PRINCIPLES OF 3D MODELING OF THE PRODUCTION AND APPLICATION OF DIAMOND WHEELS FOR HIGH-SPEED PROCESSING

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Grinding is a common method of high-precision machining of machine parts. This work is devoted to the problems that arise during the operation of diamond abrasive tools, and discusses the results of the simulation of high-speed processing and the natural self-sharpening of the tool.

As experimental investigations are very expensive and sometimes impossible, we theoretically find the area with the best results and can continue the experiment in this small region. This will allow us to save significant amounts of time and money.

International research on the simulation of processes has established an excellent tool for assessing and optimizing cutting and grinding. Knowledge about the tool – workpiece interaction in grinding – depending on the chosen parameter combination – makes selective adaptation of the process strategy possible with regard to maximum workpiece quality or minimum machining time and high economic efficiency of the process.

The creation of a methodological basic foundation and a system of 3D-CAD simulations of diamond-composite materials (DCM) at the stages of their manufacture and operation will allow the efficiency of their processing and application to be substantially raised. Modern trends in science-intensive products are characterized by extensive use of applied mathematics, in many respects connected with the creation of computer aids.

The performance of any abrasive product depends on the abrasive properties and grinding conditions (forces, chip thickness, etc.) to which it is subjected. From the standpoint of testing conditions, the force per piece of grain and chip thickness are critical in determining which of the common wear/fracture mechanisms of a given abrasive becomes active. The link between these two areas is important for predicting the most efficient grinding regimes to use with a given abrasive; one abrasive that is an excellent performer in high force per grit applications may be less than optimal in low force per grit applications.

As a result of these studies should be developed modeling technology, which will allow to obtain an adequate model of the grinding process using diamond wheels. Such models are necessary for the prospective evaluation of the feasibility of using technology and means to improve the cutting ability of grinding wheels.