
Synergetic Effect of Cryogenic Treatment and Minimal Quantity Lubrication of WC Cutting Inserts on Machinability of EN24 Steel

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Abstract

The life and productivity of cutting tools are directly impacted by cryogenic treatment. The increase in tool wear, dimensional inaccuracy, surface roughness and increased production cost is encountered by cryogenic treatment of tool materials. The current study examines the synergetic effect of cryogenic treatment and MQL on the machinability characteristics of EN24 steel. The tests were designed using an L18 orthogonal array, with the cutting speed, test condition, and kind of cutting insert serving as control variables. It was examined how these control factors affected the cutting temperature, tool flank wear, and workpiece surface roughness. According to the results, MQL decreased cutting insert average flank wear by 59.47%. Additionally, compared to cutting inserts that were not treated, the average flank wear dropped by 26.06% after cryogenic treatment and by 72.78% following cryogenic treatment with MQL. When compared to untreated inserts, cryo-treated inserts that are subjected to MQL during machining show the most percentage reduction in surface roughness 62.45%. When compared to dry cutting, MQL resulted in a 66.81% drop in average cutting temperature.

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