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AUTOMATION OF DAIRY PRODUCTION: PROSPECTS FOR IMPLEMENTATION

Modern trends in dairy production indicate active development of automation and robotics, which improve efficiency, reduce costs, and enhance quality control. The introduction of distributed control systems, machine vision, sensors, and SCADA systems significantly optimizes production processes and ensures their flexibility. The introduction of robotic systems, SCADA systems and sensors allows to reduce costs, improve quality control and make production more environmentally friendly. Further development of artificial intelligence technologies and big data analysis will contribute to the improvement of production processes in the dairy industry.

Keywords: *automation, robotics, SCADA, sensors, dairy industry.*

Automation of dairy production is an important direction of industry development, as it allows to improve product quality, reduce costs and increase productivity. The main automation tools are milk quality control systems, SCADA systems, intelligent sensors, as well as robotic technologies for dairy processing enterprises [1].

The purpose of the article is to analyze and assess the prospects for implementing automated systems in dairy production, in particular the use of SCADA systems, SMART monitoring, to improve efficiency, quality and energy optimization of production processes.

The object of the study is SMART monitoring technologies and platforms. automation technologies in the dairy industry, including distributed control systems.

The subject of the study is the main components, principles of operation and effectiveness of implementing automated systems in dairy production.

Modern dairies are actively implementing distributed control systems (DCS), which allow to increase the efficiency of production processes due to automated monitoring and operational management of milk flows, pasteurization and product packaging [1-2]. Such systems provide centralized control of all stages of production, which contributes to the rapid detection of deviations in the technological process, optimal use of resources and cost reduction. Thanks to the flexible architecture of DCS, it is possible to integrate new technologies, such as intelligent sensors and machine vision, which further increases the level of automation. In combination with analytics and forecasting systems, DCS allow to reduce energy consumption and increase the overall productivity of enterprises [1-2].

Robotization of processes, such as automated milking, filling and packaging, significantly increases productivity and product quality. Robotic systems minimize milk losses, ensure accurate dosing of components and improve sanitary and hygienic production conditions [2]. They also help reduce the impact of the human factor, which reduces the likelihood of errors and improves the stability of the quality of the final product. Modern robotic complexes are equipped with sensors for monitoring milk parameters in real time, which allows for prompt correction of the processing process. The use of robots in filling and packaging provides high speed and accuracy, as well as the ability to adapt to different packaging formats without significant costs for reconfiguring the equipment. Robotic systems minimize milk losses, ensure accurate dosing of components and improve sanitary and hygienic production conditions [3].

Automated quality control systems include the use of sensors to assess the composition of milk (fat content, protein, acidity), as well as machine vision systems to monitor the state of production lines and detect defects in products [3-5]. The use of infrared sensors and spectroscopic analysis allows for non-contact quality control of raw materials, which minimizes the likelihood of errors and reduces the need for manual sampling. The introduction of artificial intelligence technologies allows for automatic analysis of the received data and predict possible deviations before they occur. This allows for prompt adjustment of processing parameters, reducing production losses and improving the stability of the final product.

SCADA (Supervisory Control And Data Acquisition) is a complex software package designed to collect, process and store information in real time. They are usually part of industrial automation systems and can be used in almost all industries. The main features of SCADA systems are interaction with the control object in real time and provision of a human-machine interface. They can be either centralized or distributed.

The main human-machine interface of SCADA systems is mnemonics - visual graphic images of the structural or functional diagram of the control object, which are developed and executed on computer equipment (personal/industrial computers, servers, workstations, etc.). In addition, mnemonics of SCADA systems often include built-in controller screens, operator panels, touch panel controllers, industrial computers with a monitor, etc.

SCADA systems provide real-time monitoring and control of technological processes, allowing operators to control production parameters such as pasteurization temperature, tank pressure and raw material consumption [2-6]. Integration of SCADA with digital twin systems allows modeling and forecasting of production lines based on the data obtained, which helps to minimize equipment downtime and increase its efficiency. Thanks to modern communication protocols, SCADA systems also allow remote control of production processes, which is important for enterprises with a branched structure or to ensure uninterrupted operation in critical conditions.

Therefore, the authors proposed the architecture of an automated production process control system, which includes subsystems of milk preparation, processing and packaging.

Thus, automation of dairy production is an important step towards improving efficiency and product quality. The introduction of robotic systems, SCADA systems and sensors allows to reduce costs, improve quality control and make production more environmentally friendly. Further development of artificial intelligence technologies and big data analysis will contribute to the improvement of production processes in the dairy industry.

References

1. Kozub, Y.A., Komlatsky, V.I., Khoroshailo, T.A. (2020). About some automated processes in the production of dairy products. IOP Conf. Ser.: Mater. Sci. Eng., 862(3), 032021. doi:10.1088/1757-899X/862/3/032021.
2. Heema, R., Sivaranjani, S., Gnanalakshmi, K.S. (2022). An Insight in to the Automation of the Dairy Industry: A Review. Asian Journal of Dairy and Food Research, 41(2), 125-131. doi:10.18805/ajdfr.DR-1856.
3. González-Filgueira, G., Rodríguez Permuy, F.J. (2018). Automatización de una planta industrial de alimentación mediante control distribuido. Revista Ibérica de Sistemas e Tecnologías de Informação, 27, 1-17. doi:10.17013/risti.27.1-1
4. "Smart Manufacturing Systems: MES and ERP Integration Approaches": John D. Smith, 2020
5. "Smart Monitoring and Control Systems in Energy Grids" Ahmed Zidan, Haris Fath IEEE Transactions on Smart Grid, 2020.

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IMPROVED AIRPORT POWER SUPPLY SYSTEM

The article is devoted to the development of recommendations for the implementation of intelligent technologies in the energy supply systems of airfield infrastructure facilities, which is an important element of the air transport industry infrastructure, in order to ensure safety measures for aircraft operation, which in turn will make it possible to increase the reliability of cargo delivery and passenger transportation. The article defines the main requirements for the power supply systems of airfield infrastructure facilities. It is emphasized that management strategies should take into account the implementation of Industry 4.0, automation, robotization and the use of artificial intelligence.

Keywords: power supply, airport, control system, electrical energy converters, power supply sources.

Airport power supply systems play a critical role in ensuring the safety, reliability and continuity of airport operations. The improvement of these systems should take into account not only technical, but also environmental, economic and security aspects [1].