

Nazar Ferents
Dmytro Motorny Tavria State
Agrotechnological University
Language adviser: Kravets O.O.

PRODUCTION AND TECHNOLOGY: AUTOMATION AND INNOVATIVE APPROACHES

In today’s economic landscape, companies face mounting competition and a constant need to improve operational efficiency, reduce costs, and ensure high product quality. One of the primary pathways toward these goals is industrial automation, which involves conducting production processes with minimal human intervention. Production automation is based on the use of modern technologies and systems that can perform manufacturing operations accurately and reliably. In addition, artificial intelligence solutions used in factories can make industrial robots smarter and more adaptive.

The deployment of these systems focuses on minimizing worker exposure to hazardous tasks, such as heavy lifting or handling dangerous materials. By leveraging AI, we can also reduce the risk of human errors caused by fatigue or inattention, leading to fewer workplace accidents and manufacturing defects.

Automation serves as a guarantee of enhanced quality and stability, as robotic systems provide exceptional consistency and accuracy [1]. They minimize variability, ensuring constant compliance with rigorous quality standards.

Artificial Intelligence and Machine Learning are transforming industrial automation by enabling more intelligent and efficient processes, including the implementation of predictive maintenance. This allows for the early detection of potential equipment malfunctions and prevents breakdowns, which in turn reduces downtime and boosts overall production efficiency.

At the same time, the integration of such systems can be accompanied by several challenges, such as imbalanced datasets, sensor noise, missing data, model degradation, and the necessity of attracting highly qualified specialists. Automation is

also a cornerstone of advanced sustainable manufacturing, as it reduces waste by optimizing production workflows and ensuring the efficient use of materials [3]. Additionally, intelligent systems manage energy consumption by adjusting operations to minimize power usage and lower carbon emissions, making the manufacturing process more environmentally friendly.

Waste reduction methods include Lean manufacturing principles, which optimize resource utilization and minimize surplus, as well as the implementation of circular economy concepts for material reuse and recycling.

Despite these advantages, the shift toward sustainable manufacturing faces several hurdles. Transitioning to sustainable processes can require significant upfront investment, and many producers encounter obstacles due to a lack of expertise or limited access to new technologies.

In conclusion, industrial automation represents an inevitable transition from quantity to quality. Companies capable of overcoming the financial barriers today will become the leaders of tomorrow's "green" and efficient economy [3]. This is an investment in survival in a world where resources are limited, and demands for quality and safety continue to rise.

REFERENCES

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