DEVELOPMENT OF AN AUTOMATED SYSTEM FOR THE TECHNOLOGICAL PROCESSES OF A "CONCRETE PLANT" (A COMPANY FOR THE PRODUCTION OF CONSTRUCTION COMPONENTS).

Oleksii Fomin
Kharkiv National University of Radio Electronics
Ukraine, 61166, Kharkiv, Nauky av., 14
E-mail: oleksii.fomin@nure.ua

***Annotation*:** This work presents the development of an automated system for a concrete plant, which includes the development of control system software to optimize the processes of mixing, transportation, and storage of concrete mixtures. The effectiveness of the proposed system has been studied and analyzed in terms of quality control of technological processes, reporting on the operations of concrete mixers, and calculating the materials used. The results obtained can be useful for engineers and developers in the field of production process automation.

Key words: Automated system, software, concrete plant server, control system, process optimization, quality control, reporting, concrete mixer, production materials, automation.

In the current conditions of industrial development, automation of technological processes has become one of the key factors in improving production efficiency and reducing costs. Concrete plants, which specialize in the production of various types of concrete mixtures, constantly face numerous challenges related to optimizing production processes, ensuring high product quality, and reducing resource consumption. This includes issues related to equipment management, material and product quality control, as well as the efficient use of energy and labor resources. Automation of technological processes at a concrete plant is an important step not only for increasing overall production productivity but also for achieving significant reductions in energy costs and labor intensity, which in turn helps to substantially lower the cost of the finished product. Furthermore, an automated system allows for detailed control over material usage throughout the entire production cycle—from the manufacturing stage to the storage and delivery of finished mixtures to end consumers.

The project was implemented using a number of advanced technologies, including PHP, React.js, Python, and MySQL. PHP handles the server-side part of the system, request processing, and interaction with the database. React.js is used to create an interactive user interface that ensures fast and convenient interaction with the web application. Python is responsible for acting as an intermediary between the server and the control panel, forming statuses, ttns, and so on. MySQL is used to store and manipulate data, providing a reliable and scalable database for storing all necessary information. The MQTT protocol is used to ensure secure and fast communication between systems, especially for interacting with control panels and other devices in real time.

An important element of the project is the use of advanced visualization technologies that allow the creation of dynamic and interactive graphical interfaces. These technologies make it possible to effectively display data, providing users with clear and understandable representations of information in the form of graphs, charts, and other visual information, which helps in decision-making and process optimization.

The development of an automated system for the concrete plant will include the creation of software for quality control, raw material usage, and reporting. By implementing such innovative approaches, production will not only be faster and more productive but also capable of providing accurate reports on the materials used, the status of the automated mixers, and the quality level of the product at each stage of production. The main goal of this qualification work is to develop a system that ensures effective control over the quality of technological processes at the plant, automates the storage of data on the materials used, and allows for the rapid generation of reports on the operation of technological equipment, significantly simplifying managerial tasks.

Additionally, the implementation of this automated system will enable the integration of real-time data analysis and predictive maintenance. By constantly monitoring the performance of equipment and material consumption, the system will be able to predict potential malfunctions or inefficiencies before they occur, allowing for proactive interventions. This predictive approach will not only prevent downtime but also extend the lifespan of the plant's equipment. Moreover, the integration of data analytics will provide valuable insights into production trends, enabling management to make informed decisions that further optimize processes and reduce costs. This holistic approach to automation will ensure that the plant remains competitive and capable of meeting increasing demands while maintaining high operational standards.

Thus, the development of an automated system for technological processes at a concrete plant is an extremely important and relevant task that contributes to improving production efficiency, enhancing product quality, and significantly reducing costs at all stages of the production cycle. The implementation of such technologies will have a major impact on optimizing all processes, making production more flexible and stable. This will be an important step towards modernizing concrete plants and significantly improving their competitiveness in the market, allowing companies to adapt to changes in the external environment and market demands, increasing their resilience to economic fluctuations and technological challenges.

CONCLUSIONS. Automation of concrete plant processes increases efficiency, reduces costs, and ensures quality control. Implementing a management system optimizes production and material accounting, contributing to cost reduction and productivity growth.

References:

1."Automation and Computer-Integrated Technologies" of the Educational Program "Automation and Computer-Integrated Technologies": Textbook / I. Sh. Nevlyudov, O. I. Filipenko, O. V. Tokarieva, S. P. Novoselov, O. V. Sychova. Kharkiv: Ivanchenko I. S. Publishing House, 2023. – 151 pages.

2. Nevliudov, I., Yevsieiev, V., Maksymova, S., Demska, N., Kolesnyk, K., & Miliutina, O. (2022, September). Object Recognition for a Humanoid Robot Based on a Microcontroller. In 2022 IEEE XVIII International Conference on the Perspective Technologies and Methods in MEMS Design (MEMSTECH) PP. 61-64. DOI: 10.1109/MEMSTECH55132.2022.10002906.

3. Methodical Guidelines for Practical Classes and Independent Work in the Discipline "Business Process Automation" for Students of All Forms of Study in the Specialty 151 – Automation and Computer-Integrated Technologies Educational Program / compiled by: Sh. A. Omarov, N. V. Kosenko, A. I. Kolomiyets; Ministry of Education and Science of Ukraine, KhNURE. – Kharkiv: KhNURE, 2020. – 24 p. – 1.70.

4. Attar, H., Abu-Jassar, A. T., Yevsieiev, V., Lyashenko, V., Nevliudov, I., & Luhach, A. K. (2022). Zoomorphic mobile robot development for vertical movement based on the geometrical family caterpillar. *Computational intelligence and neuroscience*, *2022*(1), 3046116.

5. Kateryna Nimets1, ., Amer Abu-Jassar2, ., Svitlana Maksymova1, ., & Vladyslav Yevsieiev, . (2025). A SMALL-SIZED MOBILE ROBOT DEVELOPMENT . *ACUMEN: International Journal of Multidisciplinary Research*, *2*(3), 12–25. Retrieved from https://inlibrary.uz/index.php/aijmr/article/view/72290

6. Abu-Jassar, A. T., Attar, H., Amer, A., Lyashenko, V., Yevsieiev, V., & Solyman, A. (2025). Development and Investigation of Vision System for a Small-Sized Mobile Humanoid Robot in a Smart Environment. *International Journal of Crowd Science*, *9*(1), 29-43.

7. Yevsieiev, V., Abu-Jassar, A., Maksymova, S., & Demska, N. (2025). Development of a model for recognizing various objects and tools in a collaborative robot workspace. *ACUMEN: International journal of multidisciplinary research*, *2*(1), 224-239.