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IMPROVEMENT OF THE ECONOMIC MECHANISM OF PRODUCT QUALITY MANAGEMENT AT MINI-PLANTS IN THE FOUNDRY INDUSTRY

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Abstract. Mini-plants are an important part of the foundry industry due to their flexibility and ability to respond quickly to changes in demand. To increase their efficiency, it is necessary to improve the technological processes of product quality management. The stable and efficient operation of such plants is only possible if all their components are clearly synchronised. This study aims to develop an effective mechanism for coordinating the actions of foundry subsystems. The approach considers the specifics of production structure, product range, casting requirements, equipment condition, and maintenance efficiency.The aim of the study is to develop new approaches to automating quality control and optimise production processes in order to increase the competitiveness of mini-plants.
Keywords: Mini-plants, foundry production, technological process, quality management, automation, optimisation.

*Introduction.*Modern mini-plants in the foundry industry offer significant advantages over large-scale plants, such as greater flexibility and lower raw material transport costs. However, to ensure their stable operation and achieve high product quality, it is necessary to optimise technological processes and improve quality management systems through the implementation of integrated process modeling techniques.

The synchronisation of the foundry's subsystems is a critical condition to ensure stable and rhythmic production, minimising downtime and losses. The foundry processes a large number of interrelated operations, where a delay at any stage can disrupt the entire production cycle. Taking into account the production and technological structure allows the model to be adapted to a particular company, taking into account its specificities. The nomenclature of castings plays an important role in the construction of the model, as different types of products require different sequences and durations of technological operations. The simulation model enables the representation of the foundry's structure as a system of interacting elements, each of which performs a separate function in the overall process. Simulation modelling makes it possible to test various scenarios of system operation without interfering with the actual production process [1]. The control programme, which defines the logic of interaction between the units, allows changing maintenance strategies and adapting the model to changing conditions. The developed algorithm allows not only to achieve high quality and quantity of products, but also to optimise the use of resources, thus reducing production costs [2].

The object of the study is the technological processes of quality management at mini-plants of foundry production. It deals with the processes of production, quality control and management of technological parameters in mini-plants.

The subject of the research is to enhance the technological process of product quality management at mini-plants. The tasks include: analysing existing technological solutions, developing new approaches to quality control automation, and optimising technological processes.

The novelty of the study lies in the development of new methods for automating quality control processes and integrating innovative technologies into mini-plants production lines, which can improve production efficiency and stability.

The simulation structure of the model allows effective monitoring of the status of each unit over time and prompt response to changes in production conditions. The developed system takes into account the priority of processing liquid metal requests, which makes it possible to manage the order of maintenance according to the technological importance of the castings. The model implements mechanisms for monitoring and forecasting the load on each unit, which helps to avoid overloading and uneven distribution of resources. The software implementation offers the possibility of

experimenting with different planning and maintenance strategies, allowing the selection of optimal solutions for real production [3]. An important feature of the model is its scalability - it can be adapted to workshops of different size and complexity. Analysis of the modelling results allows us to identify bottlenecks in the production structure and formulate recommendations for their elimination. The modelling and synchronisation system is thus an effective tool for increasing foundry productivity and ensuring consistent quality of finished products..

The application of the developed model in the practical activities of a foundry enterprise opens opportunities for flexible management of production flows and increasing the level of process automation [4]. Simulation studies can help assess the impact of changes in workshop structure or equipment operation modes on final production results before they are implemented [5]. This significantly reduces the risk of making ineffective management decisions and allows potential problems to be predicted in advance.

In addition, the model can be used as a training tool for engineering and technical personnel, providing a better understanding of the interrelationships between the shop floor subsystems. It allows them to work out different scenarios for organising production in the face of variable loads, technical faults or restructuring of the production programme. This helps to improve the professional training of employees and to develop their ability to make quick decisions in difficult production situations.

Presentation of the main research material

To achieve this goal, we have applied the methods of mathematical modelling of technological processes, analysis of product quality data, and used modern automated control technologies to improve existing approaches.

The study focused on improving casting technology and quality control at various stages of the production process. The study compared various automation methods, including the deployment of sensor systems for monitoring temperature and alloy composition, as well as the integration of artificial intelligence for real-time adjustment of casting parameters. The study resulted in the development of a model for optimising process parameters to improve product quality while maintaining production flexibility.

Conclusions. The developed approaches to enhancing quality management processes in small-scale foundries facilitate increased control precision, a reduction in defective products, and enhanced production stability. The implementation of these methods helps to reduce production costs and increase the efficiency of mini- plants, making them more competitive in the foundry market.

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NANOMATERIALS IN SERVICE OF HEALTH: HOW COPPER IODIDE-BASED SENSORS HELP DETECT AMMONIA

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Abstract. The presented research focuses on the development of nanostructured copper iodide (CuI) thin-film sensors for ammonia detection. The sensors show high sensitivity to low NH_3 concentrations (from 0.15 ppm) and excellent selectivity, even in humid conditions. Their flexibility and durability make them suitable for both environmental monitoring and non-invasive medical diagnostics.