

Effect of Composite Material on Damping Capacity Improvement of Cutting Tool in Machining Operation Using Taguchi Approach

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Abstract : Chatter vibrations, occurring during cutting process, cause vibration between the cutting tool and workpiece, which deteriorates surface roughness and reduces tool life. The purpose of this study is to investigate the influence of cutting parameters and tool construction on surface roughness and vibration in turning of aluminum alloy AA2024. A new design of cutting tool is proposed, which is filled up with epoxy granite in order to improve damping capacity of the tool. Experiments were performed at the lathe using carbide cutting insert coated with TiC and two different cutting tools made of AISI 5140 steel. Taguchi L9 orthogonal array was applied to design of experiment and to optimize cutting conditions. By the help of signal-to-noise ratio and analysis of variance the optimal cutting condition and the effect of the cutting parameters on surface roughness and vibration were determined. Effectiveness of Taguchi method was verified by confirmation test. It was revealed that new cutting tool with epoxy granite has reduced vibration and surface roughness due to high damping properties of epoxy granite in toolholder.

Keywords : ANOVA, damping capacity, surface roughness, Taguchi method, vibration

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