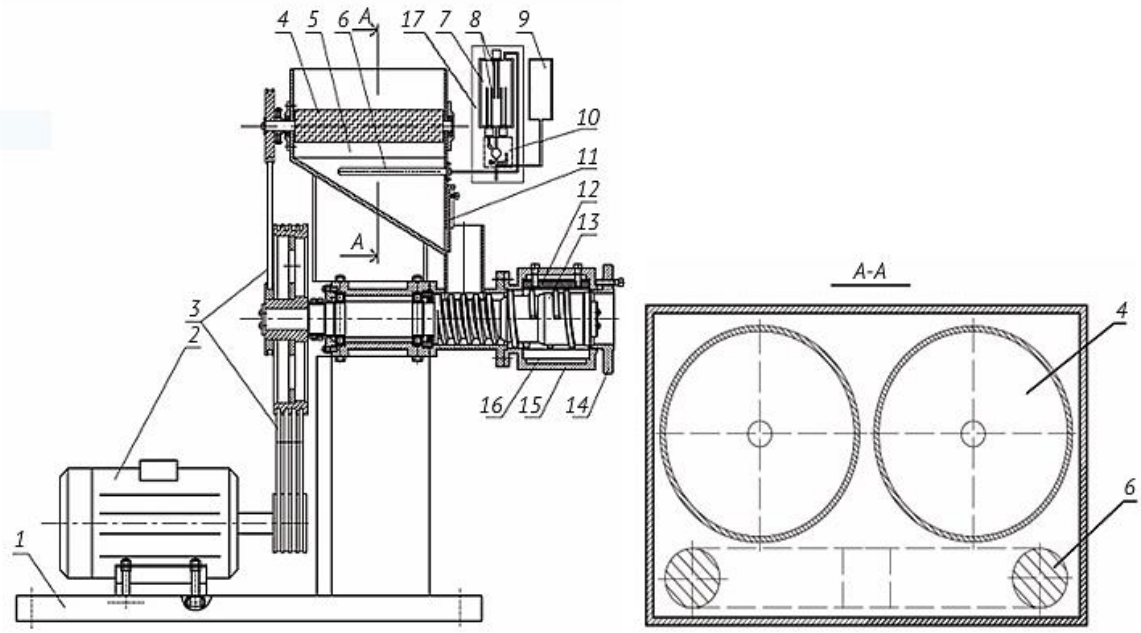

Figure 2 – **Energy-efficient oil press**
1 – frame; 2 – electromotor; 3 – V-belt transmission; 4 – threaded rollers; 5 – bunker; 6 – steam sprayer; 7 – heat exchanger; 8 – tubular electric heater; 9 – expansion tank; 10 – hydraulic groups; 11 – valve; 12 – tension wedge; 13 – worm; 14 – nut; 15 – perforated cylinder; 16 – perforated panels; 17 – steam generator

Optimization of structural and parametric schemes of oilseed processing machines in the context of sustainable development of agrarian entrepreneurship and energy-efficient equipment for oilseed processing is crucial for increasing production efficiency and reducing the enterprise's electricity costs. This helps products to be cheaper and more competitive in domestic and international markets. Enterprises can receive financing and technical support for the implementation of modernization projects with minimal risk for business if they have access to state and international green modernization programs. Optimization of structural and parametric schemes of oilseed processing machines in the context of sustainable development of agrarian entrepreneurship ensures stable development of the enterprise and increases its export potential, phased modernization programs allow for the systematic introduction of new technologies, reduce production risks and optimize resource use. In general, the combination of state support, financial instruments and strategic planning is an effective modernization method that increases the energy efficiency of processing enterprises and strengthens their positions in the global market.

References

1. Babenko, D., Dotsenko, N., & Gorbenko, O. (2024). Study of structural and kinematic characteristics of an energy-efficient oil press. *Ukrainian Black Sea Region Agrarian Science*, 28(3), 41-54. DOI: https://doi.org/10.56407/bs.agrarian/2.2024.41
2. Rajkhowa, P., & Kubik, Z. (2021). Revisiting the relationship between farm mechanization and labour requirement in India. *Indian Economic Review*, 56, 487-513. DOI: 10.1007/s41775-021-00120-x.
3. Obayelu, A.E., & Ayanshina, S.O. (2020). Agricultural and food policy: Pathways to sustainable food systems and food security. In A.E. Obayelu & O.A. Obayelu (Eds.), *Developing sustainable food systems, policies, and securities* (pp. 1-15). Pennsylvania: IGI Global. DOI: 10.4018/978-1-7998-2599-9.ch001.
4. Lytovchenko, L. (2022). Trends and prospects for the development of enterprises for the production and processing of oilseed products in risky conditions. *Innovation and Sustainability*, 4, 202-206. DOI: 10.31649/ ins.2022.4.202.206.
5. Hamulczuk, M., Makarchuk, O., & Kuts, T. (2021). Time-varying integration of Ukrainian sunflower oil market with the EU market. *AGRIS On-line Papers in Economics and Informatics*, 13(3), 35-47. DOI: 10.22004/ ag.econ.320267.
6. Babenko, D., Gorbenko, O., Dotsenko, N., & Kim, N. (2018). Theoretical aspects of oil separation process by pressing. *Ukrainian Black Sea Region Agrarian Science*, 22(3), 94-98. DOI: 10.31521/2313-092X/2018-3(99)-16.

Анотація: У дослідженні розглянуто оптимізацію структурно-параметричних схем машин для переробки олійних культур як важливий чинник сталого розвитку аграрного підприємництва. Особливу увагу приділено впровадженню енергоефективного обладнання, що знижує споживання електроенергії та виробничі витрати. Модернізація пресового обладнання підвищує вихід олії, продуктивність і конкурентоспроможність продукції на внутрішньому та зовнішньому ринках. У дослідженні наголошено на важливості державної підтримки та програм зеленого фінансування для впровадження інноваційних технологій. Зазначені заходи зміцнюють експортний потенціал та економічну безпеку агропромислового сектору України.

Ключові слова: переробка олійних культур, енергоефективність, технологічна модернізація, аграрне підприємництво, експортний потенціал.

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ІНТЕГРАЦІЯ ШТУЧНОГО ІНТЕЛЕКТУ В УПРАВЛІННІ ТВАРИННИЦТВОМ ЯК СКЛАДОВА ІННОВАЦІЙНОЇ ПУБЛІЧНОЇ ПОЛІТИКИ У СФЕРІ ПРОДОВОЛЬЧОЇ БЕЗПЕКИ

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Анотація: Роль і практичні можливості застосування методів штучного інтелекту (ШІ) у системах управління тваринництвом як елементі національної та глобальної політики продовольчої безпеки. Проаналізовано ключові напрямки застосування ШІ у молочному господарстві: моніторинг стану здоров’я, прогнозування продуктивності, автоматизація годівлі та раннє виявлення