Design Of Technological Processes For Machines Controlled By Digital Programs With The Help Of Compus Software

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Annotation
This article discusses the Siemens NX 12.0 software used in the mechanical engineering and manufacturing industries, as well as the design of technological processes for computer numerical control machines using this software
Keywords: Software, Detail, CNC, design, technology, CAD, CAM, CAE.

The labor intensity and cost of technological preparation of machine-building production (ITC) are increasing from year to year. Over the past 20 years, labor intensity has increased 3 times. Therefore, the complexity of ITC is increasing. These are due to the following reasons:
1. Machines and devices are becoming more complex every year and are switching to electronic systems. New materials are being used as the material for their parts, high accuracy is required in the production of spare parts and assemblies. This complexity leads to an increase in the labor intensity of designing technological processes.
2. Currently, numerically controlled (NC) machines are widely used in industry. They require the development of operating technology and the creation of control programs, which also leads to an increase in the complexity of designing technological processes.
3. Currently, it is necessary to design high-quality technological processes, that is, the products produced by these processes must fully meet the requirements of the Design and have a minimum cost, therefore, it is necessary to design optimal technological processes. The profitability of the enterprise largely depends on this.
Currently, in manufacturing enterprises, machines and parts are designed using programs such as Kompac 3d, CATIA, Siemens NX and others. Of these, the capabilities of the Siemens NX application package in creating three-dimensional graphics and modeling are several times higher than those of other three-dimensional application packages. When creating a three-dimensional model, the entire process from its simple drawing to its production is carried out in one system. In addition, the process of working in this application package allows not only to create three-dimensional graphics, but also to conduct testing experiments on the computer itself, without producing it. In a word, the NX program embodies CAD (computer aided-design)/CAM (computer aided-manufacturing)/CAE (computer aided-engineering) systems (Fig. 1).

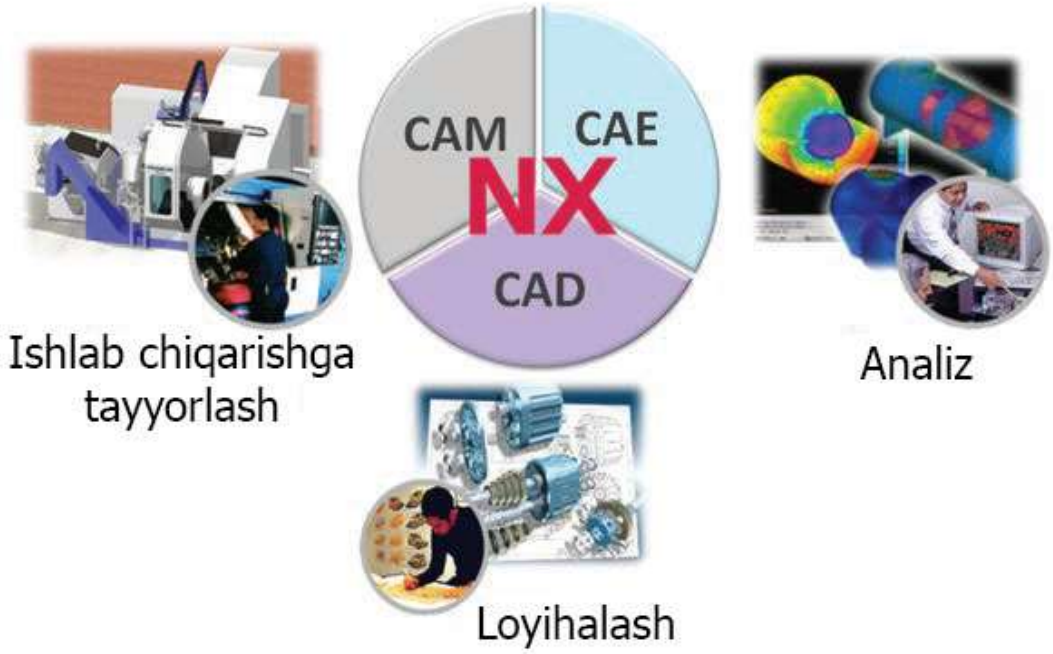

Figure 1. CAD, CAM, CAE systems in Kompac 3d.

