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Research Article

16K20F3 LATHE CNC MACHINE UPGRADE TO MILLING CNC MACHINE

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ABSTRACT

The article discusses the practical experience of modernizing the 16K20F3 tool machine for tool processing. It describes a deep modernization with a complete replacement of all drives, electrical and control systems. The goal is to consider the use of modernization of outdated metal-cutting equipment for modern technological tasks as one of the economically feasible options, alternative to the purchase of new expensive equipment. The use of aggregation allows in the process of modernization to create technological equipment for a specific group of products with the implementation of an optimal technological process. Simultaneous equipping of the machine with a modern control system, as well as assemblies and equipment for CAM technologies and HSM-technologies, allows you to get a qualitatively new equipment.

KEYWORDS

Equipment, working parts, operation, old units, application, perfect accuracy, outdated controllers, combining elements; 3D model, overhauled machines, mechanical stresses.

INTRODUCTION

The progress in all sectors of the national economy is inextricably linked with the level of development of the country's mechanical engineering and machine tool engineering, which is its main branch. It is also characterized by the constant complexity of design due to the requirements to reduce the time of mastering new products.

The level of mechanical engineering largely determines the quality and quantity of products produced by all sectors that ensure the functioning of the market economy. Therefore, attention is being paid to the effective development of mechanical engineering.

The development of computer technology, which led to the creation of flexible production systems, had a special impact on modern engineering. Such complexes, formed on the basis of numerically controlled control computers and machine tools, as well as industrial robots, have firmly entered the equipment of modern machine-building plants.

The restructuring of machine-building production in our country led to a sharp decline in the production of machine tools with digital control and automation equipment for machine-building. However, the development of a network of small enterprises that could not afford expensive automated technological equipment led to the need to modernize the equipment, including the CNC, which includes the 16K20F3 machine.

In such conditions, a new approach is needed that meets modern requirements and is able to increase labor productivity with small investments with a constantly changing range of manufactured products. .

Such upgrades are useful for small and medium-sized businesses, because they allow to have a minimum number of machines with many different processing methods in their composition. This direction was developed in our master's thesis. Work subject is the modernization of the 16K20F3 CNC machine tool to the turning-milling CNC machine tool.



Figure.1 16K20F3 Lathe - screw cutting machine CNC

In our country, it is inextricably linked with the level of development of mechanical engineering and machine tool engineering, which is its main branch. The increase in the range of manufactured products and the frequent changes in production capacities, as well as the adoption of new products is characterized by the constant complexity of the design due to the requirements of time reduction.

Modernization of an outdated machine tool with aggregate elements for certain technological tasks is one of the ways to solve the problem of raising the general mechanical engineering and, in particular, metalworking to a modern level without large capital expenditures.

METHODS

Advantages of modernization of machine tools
The main advantage of overhaul and modernization of the machine tool is primarily to increase its efficiency and accuracy of machining while reducing costs. Complete overhaul of the machine tool is the restoration of the machine geometric system to the condition defined by the general technical acceptance conditions of the new machine tool, and hence to adapt the machine to the minimum health and safety requirements. Overhauled machines have the advantage over new ones that their body is already naturally seasoned, thanks to which we

avoid mechanical stresses. Such a body maintains its geometry in the long-term perspective and more effectively suppresses vibrations. In addition, after the installation of a new control system, the functionality of the machine increases significantly and is equal to the new machine tools. Depending on the complexity of the machine, various control variants may be used, e.g.

- in simple machines – logic control system based on relays and contactors,
- with more complex machines – recommended use of PLCs (the brand of the controller is determined by the customer),
- CNC numerical control in machines requiring such system (Siemens, Fanuc, Mitsubishi)

Depending on the scope of repair and modernization of the machine tool, we can save mark able cost which appears in relation to the purchase of a new machine.

At FERPI MECH-TECHNO unitary enterprise, our team brought a derelict 16K20F3 machine ready for modernization by cleaning the body parts, painting and taking all precautions. In addition, we ordered and brought the necessary equipment for the modernization of this machine from China.

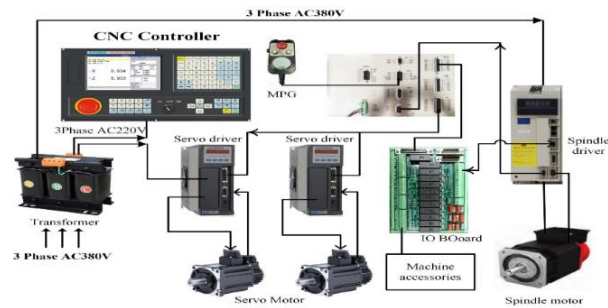


Figure.2 Installation devices for the 16K20F3 machine

Installation devices for the 16K20F3 machine.

- 3 servo motors (4 kW) and 1 (7.5 kW)
- CNC remote control
- Special cables
- Resistor 70 Ohm
- IO board

All three servo motors needed for the modern upgrade of the 16K20F3 machine were mounted on the machine in all axes. These servo motors serve to perform movements along three axes, and we have connected these motors to special drives to ensure movement along all axes.

RESULTS

To modernize the 16K20F3 machine, servo motors, servo drives, operation panels and a number of push cables and relays were used. The assembly of the electronic cabinet of the machine tool is very beautiful and assembled according to the standard. The machine tool is currently used in the unitary enterprise "FERPI-MECHTECHNO". The machine tool was assembled with high accuracy and quality. Using the machine tool in the preventive state required a lot of hard work. When writing the program to the machine tool, G codes were entered as letters, numbers and numbers.



Figure.2 New and old panel management of the machine

Modernization was carried out in order to solve the issues of increasing the machine's productivity and working capacity, as well as expanding the technological capabilities that allow processing parts of various shapes. The 16K20F3 CNC lathe has a special device for screw milling. In the course of work, the optimal modes of screw processing were selected based on calculations and experiments. Motor-spindle is also selected. The selection of equipment was made using modern references and the Internet. Maximum processing power, rotation speed and minimum price were used as selection criteria. The parameters of the developed special device fully correspond to the requirements of the technical conditions. Technical documentation for the device has been prepared.

CONCLUSION

16K20F3 the process of modernization of the CNC machine tool for turning - screw cutting. To achieve production efficiency by equipping existing local technologically unsuitable machine tools with modern parts in machine-building enterprises, and to achieve economic efficiency by replacing expensive technological equipment purchased from abroad with local technological equipment, as well as other types of machine tool and localization of modernization. The process of modernization of the 16K20F3 lathe is to increase the production efficiency by equipping existing obsolete machines in machine-building enterprises with modern working parts, and to achieve economic efficiency by replacing expensive technological equipment purchased

from abroad, and to localize the modernization of other types of machine tools.

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