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Effect of Cutting Conditions on Surface Quality in Turning of Inconel X-750 Superalloy

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Abstract

This study has been conducted to analyze the effects of turning the Inconel X-750 superalloy, which is a member of nickel-based superalloy family that is frequently preferred in aerospace and nuclear energy industries in particular, under Minimum Quantity Lubrication (MQL), cryogenic liquid nitrogen (LN₂) and carbon dioxide gas (CO₂) cooling/lubrication conditions, with different cutting speeds ($V_c = 65, 95, 125, \text{ and } 155 \text{ m/min}$), constant feed rate ($f = 0.1 \text{ mm/rev}$), and cutting depth ($a = 0.5 \text{ mm}$) parameters, on the processability of Inconel X-750, hence on the surface integrity. In this context, the results obtained from the tests have been comparatively examined through surface roughness, tool wear, and chip formation. Comparison results show that the cryogenic CO₂ method has generally provided the best surface roughness, tool wear values. MQL method has provided the best chip formation.

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