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COMPUTERIZED RESEARCH OF TEMPERATURE DEFORMATIONS OF A MACHINE

Despite the irreplaceability of direct experiments, in order to exclude random and systematic errors, as a means of measuring techniques, and conditions for conducting tests, to examinate the temperature deformations of the machine, in the work computing experiments were carried out on a computer model. In order to minimizing the simulation time and increase the convenience of performing the analysis of the obtained results, so there was developed a methodology [1] for computer simulation of the thermal characteristics of the machine.

For researching of the thermodeformation condition, there was selected a horizontal turning machine with a CNC PAB-130. The examination was conducted using Autodesk Inventor and Autodesk Simulation CFD for thermal calculations.

An analysis of previous work [1, 3] allows us to determine rational cyclograms of the machine and cutting modes. The given results of researches of thermodeformation state of a machine tool confirm the expediency of the proposed methodology and selected operating modes: continuous operation; heating-cooling mode; variable mode of operation, etc. Typically, thermal tests in conditions of continuous operation of the machine are carried out at the following spindle speeds: 800, 1000, 1250, 1600 and 2000 rpm. [1].

Researching shows that two methods are used to calculate the heat release:

1.Temperature sensors with magnetic fasteners, which are often installed on open surfaces of the carrier system of IRR.

The choice of the arrangement of temperature sensors and indicator heads is determined by two factors: the characteristics of the measuring equipment and the accumulated experience of thermal tests of the machine tools of such a layout. This method is best at complex diagnostics.

2. Infrared imagers.

Optical electronic device for visualization of temperature field and temperature measurement. The thermal imaging camera is embedded in digital multimeters to detect places of overheating of electronic devices.

The analysis of the performed work makes it possible to develop a scheme for planning and implementation of the computer simulation of the thermal characteristics of the machine for further research.

Due to the Autodesk Simulation CFD, it was discovered that the main engine, the coordinate displacement engine and the executive cutting bodies are the most suitable for heating.

It is possible to make a review in order of the solution to heating problems: it is proposed to provide equal temperature regime in the mechanisms and knots of the machine, for example, facilitates preheating the system. The temperature error of the machine can also be reduced by introducing correction into the drive of feedings from signals of temperature sensors; to introduce a compressor system for cooling the spindle or cooling water (often for motor-spindle), etc.

Developed methods of computer modeling of the thermal characteristics of the machine worked in the conditions of changing thermal regimes, which allows to perform a variety of analysis in automatic mode due to the use of developed software. This analysis simplifies the model and algorithms for problem solving, which in turn saves time and finances.

So, the main advantage of computer simulation of heating sources of the machine is a quick way of finding problems and eliminating them.

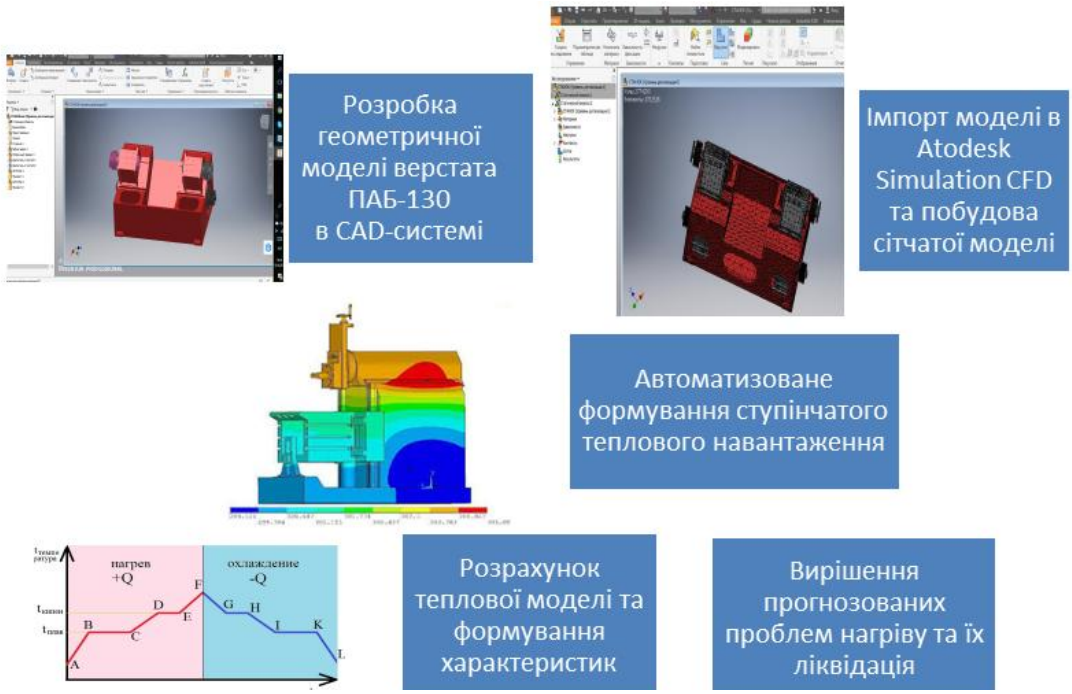

Fig.1 – Scheme of realization the method of computer simulation of the thermal characteristics of the machine

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ВЗАИМОДЕЙСТВИЯ СПЛАВА ВК 8 СО Ст.20 ПРИ ЭЛЕКТРОИСКРОВОМ ЛЕГИРОВАНИИ

Важным проблемным звеном современных отраслей машиностроения и приборостроения остается вопрос о том, как увеличить срок службы деталей машин, работающих в экстремальных условиях и их реновации. В настоящей работе сделана попытка частично решить этот вопрос.

Обьектом исследования служила Ст.20, на которую наносили сплав ВК 8. Образцы (d=15мм; h=10мм) обрабатывали методом электроискрового легирования, а после нанесения покрытия их подвергали ультразвуковой [1] и импульсной механической ударной обработке. Исследование образцов проводили рентгеновским и дюрометрическими методами. Для исследования процессов переноса атомов использовали радиоактивные изотопы.