Analytical Determination of Height Parameters of Surface Roughness During Abrasive Processing and Conditions for Their Reduction

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The work aims to establish new generalized theoretical solutions and develop practical recommendations for the technological provision of roughness parameters of machined surfaces under grinding conditions, traditionally achieved in labor-intensive processing operations with free abrasive. A mathematical model has been developed to determine the parameters of surface roughness during abrasive processing Ra, Rmax and the ratio Ramax. Calculations have established that with an increase in the number of abrasive grains involved in the formation of the roughness of the treated surface, the parameters Ra, Rmax decrease and Ramax increases. It has been shown that during grinding Ramax takes values of 4...8, during abrasive polishing - more than 30. Such large values of the Ramax ratio during abrasive polishing is due to a significant increase in the number of working grains and the excess of the cut width over the cut thickness, transition - home from micro-cutting to the processes of friction and plastic deformation of the processed material. It has been shown that it is possible to significantly reduce the height parameters of surface roughness during grinding (to the level achieved when processing with a free abrasive) and simultaneously increase processing productivity by using a diamond wheel with grains having flat tops. This is consistent with experimental data and makes it possible to combine preliminary and final grinding in one operation, eliminating labor-intensive machining operations with free abrasive.