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Tribological influence of cutting speed on tool wear and surface integrity during dry milling of CFRP

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Abstract

The utilization of carbon fibre reinforced polymer (CFRP) in the automotive and aerospace industries has been steadily rising in recent years. These sectors benefit from the remarkable properties of the composite, as well as its ability to be machined into near-net shapes. The milling process of CFRP is essential, particularly for the finishing stage. However, the wear development of cutting tool impacts the surface condition of the CFRP, potentially affecting its quality and leading to part rejection. Therefore, this research aims in examine the impact of cutting speeds applied in machining on the tool wear and evaluates its influence on the quality of the machined surface. Three cutting speeds (V_c=150, 200 and 250 m/min) and two feed rates (V_f=500 and 1,500 mm/min) were employed, while maintaining a constant 2 mm depth of. The observations indicate that higher cutting speeds at both feed rates result in increased tool wear. Meanwhile, the worst surface

roughness (Ra), measured at 4.96 µm, was observed at V_c=200 m/min and V_f=1,500 mm/min, exhibiting severe fiber pull-outs and breakage. These findings highlight the importance of cutting parameters selections in achieving improved machining outcomes. © 2026, Malaysian Tribology Society (Mytribos). All rights reserved.

Author keywords

CFRP; Edge trimming; Router tool; Surface quality; Tool wear

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