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Areas Of Application Of Automated Electric Drives In Robototechnics

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Abstract: In this article we will consider the application of automated electric drives of robotics and technical complexes and a number of production processes using industrial robots.
Key words: robotics, industrial robots, stamping, manipulators, powdered materials, lathes, welding.

INTRODUCTION

Robotics and Automated Electric Drives of Technical Complexes are included in the category of specialized subjects. Within the framework of the issues implemented in the process of mastering the academic discipline, the bachelor must have: skills in mechanical devices that move the working bodies that ensure the main functions of robotic and technical complexes, various drives; experience in designing, operating, and adjusting automated electric drives of industrial robots and technical complexes. The purpose of teaching the discipline "Automated Electric Drives of Robotics and Technical Complexes" is to familiarize students with: information about the stages of development of robotic devices and their role in production; information about the mechanical part of robots; teaching the use of robot control software; types of electric drives of robotics and technical complexes and the basic requirements for them; obtaining knowledge about power circuits of robotics and technical complexes and operating modes of their control systems.

RESEARCH METHODS

It consists of teaching the design, operation, and adjustment of automated electric drives of robotics and technical complexes. The task of the discipline is to prepare students to analyze various practical issues of application in the production of automated electric drives of robotic and technical complexes, to think independently, and to make decisions. It is important to remember that the main goal is not to buy technology, but to turn it into a lever for economic development.

RESULTS AND DISCUSSIONS

When introducing robots into production, it is necessary to divide the technological processes necessary for robotics into stages. Only then will it be possible to develop a procedure for solving the most important technical, economic, and social problems. The first stage includes work involving heavy physical labor, including loading, unloading, and the use of radioactive materials; very high and low temperatures, high humidity and vibration, polluted air, high noise levels, uniform and repeated work; and automatic control of equipment, lines, and sections, which perform the function of various technological, transport, and other equipment.

Below, we will consider a number of production processes using industrial robots. Modern industrial robots and automatic manipulators are widely implemented in the main processes of casting production (from the preparation of raw materials to cleaning, heat treatment, control and testing, loading and unloading, transport and warehouse operations, etc.). Expanding the use of robots in casting allows for the implementation of control systems in shaping, assembly, forming, and similar processes.

Temirchilik - stamp works. In various sectors of the national economy, parts of various shapes and sizes are obtained by cold stamping using pressing. In serial and small-scale production, the stamping and removal of the workpiece are most often carried out manually. Boring and monotonous work, in turn, leads to the occurrence of trauma. Now, the automatic transfer of the workpiece to the stamp and the removal of the stamped part are carried out using various industrial robots and manipulators. The robots used for this purpose should have fast-acting transmissions, reliable control systems, universal or easily replaceable magnetic, vacuum, and similar grippers.

Making an item from powdered materials. In the production of products using the powder metallurgy method, industrial robots are used for the placement and removal of the press-form into the pressing

equipment, lubrication of the shaping surfaces of the press-form, removal of the finished product from the press-form, pouring into a thermal furnace, and similar auxiliary operations. In addition, robots are used in a number of technological operations for laying thermoplastic materials, as well as in loading, unloading, placement, and control work.

Welding production. In welding production, industrial robots are primarily used for performing the main technological operations of direct welding. The main tasks that universal and specialized industrial robots must perform in welding work include: installation and removal of the device to technological or other equipment, assembly of parts and assemblies before welding, preparation of the part for welding, removal and removal of the welded part from the working zone, performing the main welding technological operation, if necessary, forging the workpiece before the welding process, alignment of the part and welded part - installation in the device, cleaning of welded joints, weld quality control, automatic or flow line operation control, etc.

Thermal production. Considering that some robotic operations in heat treatment occur at temperatures exceeding 10000C, the trapping devices should be made of heat-resistant material that does not change their parameters even at high temperatures. The work that industrial robots can perform during heat treatment includes: preparing the product for heat treatment, transferring and placing it in a heat furnace, cleaning, retrieving, straightening, controlling the hardness and quality of the product, controlling the operation of equipment, etc.

