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Classification of Machine Control Systems and Automated Systems

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Abstract: This article deals with mechanical processing of workpieces, software, automatic control of machines, numerical control systems based on software used on milling machines, continuous comparison of the actual size of the workpiece or the actual movement of the machine unit with a given program during machining of parts in closed systems and the use of automated systems in the machining, assembly, and packaging of various parts.

Keywords: blanking, machining, software, bench, automatic control, machine, detail, system.

When machining workpieces, it is necessary to ensure a certain sequence of work movements and additional movements. This sequence is called a program. Devices that act on machine tools are called control systems.

Preliminary information (drawings, technological documentation) of the manual control program on machine tools, as well as measuring the work of the machine and the instrument, as well as the operator himself on the basis of current information collected based on the results of observations.

Automatic control of the machine keeps the whole program in the fall, recording and execution using a special software carrier - a memory device. Adjustable racks, handrails, copers, typewriters and others are used as software carriers. Digital program-based control (DPC) is a type of automatic control. It plans to record the program in alphanumeric code in the fall.

There are two types of numerical control systems used in milling machines: open and closed. In open systems, the flow of information to the computing device is one. When the software tape moves through the computing device and the decoder, command signals are generated at its input.

However, usually these signals do not have the power needed to move the executive. For this reason, amplifiers are often used to amplify signals in automatic device systems. The amplified signals fall on the drive, which drives a certain unit of the machine to the required position directly or through intermediate mechanisms. Here the movement of the working bodies is precisely dosed with stepper motors. This system is simple and inexpensive, but its accuracy and precision are lower than those of feedback control systems.

In closed systems, the actual size of the workpiece or the actual movement of the machine unit during the workpiece is continuously compared with the given program. In the calculation of a given program, command signals are generated at the output of the computing device and the decoder and go to the comparator. The sensor measures the actual movement magnitude or blank size of the lathe and converts it into a feedback signal, which is then directed to the comparator.

In the comparator, the signals from the feedback sensor are compared with the signals from the computing device and the decoder.

If there is a difference between the given magnitude of the motion and the actual magnitude, a signal corresponding to that difference will appear at the output of the comparator. This signal is transmitted through an amplifier to the actuator, which adjusts the work of the machine to the given program.

In analog software-based control systems, information travels from the programmer or feedback sensor to the comparator in a modified form, rather than in numeric code. An analog that is proportional to the given number is used. Software-based coding systems are based on the use of special coded sensors. Indicators of the actual displacement in the numeric code are taken from the sensor and compared to the program, which is calculated from the perforated.

In program-based control pulse systems, the principle of comparing the number of pulses coming from the initial program to the number of pulses produced by the feedback sensor according to the actual magnitude

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of the shift is used. When the given number of pulses and the number produced by the feedback sensor match, the drive motor is switched off.

Software-based control systems are divided into positional and contour types depending on the technological function. Typically, the positional systems of the SDB are given in right-angled coordinates for independent movement of the machine working bodies. They are used to automate drilling and coordinate washing and expansion machines. Contour systems of DPC are designed for processing of complex shaped details at the expense of corresponding displacements of working bodies on several coordinates. Digital programming uses two-coordinate, three-coordinate, four-coordinate and even five-coordinate control systems.

In order to reduce the downtime associated with equipment failure in recent years, great attention is paid to the diagnosis of the bench-SDB system. For example, SS-type DPC devices have errors in programming the following parameters, errors in machine maintenance, errors in machine maintenance, controls the failure of electronic blocks, the temperature in the control cabinet exceeds the set value, the condition of the mechanical components of the machine, and so on. Soda systems, in which the control program is entered manually directly from the keyboard in the workplace, are widely used. They are designed for contour control of universal machines in individual and serial production. The use of such systems reduces the time to reset the machine while maintaining high accuracy. Due to the compactness of the system, it can be installed directly on the machine.

Machine tool control systems with DPC devices (for managing multiple machines) perform the following functions: distribute the detail processing program; monitors the operation of datsgohs and detects errors; provides the necessary information for the management of datsgohs; assesses the condition of datsgohs; checks and corrects programs in the workplace, etc.

Assembly is the final step in the production process. In this case, the finished product is assembled from separate parts and components. The quality of assembly work has a significant impact on the reliability and durability of machines during operation.

If the assembled product-machine-individual parts are not attached to each other with sufficient accuracy, even if these parts are made with the specified accuracy, they will not work qualitatively and reliably during operation.

Therefore, in mechanical engineering, great importance is attached to the assembly process. It can be added that the scope of the collection work is very large; for example, in agricultural machinery, 20-30% of the total workload is harvested, while in other machines, 40-60% of the total work is harvested.

The ratio of the time spent on the assembly to the time spent on the preparation of the part, as well as the time spent on the individual stages of the assembly process depends on the type of production and methods of assembly.

Assembly time is approximately the following percentage of machining time:

1. 40-50% in individual and small series production; 30-35% in medium series production;

2. 20-25% in large series production;

3. less than 20% in mass production.

In addition, the use of automatic systems in the machining, assembly, packaging of various parts leads to the solution of many design problems.

Systems are divided into two classes depending on the type of operation:

a) synchronous-rigid and

b) synchronous flexible. In a synchronous automatic system, the blanks are transferred from machine to machine at the same time during processing. In an asynchronous system, the parts being machined are not organically connected to the conveyor, they can be assembled at the machining site, which ensures that the machining process does not stop.

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Synchronous systems consist of benches, each of which is equipped with a bunker and a store for storing details. Because the benches are flexible, they have the ability to work independently of each other. According to the description of the transport can be divided into processing or assembly system - stationary, rotor and chain. In stationary systems, the details are characterized by the fact that they do not change their position relative to the machine. In rotary and chain systems, the parts move continuously. Each rotor bench rotates continuously around its axis at a set speed. In this case, the processing of the detail is inextricably linked with the transfer.

Part of the time is spent on machining, the rest on pushing the cutting tool and ensuring that the part moves from one rotor - machine to another. *Scraper for taking any wastes.* The most common scrapers in automated systems are auger and scraper conveyors. They are mounted under the counter. The auger conveyor is used in the processing of steel and aluminum scraps obtained with or without the use of coolant during processing. Auger diameter 100-250 mm, total length 25-50 m for single auger, 40-50 m for two auger conveyor.

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