AP27511047 «Improving the quality of processing stepped holes of large-sized parts» Sc.s. – Karsakova N.Zh.

Project Abstract:

The idea of the project is to improve the quality and reduce the cost of step hole machining by minimizing the number of technological transitions. Boring is not only one of the most in-demand operations in metalworking but also among the most labor-intensive. Studies conducted at domestic machine-building plants, particularly in the Karaganda region, revealed persistent issues in ensuring accuracy and quality in the manufacturing of large-sized parts.

Analysis of the machining processes for these parts showed that the most complex and labor-intensive operation is the machining of stepped holes. To investigate and address this issue, a large-sized part—the housing (frame) of the NP8 submersible pump—was selected as the research object, along with its manufacturing technology implemented at LLP "Maker" – KLMZ (Karaganda city).

The goal of the project is to improve the quality of step hole machining by reducing vibrations through the development of a special boring bar.

Project Objectives:

1. To study the issue of machining large-sized parts, particularly stepped holes, in machine-building environments, including a literature review and patent search. The causes of poor machining quality and the technical requirements for stepped holes will be identified.
2. To analyze the existing designs of cutting tools used in the machining of stepped holes in large-sized parts at machine-building enterprises. Deficiencies in tool designs and the requirements for them will be determined.
3. To study the types of insertable cutting plates used in boring operations: their varieties, materials, shapes, and fastening methods. The optimal insert, material, shape, and attachment method will be selected.
4. To design a special boring bar for machining stepped holes. Assembly and working drawings for the boring bar components will be developed.
5. To perform computer modeling of the boring bar and determine its optimal parameters.
6. To manufacture a prototype of the special boring bar.
7. To plan and conduct experimental research on the technology of simultaneous machining of stepped holes using the special boring bar. Optimal machining parameters that ensure high quality will be identified.
8. To model the process of simultaneous boring of stepped holes using the special boring bar and to study vibration occurrence. The influence of cutting parameters on vibration will be examined.
9. To investigate temperature distribution during the machining of stepped holes and the stress-strain condition of the special boring bar. The impact of temperature on machining quality and the most highly loaded part of the boring bar will be identified.
10. To develop recommendations and conduct pilot implementation of the results in production. Guidelines and trial protocols will be prepared.

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