



"INCREASING THE PRODUCTIVITY OF MANUFACTURING BODY PARTS BY DESIGNING TECHNOLOGICAL PROCESSING ON CNC MACHINES"

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Abstract: *The article contains a generalization of the purpose, design, technical requirements, methods of manufacturing blanks of Body parts. Description of CHPU machines, their advantages, operations performed. Improving the efficiency of the production process with the latest 5-axis CHPU machine.*

Keywords: *Housing, prismatic, flanged, gray cast iron, ductile iron, carbon steel, earth and rod molds, CHPU (Numerical Software), five-axis machine.*

The figures of the technical sphere know that the cabinet-type parts serve to accommodate assembly units and individual parts. A feature of the housings is the presence of support extended and precise planes and holes. The housings are of the prismatic type and flanged.

For the manufacture of blanks of body parts, gray cast iron, ductile iron, carbon steels, heat-resistant steels are most often used, they are more often cast in earthen or rod forms, but for the manufacture of cases of a more complex design and the requirements of roughness accuracy, casting in shell molds and in molds is recommended.

As you know, after manufacturing the workpiece of the part, it is necessary to design the technological route of processing the part, in this case the housing. It is necessary to choose the optimal methods of processing and machines for carrying out operations.

Numerical Control machines (hereinafter referred to as CHPU) help to reduce costs, improve the quality and speed of their creation. The worker is required to put a program written in numerical form into the machine, and then check the quality of its execution through the operator panel. Switching between different modes and parameters of operation, product dimensions, accuracy of execution occurs automatically.



They perform a wide range of operations: drilling, turning, milling, grinding and so on. The same machine is capable of performing several different operations, automatically reconfigured in accordance with the specified program. The operator is not required to reinstall the workpiece manually: the unit itself will move it to the desired position and perform all the necessary actions. Time is saved, among other things, due to the fact that employees do not have to move the same part from one machine to another, moving around the shop for this. Accordingly, the production can fit into a more compact room — since, relatively speaking, instead of three machines, it is enough to install one.

One of the most modern CHPU machines are 5-axis machines.

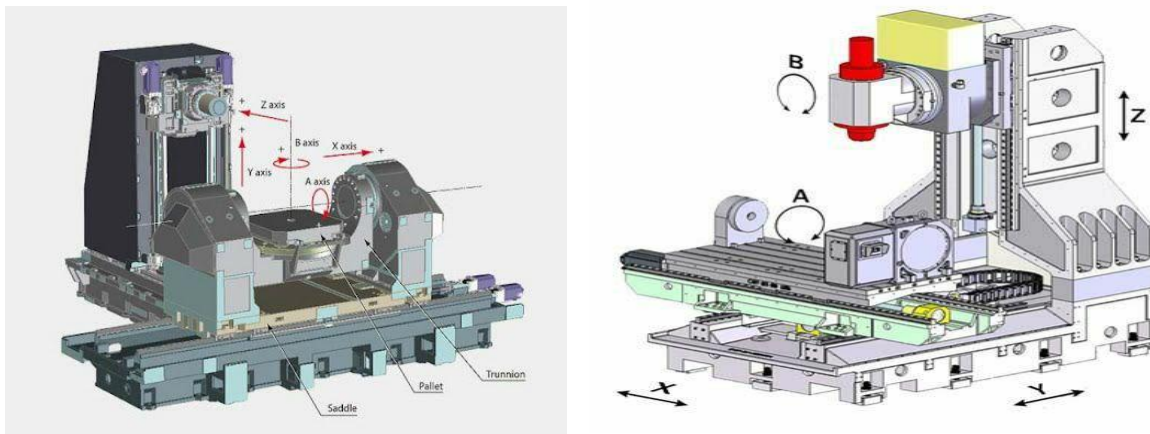


Fig.1 Types of modern five-axis CHPU machines

Five-axis (5-axis) machining of housings and other parts is a unique 3D milling technology that allows you to obtain products of complex spatial shape with high dimensional accuracy and relative positioning of surfaces. Initially, 5 coordinate machines were developed for the aviation and space industry, where the most stringent requirements are imposed on the quality and accuracy of complex parts.

The five-axis machine with numerical control G-2030-5S performs processing of body parts in automatic mode according to a given program. The peculiarity of the equipment is the presence of a two-axis rotary milling head. The machine has 5 degrees of freedom: the milling cutter not only describes the trajectory in three Cartesian coordinates, but can also be rotated at any angle to the surface being processed. Thus, the movement of the cutting tool in five different directions is ensured. Two additional coordinates allow you to process parts of increased complexity that cannot be obtained on three-coordinate machines.



The calculation of cutting modes is carried out in automatic mode – for this, a digital 3D model of the part is loaded into the program. The CAM system converts the geometric parameters of a three-dimensional model into the trajectory of the cutting tool. The computer optimizes cutting modes to ensure maximum CHPU machining performance with minimal tool wear. Control of the actual trajectory of angular and linear movement of the tool is carried out by special precision sensors. If there is a processing error, the software package automatically compensates for it.

The five-axis CHPU machining center G-2030-5S allows you to manufacture body parts of complex configuration from a single blank. The equipment is used for the production of medical equipment cases, devices, architectural elements, exhibition prototypes, advertising layouts. Solid housings are stronger and more reliable than prefabricated ones. If before the advent of CHPU machines, a monolithic body could only be obtained by casting or stamping with subsequent machining, today the most complex geometry is reproduced in a matter of minutes with guaranteed accuracy on a milling machine. The monolithic housing of a complex configuration is made from a single installation – and for this you do not need to mill and assemble individual parts, reinstall them several times during processing on a CHPU machine, make special equipment for their basing. Without removing the part from the machine, we get a set of structural elements:

- holes at any angles;
- stiffening ribs;
- bosses;
- rounding;
- screw and threaded surfaces;
- galleti;
- internal and external grooves;
- grooves, chamfers;
- shaped elements.

The workpiece is processed without resetting, thereby eliminating the error associated with the relocation, and reducing the total manufacturing time of the part. The G-2030-5S machining center is equipped with a linear tool change shop for 10 milling cutters. The tool



changes automatically according to the specified program. One five-axis machine in its functionality can replace an entire line of machining equipment. High productivity, automatic change of milling cutters, processing in one installation - all these factors reduce the cost of manufacturing body parts in mass production.

In the era of advanced technologies and an assortment of modern equipment, it would be advisable to use the latest equipment to increase production efficiency, improve the quality of manufactured enclosures, save time, minimize heavy human labor for light physical exertion and mental skills of working with programming and modern technologies.

The resulting parts have high accuracy, meet all technical requirements, and the release time is significantly reduced.

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