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Effect of feed rate on tool wear and surface condition during milling of CFRP

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Abstract

Application of carbon fibre reinforced polymers (CFRP) is rapidly increasing for use in industrial applications such as in the aerospace and automotive industry. However, issues such as rapid tool wear during CFRP milling remain significant, due to the abrasiveness of the carbon fibre. Thus, this study was conducted to investigate the effect of feed rate (1250, 1500 and 2500 mm/min) on tool wear and surface conditions during milling operations. The cutting speed and depth of cut were kept constant during the milling test at 100m/min and 3 mm respectively. Milling of CFRP with an uncoated tungsten carbide end mill was carried out and the progression of tool wear was observed until a machining length of 6000 mm. It was observed that the lowest tool wear was achieved when employing the highest feed rate of 2500 mm/min. It was observed that all cutting tools experienced abrasive wear as it was observed that pull out of WC-Co occurred on the flank surface of the cutting tool. The abrasiveness of CFRP leads to the flank wear of the carbide cutting tool. Damages such as fibre pull out, delamination and matrix smearing were observed on the CFRP machined surface. © 2023, Malaysian Tribology Society (Mytribos). All rights reserved.

Author Keywords

Abrasive wear; CFRP; Damage; Surface roughness; Tool wear; Tungsten carbide

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