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ПОВЫШЕНИЕ ПРОИЗВОДИТЕЛЬНОСТИ И КАЧЕСТВА ОБРАБОТКИ ЦИЛИНДРИЧЕСКИХ ЧЕРВЯКОВ

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In the process of machining a cutting force P acts on the manufacturing system, causing elastic deformation and displacement in its elements, which are in their turn a cause of the error processing.

The cutting force component Py has the most significant impact on the accuracy. It is directed normal to the processed surface. As a result of the formation of the worm turns by the process of cutting we receive a part with a variable diameter and errors in its longitudinal section. Under adverse conditions the value of this error may exceed the dimensional tolerance for the part.

In the course of the research process two possible options for manufacturing a worm profile were considered: cutting on the CNC lathe and cutting by the thread-whirling head on the turning lathe.

To estimate the cutting inaccuracies of the deformation by a manufacturing system a mathematical model was created, which made it possible to identify and evaluate the impact of the cutting force component Py on the deformation of the workpiece. This mathematical model is developed on the basis of information about the material and the properties of the workpiece, the dimensions of its surface and the values of cutting parameters.

The formula for calculating the deflection of the workpiece was derived on the basis of Vereshchagin rules (multiplication of stress diagrams), and the workpiece is considered as a beam with a variable cross-section, and is pivotally mounted at both ends.

Theoretical studies have shown that the deformation of worms caused by the effect of the cutting force component Py when cutting by a thread-whirling head is up to 292 microns and it is 183 microns when cutting a worm on a CNC lathe.

In practice, the first method is usually used for processing screw surface of cylindrical worms. The choice of this method is related to productivity and cost-effectiveness of cutting by a thread-whirling head.

The results of these studies make it possible to predict the deformation process of the spiral worm formation before treatment without making experiments, as well as to determine optimum cutting conditions that allow obtaining a desired accuracy for maximum productivity, which decreases the complexity of subsequent final processing and leads to reduction in the cost of performing the process of treatment.