



**THE ROLE OF TECHNICAL EQUIPMENT IN THE AUTOMATION OF PRODUCTION PROCESSES IN ENTERPRISES**

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**Annotation**

This article discusses the role of technical means in the automation of production processes in enterprises. Today, the automation of production is one of the key factors of the modern scientific and technological revolution, which opens up to humanity the opportunity to change nature, create enormous material wealth and increase human creativity.

**Keywords:** automation, hardware, mechanization, automatic system, product, program, enterprise, automation, model, control system.

**Introduction**

The main condition is the introduction of technical means to automate production processes in enterprises. The diversity of modern automation methods expands the scope of their application, the cost of mechanization is, as a rule, justified by the final results in the form of an increase in the volume of products produced, as well as an increase in quality.

Organizations that follow the path of technological development, occupy leading positions in the market, improve working conditions and minimize the need for raw materials. Therefore, large enterprises can no longer be imagined without the implementation of mechanization projects - the exceptions apply only to the



handicraft industry, where production automation does not justify itself due to the fundamental choice in favor of manual production. But even in such cases, it is possible to partially turn on automation at some stages of production.

In a broad sense, automation involves the creation of such conditions that allow to perform certain tasks on the production and release of products without human intervention in production. In this case, the role of the operator may be to solve the most important tasks. Depending on the set goals, automation technological processes and productions can be complete, partial or complex. The choice of a particular model is determined by the complexity of the technical modernization of the enterprise at the expense of automatic filling.

In factories and mills where full automation is carried out, usually mechanized and electronic control systems are transferred to control the production of all functions. This approach would be most reasonable if the operating modes do not involve change. In part, automation is introduced in individual stages of production or in the mechanization of an autonomous technical component without the need to create a complex infrastructure to manage the entire process. The complex level of production automation is usually done in specific areas - be it a department, workshop, line, etc. it can. The operator in this case manages the system itself without directly affecting the workflow.

First of all, it should be noted that such systems assume full control over the enterprise, factory or plant. Their functions can be extended to a specific equipment, conveyor, workshop or production site. At the same time, process automation systems receive and process data from the serviced facility and have a corrective effect based on this information. For example, if the operation of the manufacturing complex does not meet the parameters of technological standards, the system changes the operating modes in accordance with the requirements through special channels.

The main task in the introduction of means of mechanization of production is to maintain the performance parameters of the object, which in turn affects the properties of products. Today, experts try not to delve into the essence of the technical parameters of various objects, because theoretically control systems can be implemented in any component of production. If we consider the basics of automation of technological processes in this regard, then the list of mechanization objects includes the same workshops, conveyors, all types of apparatus and devices.



Input and output indicators can be separated relative to the parameters at which automatic systems operate. In the first case, it is the physical properties of the product, as well as the specific properties of the object. In the second, these are direct quality indicators of the finished product.

In automation systems, control devices are used in the form of special signaling devices. Depending on the purpose, they can monitor and manage various technological parameters. In particular, the automation of technological processes and production may include signaling devices for temperature indicators, pressure, flow characteristics, etc.

The principle of operation of control signaling devices is also different. If we look at the most common temperature devices, we can distinguish manometric, mercury, bimetallic, and thermistor models. Design is, as a rule, determined by the principle of operation, but the working conditions also have a significant impact on it. Depending on the direction of the enterprise, the automation of technological processes and production can be developed in anticipation of certain operating conditions. Therefore, control devices are also designed for use under the influence of high humidity, physical pressure or chemicals.

The quality of management and control of production processes has significantly improved against the background of the active provision of enterprises with computing devices and microprocessors. The capabilities of programmable hardware in terms of industrial needs allow not only to ensure effective management of technological processes, but also to automate the design, as well as to conduct production tests and experiments.

Computer devices used in modern enterprises solve the problems of regulation and management of technological processes in real time. Such means of production automation are called computing complexes and work on the principle of integration. The systems include integrated functional blocks and modules, from which you can create different configurations and adapt the complex to work in specific conditions. Units and mechanisms in the automation system. Electrical, hydraulic and pneumatic devices are directly responsible for the execution of working operations. According to the principle of practice, classification includes functional and partial mechanisms. Similar technologies are commonly implemented in the food industry. In this case, production automation involves the introduction of electric and pneumatic mechanisms, the design of which may include electric drives and regulators.



