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DESIGN AND TECHNOLOGY PARAMETERS OF NON-STATIONARY CUTTING WHEN PROCESSING BY SINGLE- AND MULTI-BLADE TOOL

Cutting conditions are determined by certain parameters. When one or more of these parameters change their value while removing a layer of material the cutting method is called non-stationary cutting. Therefore, non-stationary processes are the processes that due to changing cutting conditions significantly alter cutting results - processing performance, instrument stability, accuracy and quality of manufactured parts surface.

According to the authors of the project it is better to solve the problem through the development of a special tool with kinematical transformation from circular movement of formative elements. Balancing of cutting forces components can be achieved due to their geometrical parameters. This approach makes it possible to use a non-stationary cutting process even on the machines without CNC.

The problem can be solved through improving machinery structures, equipment and rational choice of materials for their parts. Significant attention is paid to the development of new technological parts formation processes and providing the necessary physical and mechanical properties of the material from which they are made. The task is to improve the design of end mills.

The problem is solved by the fact that due to the shape of the copier according to the dependence $l_x + l_{dc} + d_{bear.} / 2 = const$ (l_x is distance from the center of the copier to the surface; l_{dc} is the distance from the center of the copier to the axis of the bearing; $d_{bear.}$ is bearings diameter that provides a significant increase in tool life, improve the quality and accuracy of processing) circular movement of the cutting element is transformed into a straight, perpendicular to the flow vector. Thus, the path of cutting elements in the process of cutting is shortened. This significantly increases the rigidity of the instrument. In addition, changing cutting angles and cutting speed that occurs when converting circular motion of cutting elements into rectilinear significantly increases the rigidity of the cutting elements. And the fact that springs effort is perceived by a rigid machined copier significantly improves the accuracy and quality of processing.

Terms of machining can be controlled by changing the settings for the load of work surfaces and cutting edges:

- chip formation force;
- nominal and actual contact area;
- coefficient of friction, adhesion and diffusion processes;
- thermal characteristics of the tool material;
- terms of penetration into chip formation zone and on the contact surface of technology environment, etc.

For example, at the stage of designing the instrument you can change the blade loading conditions, i.e. you can decrease normal pressure, maintain the temperature at an optimum level, reduce or increase the time of contact, etc. You can significantly reduce the wear intensity of its work surfaces and the degree of mechanical destruction of the cutting edge and tool breakage probability. All the abovementioned can be achieved through changing the geometric parameters of blades, their number and location depending on the forming and cutting scheme.

Considering the machining from the standpoint of tool blade load allows us to successfully implement an integrated approach at the formalized level (providing the model of the base cutting process) both in solving the problem of predicting its performance under given conditions and in optimizing these conditions depending on the requirements for the processing.