



MECHANICAL ENGINEERING ROBOTS ARE THE FOUNDATION OF OUR FUTURE

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Abstract

In the conditions of the accelerated scientific and technical progress when there is a frequent change of objects of production and requirements to quality of products raise, technological systems have to be fast-readjusted on release of new products on more progressive technology. In these conditions use of industrial robots on the main technological operations, at auxiliary and transport works allows to create the multipurpose, easily readjusted technological systems. Such systems form essentially new technical means capable to react quickly at change of objects of production. In article advantages of use of robots manipulators at machine-building enterprises are considered.

Keywords: industrial robot, robotic arm, welding, CNC machine, six degrees of freedom, FANUC, R-1000iA/80F, precision, performance.

Аннотация

В условиях ускоренного научно-технического прогресса, когда происходит частая смена объектов производства и повышаются требования к качеству продукции, технологические системы должны быть быстроперенастраиваемыми на выпуск новой продукции по более прогрессивной технологии. В этих условиях использование промышленных роботов на основных технологических операциях, на вспомогательных и транспортных работах позволяет создавать многофункциональные, легко перенастраиваемые технологические системы. Такие системы образуют принципиально новые технические средства, способные оперативно реагировать при изменении объектов производства.

Ключевые слова: промышленный робот, машиностроение, робот-манипулятор, сварка, станок с ЧПУ, шесть степеней свободы, FANUC, R-1000iA/80F, точность, быстрдействие.

The concept of industrial robots and their classification.

Industrial robots replace humans in heavy, monotonous, dangerous and unhealthy jobs. Robots are used to automate various technological, transport and handling operations.

Industrial robots are classified by purpose, control method, design parameters, motion accuracy, speed.

Depending on the nature of the functions performed during the implementation of the technological process, robots are divided into main and auxiliary. The main ones include robots - manipulators that perform such operations as welding, soldering, assembly and others.

To auxiliary - installation of the workpiece in a fixture, machine; placing a part or blank on a conveyor; waste disposal (chips, etc.), size control. Figure 1 shows a robotic arm inserting a workpiece into a CNC lathe.



Figure 1—Robot manipulator sets the workpiece into the machine
The principle of operation of the robot-manipulator and its control.

Industrial robotic manipulators have six joints, outwardly they resemble a human arm (shoulder). The arm is mounted on a fixed base, therefore such a robot has six degrees of freedom, which means that the manipulator can move in six different directions.



Figure 2 shows a tapping-manipulator.

The robots are equipped with a mount, which can be equipped with various devices for gripping a workpiece, part, semi-finished product. It resembles a human hand (hand), which allows the robot to “grab” and move the required item, install them in the machine, remove them after processing, change the cutting tool, put parts and blanks into storage containers, and so on. Very often, manipulators have built-in pressure sensors that can control the grip force. You can control the robot using a program, adaptive control (sensor devices), remote control of people and using artificial intelligence.

Components of an industrial robotic arm.

Robotic manipulators are classified by carrying capacity, by reach, by the number of rotation axes, by working in dangerous and aggressive environments, by arm drive and the drive of the robot itself, and so on. Figure 4 shows the robotic arm of the Japanese company FANUC, model R-1000iA/80F.

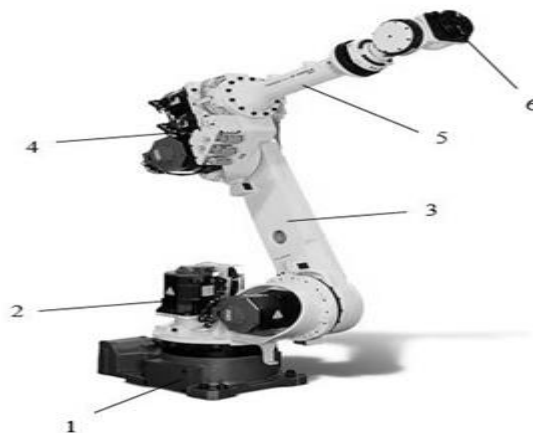


Figure 3—Robot manipulator of the Japanese company FANUC R-1000iA/80F:



1-base; 2-robot drive; 3-body; 4-hand drive; 5-robot hand; 6-fastening for the working body (grip).

This robotic manipulator feeds the workpiece into the machine, changes the metal-cutting tool, takes it and puts it back on the conveyor for further processing on other machines.

Due to the fact that not only a device for gripping workpieces and tools, but also a device for welding can be inserted into the working body, it makes this manipulator functional.

Benefits of using robotic arms.

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The advantages of using robotic arms are:

- Fast payback of the robot, despite its high cost;
- Increasing labor productivity;
- Improved economic performance;
- Increasing the accuracy of technological operations;
- Use in dangerous conditions for humans;
- Deliverance of a person from monotonous and routine work;
- Ability to use the robot in three shifts;
- Flexibility and autonomy of the control system.

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