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Ismail, A.N.N.^a, Tomadi, S.H.^a, Halim, N.F.H.A.^a, Hassan, M.A.^b, Daud, R.^c

Effect of dry and MQL cutting condition on coated carbide cutting tool during the end milling of Ti-6Al-4V titanium alloy

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^a Manufacturing and Materials Engineering Department, Faculty of Engineering, International Islamic University Malaysia, Kuala Lumpur, 53100, Malaysia

^b Faculty of Manufacturing & Mechatronic Engineering Technology, Universiti Malaysia Pahang, Malaysia

^c Faculty of Mechanical & Automotive Engineering Technology, Universiti Malaysia Pahang, Pahang, Pekan, 26600, Malaysia

Abstract

The properties of titanium alloy caused some problems in dry cutting conditions such as rapid wear and reduced tool life because the heat cannot dissipate rapidly on the cutting tool. Thus, the objective of this paper is to examine and compare the tool wear of coated carbide cutting tool in end milling of Ti-6Al-4V (titanium alloy) between dry conditions and using the Minimum Quantity Lubrication (MQL). From the experiment, MQL is found better cutting condition than dry condition. It is proven that the improvement of 46.08% with the cutting parameters of spindle speed of 500 rpm, 0.2 mm/tooth and depth of cut of 0.3 mm and 81.94% with the cutting parameters of spindle speed of 1500 rpm, 0.4 mm/tooth and depth of cut of 0.3 mm. Abrasion, adhesion, notch, and crater wear of the cutting tool are explored in this study. The optimum cutting parameters were 500 rpm for spindle speed, 0.2 mm/tooth for feed rate, and 0.4 mm for depth of cut. Therefore, a higher cutting speed and feed rate with a lower depth of cut is preferable to achieve lower tool wear for the coated carbide cutting tool. © 2024, Malaysian Tribology Society (Mytribos). All rights reserved.

Author Keywords

Milling machining; MQL; Tool wear titanium; Wear mechanism

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Correspondence Address

Ismail A.N.N.; Manufacturing and Materials Engineering Department, Malaysia; email: aimannazrin17@gmail.com

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