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MODERNIZATION OF CNC MACHINES

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ABOUT ARTICLE

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Abstract: Modernization of an outdated machine tool with aggregate elements for specific technological tasks is one of the ways to solve the problem of raising general mechanical engineering and, in particular, metalworking to a modern level without significant capital investments. The article discusses the importance of modernization of an outdated machine-tools which can be useful for students studying in the field of mechanical engineering as well as for factories which are intended to produce metal-based goods, using different types of machine-tools.

INTRODUCTION

The development in all sectors of the national economy is inextricably linked with the level of development of the country's machinery industry and its main branch, the machine tool industry. Modern domestic and global mechanical engineering is characterized by the constant complexity of design due to the increase in the range of manufactured products and frequent changes in production capacities, as well as 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. 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. Today, factories mechanize and improve technological equipment need tools, it is necessary to create new high-performance technological equipment. 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.

Modernization of CNC machines.

The modern path of development of the machine tool industry can be described as a focus on the creation and production of CNC turning, milling and turning-milling equipment that will be able to work with certain parts. It is also important to develop a function for a milling machine exactly the opposite. Today, many leading manufacturers of such CNC units produce them with a configuration of two computer architectures, control is carried out by two axes and 4 channels, have high processing speed and perfect accuracy in creating parts. If we talk about the cost of such equipment, then it costs an average of 15,000 euros, and this is just in the basic configuration with minimal, additional functions. If we talk about the complete set, then such an SPU can cost from 60,000 euros. It is impossible to produce such equipment in Uzbekistan, because there is no corresponding technical capability, but the demand for units is constantly growing. The current economic and geopolitical situation in the country should also be taken into account, due to which the situation with import substitution is one of the most urgent at the moment, it requires a progressive solution and the creation of the necessary technical base so that many areas of the economy can be developed in the future. The country still has a high level of extraction of various raw materials, with which the largest industrial enterprises work. This causes the need to actively develop the metalworking industry, create the necessary conditions for the safety of all labor processes, so that you can increase the productivity that is necessary to meet your needs. But if we consider small industries that belong to small enterprises, as well as take into account representatives of medium-sized businesses, as well as representatives of a new, only developing business, then everyone is well aware that they cannot afford to purchase expensive and high-quality equipment from global corporations - manufacturers. Against the backdrop of this situation, many entrepreneurs use old equipment that needs to be updated and improved, replacing outdated controllers and drives, and other components. As a result, it turns out that the issue of improving the CNC, which is used today in Uzbekistan, is very relevant and requires modern solutions, among which it is possible to create updated equipment. Due to the fact that axial units, digital drives and components, linear and ring motors are used, the CNC can be upgraded with additional units and modules. This technique allows you to get modernized machines. With the use of integrated CAD/CAM systems, as well as modern drives and CNC systems, it is possible to increase the productivity of the industry, alleviate service needs. Unfortunately, the products of well-known global manufacturers are not always affordable for representatives of small and medium-sized businesses that produce small products. The same situation is with young startups that do not yet have sufficient financial resources. This situation forces many enterprises to upgrade the CNC if their production lines are equipped with old units. Based on the foregoing, we are talking about the fact that the country is actively looking for solutions to improve outdated equipment so that the machines can work with specific technical tasks. To solve this problem, the basic modular principle of designing or updating the machine is used. CNC systems are capable of performing a variety of tasks when upgraded with additional modules. By applying such

steps, it is possible to carry out stepwise processing with several operations, for example, turning, drilling, grinding, etc., with the help of which the processing of a wide variety of parts can be carried out. The production of such products requires high precision and speed without the direct participation of the worker. Thanks to the ability to modernize old units and make them more productive CNC, it is possible to increase many areas of production in the country, to make work processes more flexible and accurate.

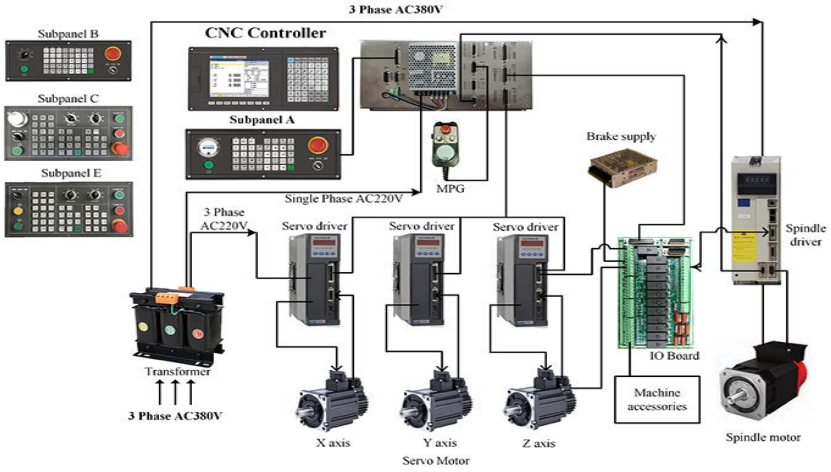

Fig. 1.1. CNC Machine Control System

Analyzing our version of the decision on the issue of modernizing CNC machines, it is clear that taking the old unit as a basis, it is really possible to improve it, to make modern equipment that meets international performance standards.

- Modern systems have high performance, the CNC is able to support about 16 interpolated axes, they are easily introduced into a wide variety of technological equipment;
- They can be immediately installed on equipment of any, even foreign-made, with a pre-configuration function, on productive transistor switches;
- Ball screws are ready-to-work assemblies produced by foreign companies, capable of performing a variety of technical tasks;
- Guides of linear and roller properties are also ready-made units and are produced for any technical and physical parameters;
- To work with additional axes, linear drives are used (also ready-made, universal modules);
- Ring motors (high-speed and power) work with gears, which helps to simplify the structure of the module;
- Motor spindles designed to work with different types of equipment: with installed power and high-speed motors, vector, with frequency control, etc.;
- Stations designed to control the temperature regime in spindle modules, linear guides;
- Coolant stations;
- Equipment for organizing the safety of guides;
- Newly introduced CAD/CAM features direct 3D modeling, capable of creating every step of the workflow that fully meets the world's quality standards.

After the necessary components and parts are selected, such as drives, CNC and others, in order to solve the specific production task, it is necessary to design the parts necessary for these tasks in order to be able to connect it to the basic configuration of the machine. This described approach for upgrading obsolete equipment is an excellent productive solution with which it is possible to create flexible workflows that will occur with minimal time costs. The solution allows to solve many production problems: to reduce financial items of expenses, to simplify the technological stages of production, to increase productivity. In order to carry out maintenance of the unit using the solutions described above, not several specialists are required, but only one worker who will configure, manage and service the equipment. One operator is able to control several CNC machines.

Fig 1.2. FP17SMN4 Vertical milling machine in the process of modernization.

We are carrying out a practical modernization of the FP-17SMN4 vertical CNC milling machine. The machine will be modernized for high-performance mechanical processing under "FarPI MECH-TECHNO" conditions. The following pictures above show equipment which are being assembling into the FP-17SMN4 vertical milling machine to produce metal-based operations which can be both useful for students studying in the field of mechanical engineering and metal processing for production. Therefore, we collected working parts with our team and prepared them for modern modernization.

At FarPI MECH-TECHNO, our team brought the obsolete FP-17SMN4 vertical CNC milling machine to a state of readiness for modernization by cleaning the body parts, painting and taking all precautions for modernization. In addition to these, we are using ordered the necessary parts for the modernization of this machine brought from the Chinese market.

CONCLUSION

The updating of machine-building production in Uzbekistan 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. 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.

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