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

By

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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 & micro;m, 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.

Keywords

Author Keywords: CFRP; Edge trimming; Router tool; Tool wear; Surface quality

Keywords Plus: PARAMETERS; ROUGHNESS

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