Mechanical processing. One of the main features of serial, small-batch, and piece-by-piece production in mechanical processing is the low machine time. In the general cycle of machining, the time spent waiting for and transporting parts constitutes 95% of the time spent on manufacturing these parts. The use of robots allows increasing the utilization coefficient of equipment, reducing the production cycle, and improving product quality. The versatility of industrial robots allows their use in automating auxiliary operations of various metal-cutting machines. In most cases, each robot can serve two or more machines. Ordinary machine tools automated with the help of robots often do not lag behind specialized machine tools in terms of productivity and are cheaper. When using sliding robots, a single robot can serve a group of machine tools for section and flow lines.

The main and auxiliary operations that must be performed using industrial robots for machining include: installing and removing devices on various metal-cutting machines and complexes, servicing digitally controlled and grouped universal machines, section and flow lines, installing and removing workpieces, tools, and devices, monitoring and testing technological operations (drilling, grinding, polishing, etc.), performing inter-operational and intra-workshop transport operations, managing the operation of technological and transport equipment, etc.

One of the variants of robotic flow lines is a line organized on the basis of an industrial robot model "Universal 5." This line consists of eight metal-cutting machines equipped with four Universal 5 robots. There are sections consisting of one robot and two machines on the line. The sections are connected to receiving and transmitting devices.

In this line, industrial robots perform the following operations: supply the machine tools with a workpiece, hold the incoming workpiece; transfer the workpiece from machine tool to machine tool; correct the direction in space before installing the workpiece on the device; install the workpiece on the transmitting device, etc.

The first section of the robotic line consists of a centered milling machine of the MR G6A model and a program-controlled lathe of the GE61MFA model, the second section - of two copying lathe of the 1A616S model, the third section - of a lathe of the 1E61MFA model and a grinding machine of the VT 53 model, and the fourth section - of a grinding machine of the VT 53 model and a thread-cutting machine of the UPW 12.5x70 model.

Robotic complexes implemented in the form of sections, in turn, allow for the implementation of flexible production systems, as each machine tool in the complex allows for the processing of various parts. One of such complex sections is TUR 1.

Surface coating processes. Industrial robots are widely used for coating the surface of products with metal or powdered polymers, galvanic coating, and painting by various methods. When metallizing the surface of an object, robots perform tasks such as surface preparation (cleaning, polishing, etc.), transferring the object

and installing it on equipment, removing the object from the working zone after metallization, and finally, directly coating the object's surface with metal. When using the galvanic coating method, robots serve the equipment, prepare the surface for coating, and finally, carry out the coating process.

Gathering works. Special industrial robots are being used to automate the main and auxiliary operations in assembly work. The use of robots frees the operator from a lot of physical work, ensures the smooth operation of the process, and prevents errors that may be made by the operator. The possibility of automating assembly work using robots increases when there is a straight-line direction in the transfer of products and when installing them in the device.

Automation of control, transport, and warehouse operations. Robots are used in automating a number of control works, analyzing the chemical composition of alloys and other materials, preparing standard parts for control and installing them on equipment for control, conducting tests, etc. When using industrial robots in warehouse management, tasks such as systematic stacking of parts, their placement, search, and transportation according to a designated program can be carried out.

CONCLUSION

In general, industrial robots can be used in construction, the light industry, pharmaceuticals, postal services, and other sectors, as well as in scientific research. For example, in the textile industry, when transporting materials piece by piece, when fitting sewing materials together, when sewing buttons, and when stacking and transporting postal cargo, etc. In the service sector, robots can act as guards, gardeners, wash dishes and clothes, work at gasoline distribution stations, collect garbage, sell individually sold goods, and place food orders. Robots can also work in an automatic fire extinguishing system and control traffic rules.

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