

Interaction Effect of Machining Parameters on Material Removal Rate in Machining of AA6061–T6 Using MQL Conditions

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Abstract:

The objectives of this study are to investigate the interaction effect of machining parameters on material removal rate in end milling of aluminium alloy AA6061-T6 with conventional MQL techniques. Uncoated tungsten carbide (WC-Co 6.0%) and PVD TiAlN and TiAlN+TiN coated carbide cutting tools are considered using 23.4-54.0 ml/hr flow rate of commercial mineral oil for MQL machining with different combinations of input cutting parameters. Response surface methodology with central composite design approach is used for the design of experiments. Second order mathematical models are developed for machining performance measures with different cooling conditions and validated statistically. The developed models show good agreement (< 5 % error) with the experimental results. The metal cutting performance of the TiAlN coated tools relative to uncoated and TiN coated inserts is better at all combinations of input cutting parameters. Hence superior performance of TiAlN coating makes it more suitable for use with MQL. In case of material removal rate, all the tools show similar behavior in all the measurements with depth of cut as the most significant parameter followed by feed rate. Interaction of feed rate and depth of cut is most effective.

Keywords: AA6061-T6; PVD TiAlN; TiAlN+TiN; Minimum Quantity Lubrication (MQL)

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