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Influence of MQL parameters on surface roughness and temperature in end milling of titanium alloy

By [Ismail, ANN](#) (Ismail, Aiman Nazrin Noor) ^[1] ; [Tomadi, SH](#) (Tomadi, Siti Haryani) ^[1] ; [Abd Halim, NFH](#) (Abd Halim, Nor Farah Huda) ^[1] ; [Sulaiman, MA](#) (Sulaiman, Mohd Amri) ^[2] ; [Zalani, MR](#) (Zalani, Mohd Reza) ^[3]

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Abstract This paper addresses the challenge of optimizing Minimum Quantity Lubrication (MQL) parameters in the end milling of titanium alloys, where improper lubrication can lead to increased friction, elevated temperatures, and poor surface quality. The

study aims to enhance machining performance by systematically investigating the effects of lubrication flow rate, nozzle distance, and nozzle angle on key performance metrics such as surface roughness and cutting temperature. The Taguchi method was employed to design experiments and analyse the influence of these parameters, enabling the identification of optimal conditions. Results revealed that a flow rate of 10 m³/s, nozzle distance of 20 mm, and nozzle angle of 60 degrees minimized surface roughness to 0.66 µm and a flow rate of 10 m³/s, nozzle distance of 10 mm, and nozzle angle of 30 degrees reduced cutting temperature to 58 degrees C, significantly improving machining efficiency. This research highlights the importance of precise MQL parameter control and contributes to advancing sustainable manufacturing practices by reducing environmental impact and enhancing process efficiency.

Keywords

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Author Information

Corresponding Address: Tomadi, Siti (corresponding author)
Haryani

▼ Int Islamic Univ Malaysia IIUM, Dept Mat & Mfg Engr,
Kulliyah Engr, Kuala Lumpur 53100, Malaysia

E-mail Addresses :

sharyani@iium.edu.my

Addresses :

▼ ¹ Int Islamic Univ Malaysia IIUM, Dept Mat & Mfg Engr,
Kulliyah Engr, Kuala Lumpur 53100, Malaysia

² Engr Univ Teknikal Malaysia Melaka UTeM, Fac Ind & Mfg
Technol, Melaka 76100, Malaysia

▼ ³ Univ Malaysia Pahang UMP, Fac Mech & Automot Engr
Technol, Mfg Res Focus Grp MFG, Pekan 26600, Pahang, Malaysia

E-mail Addresses :

sharyani@iium.edu.my

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