Siemens NX is a software product from Siemens PLM Software and is designed to work on almost all operating systems. NX software is widely used in many industries - aerospace, automotive, medical equipment, as well as industrial construction.

The NX automated design system opens up a wide range of opportunities for designing and programming simple parts along 2 and 3 axes, and complex and shaped parts along 4 and 5 axes, prismatic and free-form.

NX is the most convenient software for solving the problem of developing high-quality parts in a short time. One of the advantages of the program is that the entire process, from designing a part to manufacturing it, is implemented in a single system. The part to be manufactured is designed in the CAD part of NX. The part processing program is created in the CAM part (Figure 2)

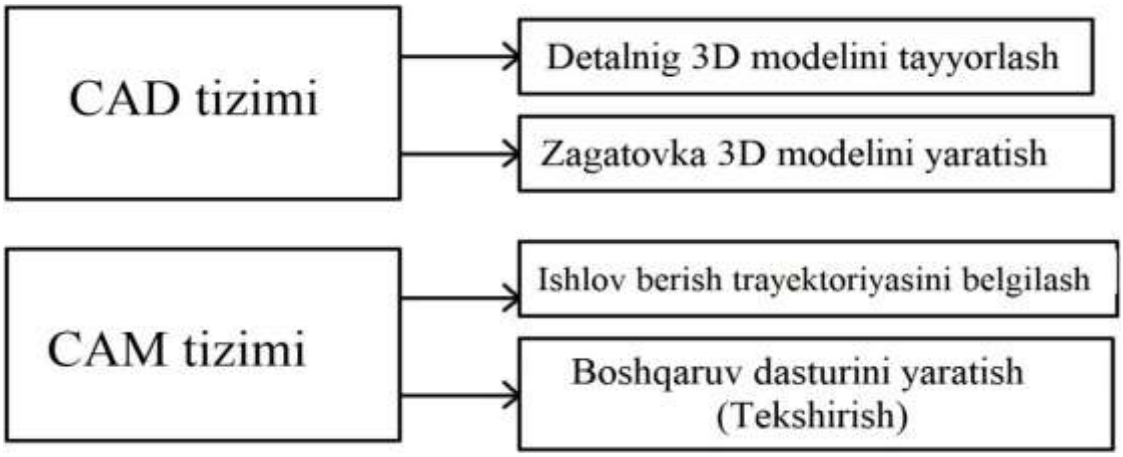

Figure 2. Design stages using the CAD and CAM system in the Siemens NX 12.0 program.

The sequence of creating a program for designing and processing a part is as follows:
1. A spatial view (3D drawing) of the part and its workpiece is drawn according to the working drawing (2D drawing). These operations are designed in the working drawing section of the program (Drawing), and then a 3D view of the part is created in the 3D object creation section (Model).
2. In the assembly section, the part and its workpiece are combined and displayed separately. This process is performed in the processing section of the program (Processing). First, the part and the workpiece are combined (Assembly). Then, using the CTRL+J keys, the visual appearance of the workpiece can be reduced or colored (Figure 3).

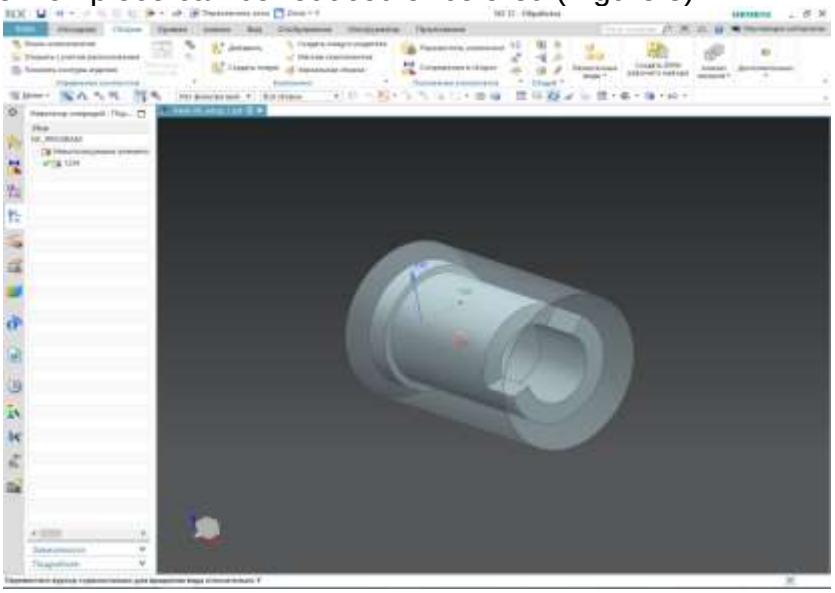

Figure 3. The process of creating a part machining program in Siemens NX 12.0.

