

DIAGNOSIS OF CUTTING TOOL BY THE SOUND THAT ACCOMPANIES THE PROCESS OF CUTTING

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Typical defects of a tool is wear and peeling of tool blade. These defects must be detected in proper time to replace the tool immediately. One of the diagnostic signs of these defects is the sound level which accompanies the cutting process.

To make the diagnosis of the instrument state more effective it is necessary to know the laws of sound change as the tool wear. The tool is an important part of the processing system "tool - device - milling machine". Tool wear influences on the behavior of this system, which affects the sound level, generated by vibrations of the processing system. The vibration computer study of the vertical milling machine 6R13 was conducted to solve this problem.

The dynamic model allows to consider vibrations of the machine units by 10 degrees of freedom. Model vibrates under the influence of the variables of the cutting forces: P_{VZ} , P_{VX} and P_{VY} .

Research has shown that during normal operation of the instrument a gradual decrease in sound level E_s takes place. This is due to the damping effect of friction of the tool main rear surface against processed detail. This damping reduces amplitude of instrument oscillations. At the same time tool blade wears relatively slowly. During catastrophic tool wear the sound level increases sharply. The reason of this is the significant intensification of the process of blade destruction.

Computer studies showed analytical dependence describing the change of sound level depending on the size of the tool wear.

This dependence is necessary to predict the moment of transition from the area of the normal operation of the blade to the area of its catastrophic destruction. This in turn makes it possible to carry out timely replacement of the tool and thus avoid the appearance of defective goods.

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