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METHODS OF INCREASING THE EFFICIENCY OF TECHNOLOGICAL MACHINES IN INDUSTRIAL ENTERPRISES

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Abstract: This scientific article provides an in-depth analysis of the issues of increasing the efficiency of technological machines in industrial enterprises. It covers the impact of monitoring the technical condition of technological machines, automated control systems, energy-saving technologies, planned maintenance, modernization and digitalization processes on production efficiency. Each approach is scientifically explained and indicated as factors that contribute to the continuity of production processes, economic efficiency and product quality. The role of the human factor, operator skills and the level of technical culture are also assessed as important factors affecting efficiency. This study contains practical recommendations for more efficient operation of technological machines and is relevant in a modern industrial production environment.

Keywords: technological machines, efficiency, automation, energy saving, maintenance, monitoring, industry 4.0, modernization, production, operation.

Technological machines, which are an integral part of modern industrial development, are one of the main factors determining production efficiency. In today's globalization and competitive environment, each industrial enterprise strives to operate as efficiently as possible. This directly depends on the condition of technological machines, which are the basis of production processes, their performance, reliability and maintenance systems. Increasing the efficiency of technological machines not only increases production capacity, but also reduces costs, reduces the level of energy resource use and stabilizes product quality.

The problem of increasing the efficiency of technological machines requires an integrated approach. This problem must be analyzed at each stage of the production process: design, production, installation, operation, maintenance and modernization. Efficiency means not only productivity, but also energy, technological, economic and environmental aspects of operation. Therefore, the system of effective operation of technological machines includes, in addition to technical parameters, control and monitoring systems, operator qualifications, digital control and optimization mechanisms of technological processes.

First of all, it is important to constantly monitor the technical condition of technological machines. In this regard, the introduction of modern diagnostic equipment, remote monitoring technologies and artificial intelligence tools directly affects efficiency. For example, through technologies such as vibration analysis, thermography, ultrasound diagnostics, malfunctions in the mechanical parts of the machine are detected at an early stage and preventive measures are taken. This prevents unplanned downtime and makes the production process uninterrupted.

Another important factor affecting efficiency is the automated control systems of technological machines. Automation makes production processes independent of the human factor, increases accuracy, reduces the likelihood of errors and creates conditions for uninterrupted operation of machines. Automated systems, in particular, allow for real-time processing of large amounts of information, accurate control, and remote monitoring. Also, control over technological machines can be carried out continuously through systems such as SCADA, PLC, DCS.

The introduction of energy-saving technologies plays an important role in increasing the efficiency of technological machines. Since energy consumption accounts for a large part of production costs, economic benefits are achieved by increasing energy efficiency. In this case, high-efficiency electric motors, frequency control systems, heat recovery devices, and regenerative braking technologies are widely used. In particular, frequency control systems prevent excessive energy consumption by adjusting the speed of the machine in real time.

The high efficiency of technological machines is also associated with their proper operation. Strict adherence to technical regulations developed for machines, the service life of each part, the period of technical lubrication, the cleanliness of cooling systems, and timely replacement of filter elements - all this directly affects the service life of the machine. Another important aspect is the operator's qualifications. If the operator does not understand the essence of technological processes and does not use the machine correctly, even the most advanced technologies will not be effective. In order to increase the reliability of technological machines in industrial enterprises, a planned maintenance system should be introduced. If the equipment is not inspected and preventive repairs are not carried out in a timely manner, their failures will unexpectedly stop the production process. Therefore, by implementing the TPM (Total Productive Maintenance) system, not only the condition of the equipment is under control, but also an environment that increases efficiency is formed in the entire enterprise. Through the TPM system,

each employee feels responsible for the technical condition of the machine, and this strengthens discipline in the enterprise.

Modernization is one of the most important stages in increasing the efficiency of technological machines. Equipment used for years begins to lose its technical and technological capabilities after a certain period of time. In this case, instead of purchasing new equipment, it is possible to increase productivity by modernizing the existing machine. During the modernization process, the main units of the machine are updated, modern control systems are installed, energy efficiency is increased, and the production process is optimized. This method reduces investment costs and allows you to achieve results in the short term.

The rapid development of information technologies requires the digitization of technological machines. The concept of Industry 4.0 allows for the complete digitization of production processes, the operation of machines connected to the Internet, the analysis of large amounts of data and their effective use. Using technologies such as Big Data, AI, Machine Learning, the algorithms of the machines' operation are constantly analyzed and optimized. This allows preventing production failures, reducing production cycles, and increasing product quality and volume. Increasing the efficiency of technological machines in industrial enterprises is an important factor in ensuring the stability, economic efficiency and environmental safety of modern production processes. This process is achieved not only by implementing technical innovations, but also through careful planning at all production stages, improving management systems, correctly assessing the human factor, and improving the culture of technical maintenance. Since each industrial enterprise has its own technological system, the strategy for increasing efficiency should also be formulated on the basis of a comprehensive, scientifically based and long-term approach. It is this approach that ensures the competitiveness of our industry in the global market.

References:

1. Abdullayev A.X. Promyshlennye mashinalar va oborudovanie: teoriya va amaliyotda ekspluatatsiya. – Toshkent: Fan, 2020. – 325 b.
2. Nazarov B.J., Murodov Sh.K. Texnologik mashinalar va jihozlar. – Toshkent: Iqtisodiyot va ta’lim, 2022. – 284 b.
3. Qosimov U.K., Hamidov A.Sh. Ishlab chiqarish jarayonlarida avtomatlashtirish va nazorat tizimlari. – Toshkent: TATU nashriyoti, 2021. – 198 b.

4. Azizov I.R., Xayrullaev S.B. Innovatsion texnologiyalar asosida mashinasozlik sanoatini modernizatsiya qilish yo‘llari // Ilmiy-amaliy texnika jurnali. – 2023. – №2. – B. 45–52.

5. Brovko P.M., Zlotin B.N. Energoeffektiv texnologiyalar mashinasozlikda. – Moskva: Mashinasozlik, 2019. – 256 b.

6. Yunusov Sh.T. Raqamli texnologiyalarni ishlab chiqarishda qo‘llash imkoniyatlari // Texnika va texnologiyalar muammolari. – 2024. – №1. – B. 73–79.

7. Filippov I.A. Texnologik mashinalarga xizmat ko‘rsatish va ularni ta’mirlash. – Sankt-Peterburg: Politeknika, 2020. – 318 b.

8. World Economic Forum. Industry 4.0: Shaping the Future of Advanced Manufacturing. – Geneva, 2022. [Elektron resurs] https://www.weforum.org/reports