1. The workpiece is defined, the zero point of the machine tool, the workpiece, and the cutting tool are determined.
2. Cutting tools are selected according to the sequence of operations to be performed, and their parameters are entered. For example, for a turning operation, a turning cutter is selected from the cutting tool selection section (tool creation), and information about the cutter material, length, thickness, length of the cutting part, and its location (orientation) is entered.
3. Machining modes, cutting speed, and feed rates are entered. Another advantage of the NX program is that the program automatically determines the compatibility of the entered values.
After the above work on the technological operation processes is completed, the machining process of the part can be monitored using the “Machine simulation” section. This will make it possible to make sure that the design process of the part was carried out correctly. Using the "Postprocess" section, the part processing program is automatically generated in G-code (Figure 4).

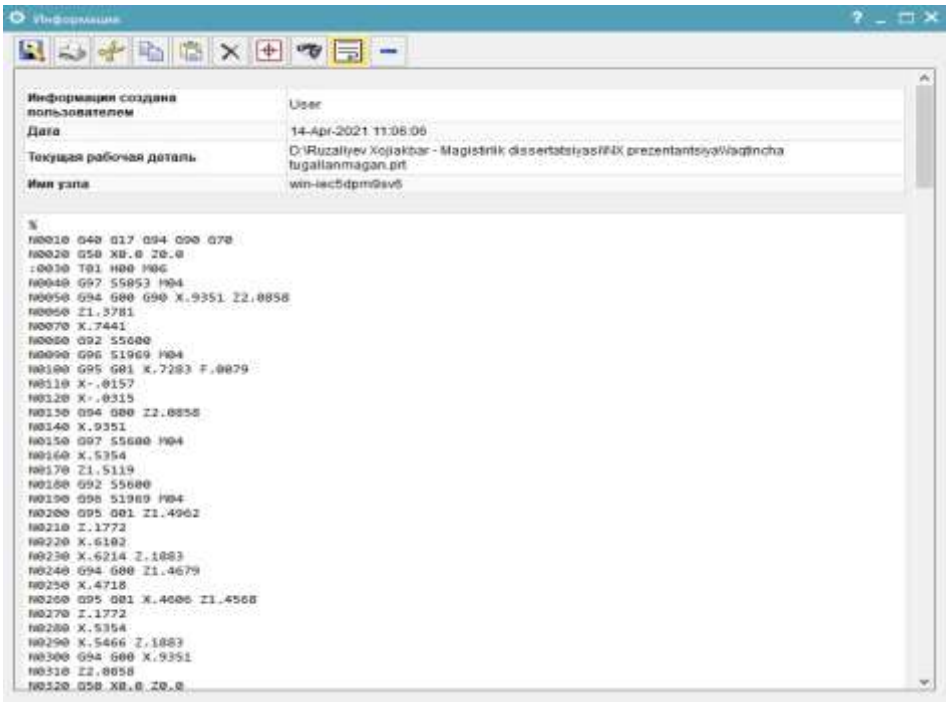

Figure 4. A G-code program for a part to be machined on a RDB machine in Siemens NX 12.0.

After these processes are completed, this program is saved in .txt format and transferred to the RDB machine via an external memory source. After that, the machine automatically processes the part and a finished part is created.

Conclusions

1. Designing parts and creating a program for their processing using the Siemens NX program helps to achieve several times higher productivity compared to manual design of parts and their preparation on a simple machine.
2. Through automated design, the human factor and basing errors are reduced and the accuracy and surface finish of parts are increased.
3. It allows you to analyze and test parts without manufacturing them.

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