Electric motors in automation systems. The basis of actuators is often electric motors. Depending on the type of control, they can be provided in contactless and contact versions. When operated by the operator, the units controlled by the relay-contact devices can change the direction of movement of the working bodies, but the speed of operations remains unchanged. If the automation and mechanization of technological processes using non-contact devices is envisaged, then semiconductor amplifiers are used - electric or magnetic.

Plates and control panels. Special consoles and panels are installed in enterprises to install equipment that should provide control and supervision of the production process. They place devices on automatic control and regulation, instrumentation, protection mechanisms and various elements of the communication infrastructure. By design, such a shield can be a metal cabinet or a flat panel on which automation equipment is installed.

The console, in turn, is the center for remote control - this is the control room or the area of the operators. It should be noted that the automation of technological processes and production should also provide access to services from employees. It is this function that is mainly determined by consoles and panels, which allows you to perform calculations, evaluate production performance and monitor the workflow in general.

Design of automation systems. The main document that serves as a guide for the technological modernization of production for the purpose of automation is a diagram. It reflects the structure, parameters and features of the devices that will serve as a means of automatic mechanization in the future. In the standard version, the diagram shows the following information:

- Level (scale) of automation in a particular enterprise;
- Determine the parameters of the object to be provided with management and regulatory tools;
- Management features - full, remote, operator;
- The ability to block executive mechanisms and units;
- Location of hardware, including configuration on consoles and boards.

Despite their small role, ancillary devices provide important control and management functions. With their help, the communication between the executive devices and the person itself is ensured. In terms of equipping with ancillary equipment, production automation can include push-button stations, control relays, various switches, and



control panels. There are many designs and varieties of these devices, but all of them are aimed at ergonomic and safe operation of the main blocks.

Have you learned “technological processes and production automation” that you can’t even imagine working with? Perhaps this may indicate a serious flaw in your education, but let’s try to understand the issue together. We use automated systems every day without even realizing it.

Need automation?

Any production process is a waste of these resources. Thanks to new technologies and production methods, we can save raw materials and fuel used in the production of the product.

But what about human resources? After all, highly qualified specialists can also be involved in the implementation of other projects, and the fact that workers control the conveyor is an expensive pleasure that increases the cost of the final product.

With the invention of steam engines and conveyor manufacturing, this problem was partially solved centuries ago. But even now, most workshops in the former Soviet Union are overcrowded. In addition to the additional costs, this is fraught with the “human factor” which is the root cause for most of the problems that occur.

Today, automation of production processes has been implemented in many industries. Regardless of the size and scale of the businesses, almost all of them use software devices. There are different levels of automation of production processes. However, the same principles apply to each of them. They create the conditions for the effective conduct of operations and form the general rules of their management. The principles of automation of production processes include:

1. Solidarity. All the actions within the practice must be combined with each other, in a certain sequence. Failure to do so may result in discomfort during the process.
2. Integration Automated operation should be appropriate to the overall environment of the enterprise. At one stage or another, integration is done in different ways, but the essence of this principle does not change. Automation of production processes in enterprises should ensure the interaction of operations with the external environment.
3. Execution independence. Automatic processing should be performed independently. It does not ensure human participation or it should be minimal (control only). If it is carried out in accordance with the established requirements, the employee should not interfere in the operation.



These principles are defined according to the level of process automation. Additional proportions, specializations, etc. are determined for operations.

The cost-effectiveness of production automation is assessed in terms of indicators and value.

The technical level of modern production allows to automate almost any technological operation. However, automation is not always cost effective. Production automation is the management of various equipment, various automation tools, transport and control devices, any technological equipment, etc. Therefore, it is necessary to choose the right options for production automation and comprehensively assess their cost-effectiveness.

Efficiency of automated production. When working in a particular enterprise for the transition to automated production, the question arises of estimating the capital costs for the introduction of automation and determining the effectiveness of these costs. To do this, it is necessary to determine the composition of the costs of creating automated production and the procedure for determining the efficiency of these costs.

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