

**СЕКЦІЯ 9.  
УПРАВЛІННЯ ПРОЕКТАМИ**

**A SYSTEMATIC APPROACH TO THE PROCEDURE FOR DESIGNING  
AUTOMATED CONTROL SYSTEMS FOR PRODUCTION PROCESSES**

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Automation of the production process control is a set of measures that ensure the control of the production process using an automatic control system and a person. The main goal of automating the control of the production process is to improve the control of the production process, aimed at improving its technical and economic performance. Moreover, sometimes the implementation of production processes is impossible without automating the control of this process. The automation of production process control is based on the methods of automatic control theory, information theory, computer technology, research operations, etc. Automation of production process control is a complex engineering problem that combines many tasks. Main stages: feasibility study; production process modeling; development of the structure of the automation system for managing the production process and solving the problem of synthesis of the control algorithm; technical implementation of automation of production process control. There is a relationship between the stages, determined by technical and economic considerations. The presence of a connection causes the repetition of the cycle, its parts, the organization of approximations aimed at finding a variant of the automatic control system.

A comprehensive consideration of the problems of creating an automatic control system is not yet provided by the theory and engineering methods of calculation and design. When automating the control of the production process, tasks may turn out to be unsolvable from the standpoint of the theory of automatic control, and a person who is included in the control system and acts in accordance with his experience and intuition must solve then these tasks. In this case, we talk about an automated system. If a person acts because of a certain set of rules – some algorithm, then he can be considered as an automaton as part of a control system. The distinction between automated and automatic systems disappears in this case.

Consider the stages of building an automatic control system. To conduct a feasibility study, it is necessary to adopt some criteria that quantify the quality of management. The simplest criterion is the unit cost of production.

Criteria that are more complex may take into account the quality of products, the cost over a certain time interval, and other characteristics of the production process. A rough sign of a poorly controlled production process is a significant

variance in the quality criterion when iterating multiple production cycles. For more subtle conclusions, it is necessary to carry out mathematical, physical or natural modeling of the production process from the standpoint of control theory.

The complexity of modern technologies leads to difficulties in obtaining a model of the production process. These difficulties are due to the dimension of the inputs and outputs of the control object, the structure and uncertainty of the transformations of the input streams within the control object. The nature of these transformations changes in time randomly. In complex production processes, decomposition methods are used – the division of the production process model into parts, each of which is considered as a model of an independent control object.

A mathematical model of the production process is necessary at the next stage - when choosing a block diagram of the system and determining the control algorithm. Here information about the state of the control object is essential. Characteristics of the state of the control object are derived from observations of its inputs and outputs.

This makes it necessary to study the issue of the possibility of measuring input and output quantities, measurement errors, and the reliability of the results obtained.

The dynamic properties of the production process make it necessary to include in the information about the control object the values of its input and output values not only in the current, but also in the past. In this case, the volume of information increases significantly, and the organization of information flows becomes a complex technical task, which requires special data preprocessing subsystems.

In the case when the model of the control object contains not directly observable perturbations, closed control systems are used, containing feedback, through which information about these perturbations or parameters is received.

Once the block diagram is selected, information is determined that can be used in the control device. The task of the control device is to develop a decision on the control action at the input of the control object based on this information in order to change its output value. In this case, it is necessary to establish a relationship between information about the state of the control object entered into the control device and the control action coming from the control device to the control object input.

At the stage of technical implementation, a choice of options for technical means is made for carrying out both operations for the organization or primary processing of information about the control object, and operations for calculating control actions. The use of digital computers as a control device must be deeply economically justified. Sometimes it is advisable to use a special analog or combined computer for the implementation of the control algorithm, thus providing an overall gain in a number of technical and economic characteristics of the system.

A comprehensive consideration of the stages of automation of production process control is a systematic approach to the design of automated, automatic control systems for production processes. The development of engineering methods for system design is necessary for the creation of automatic process control systems. Automation of the management of shops, enterprises and associations is partial. A person makes decisions on operational planning and production management.