

MODERN AUTOMATED MACHINES: OPPORTUNITIES AND DISADVANTAGES

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Abstract: This scientific article analyzes the role of modern automated machines in industrial production, their technological capabilities and their practical effectiveness. At the same time, the economic, technical and social problems associated with the introduction of these machines are also examined in depth. Through a scientifically based approach, the advantages of automation - accuracy, stability, safety and increased labor productivity - are assessed, as well as high costs, complexities in maintenance and negative social consequences. The study includes recommendations aimed at increasing the competitiveness of industrial enterprises through the rational use of automation technologies.

Keywords: automation, industry 4.0, technological machines, digitalization, robotics, safety, production efficiency, maintenance, social consequences

The rapid introduction of automation technologies at a new stage of industrial development serves to increase the efficiency of technological processes, reduce the human factor and reduce production costs. Modern automated machines serve as the main tool for ensuring the competitiveness of industrial enterprises. Such machines operate with real-time accuracy, can process large amounts of information, and reduce the impact of human error. At the same time, automated systems also have a number of shortcomings, and their in-depth analysis, realistic assessment of capabilities, and development of improvement measures are urgent issues.

One of the main advantages of automated machines is the ability to perform production processes continuously, repeatedly, and with high accuracy. For example, in micron-level processing processes, the pharmaceutical industry, or the production of electronic components, automation has become almost the only solution. These machines operate at high speed, without fatigue exceeding the norm, and with stable quality. Their capabilities serve to increase productivity several times.

Modern automated machines are equipped with various sensors, actuators, programmable control systems (PLC, SCADA, DCS), and their integration fully meets

the principles of the digital manufacturing environment - Industry 4.0. Through this, indicators such as machine movement, load level, failure conditions, and energy consumption are monitored in real time. Artificial intelligence-based algorithms of machines allow them to adapt to various problems, prevent anomalies, and plan maintenance and repairs.

Another advantage of automated machines is that they remove human life from hazardous production zones. In industries such as large chemical industries, metallurgy, or mining, automated machines are used in places where there is high temperature, pressure, or a toxic environment. This not only ensures safety, but also increases labor productivity.

There are also economic advantages to automation: continuous production, reduced labor costs, stabilized product quality, reduced waste, and shortened production cycles. For example, robotic assembly lines can operate 24/7 without human participation, and there is no risk of fatigue, loss of attention, or injury during their operation.

However, automated machines also have disadvantages. The first and main disadvantage is the high cost of the technology and the large initial investment. Modern robots, programmable control systems, sensor systems and software require significant investment. This can be an obstacle, especially for small and medium-sized manufacturing enterprises.

The second significant disadvantage is the lack of technical support and qualified personnel. Automated machines have a complex structure, and their adjustment, maintenance and repair require highly qualified specialists. In the conditions of Uzbekistan, the number of such engineers is insufficient, which negatively affects the effective operation of automated systems.

Another aspect is the risk of stopping the entire production process due to technical failures and software errors in the system. Since automated systems operate in a single integrated environment, a small error can disrupt the entire production cycle. Therefore, reliability, the availability of backup systems and security protocols are of great importance.

In addition, automation can also have certain negative consequences in social terms. As a result of the reduction of the human factor, jobs are reduced, which can lead to unemployment. In particular, low-skilled workers are excluded from the labor market, which can lead to social inequality. Therefore, along with automation,

measures such as retraining, vocational orientation and advanced training of personnel should be taken.

The disadvantages of automated machines indicate not their complete denial, but the need to use their capabilities correctly and rationally. In modern industrial conditions, these machines have become the most important link in production, and by establishing their correct selection, implementation and high-level maintenance, their disadvantages can be reduced and their capabilities can be used to the maximum.

Modern automated machines play a major role in the development of industry. They increase the speed, accuracy, safety and sustainability of production. At the same time, technological, economic and social factors must be taken into account when introducing them. Effective use of automation opportunities requires a comprehensive, scientifically based, strategic approach. This is an important factor in increasing the competitiveness of industrial enterprises, ensuring energy efficiency, and integrating into global production chains.

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