

AP27510559 «Modernization of machine-tool equipment of machine-building enterprises with application of composite materials on the basis of additive technologies». г. ж. - Беpr A.C.

Project summary:

The machining of long cylindrical parts is a complex engineering task associated with such disadvantages of existing CNC machines as part deflection, significant vibrations, and high production costs. These problems are caused by the limitations of traditional machine bed materials (cast iron, steel), which have low vibration resistance and dimensional instability under load.

This project aims to solve these critical problems by developing and applying innovative technology for manufacturing machine beds for metal-cutting machines from polymer concrete composite material. The use of polymer concrete with optimized geometry will significantly increase the rigidity and vibration resistance of the bed structure, minimize deflection of parts, and ensure high precision in the machining of long workpieces. This will lead to increased machine stability, reduced scrap rates, and lower production costs, which is critically important for modern machine building.

The aim of the project is to create a universal technology of manufacturing and construction of the MCMT bed from polymer concrete on the basis of optimized geometry with special properties (rigidity, wear resistance, heat resistance, corrosion resistance), which allows to achieve the required accuracy in the processing of long parts.

Project objectives:

1. Analysis of existing design and technological solutions, review of problems related to metal cutting equipment for machining long parts in the literature.
2. Analysis of features of typical steels and cast irons used for manufacturing of metal-cutting equipment in order to determine critical properties of steels and cast irons, which should be taken into account in the development of optimized geometry of MCMT made of polymer concrete.
3. Additional analysis of the latest scientific developments in the field of modernization of metal-cutting equipment taking into account specific working conditions in order to determine the preferred compositions of polymer concrete and geometry parameters.
4. Experimental research and simulation modeling of the selected composition of polymer concrete mixture.
5. Carrying out simulation modeling of the bed made of the selected polymer material with optimized geometry.
6. Conducting experimental research and approbation of the results of the obtained research.

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