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Investigation of Chip Formation During Turning of Aluminum Alloys 7075-T651 in Dry and Chilled Air Condition
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Abstract

Aluminum alloys 7075-T651 is a ductile material which may lead to tool damage and machined surface deterioration due to the formation of built-up-edge (BUE) and adhesion layer during machining especially in dry cutting condition. This paper discusses the chip formation of aluminum alloys 7075-T651 during turning in green environment. Uncoated carbide KW10 cutting tool was used to machine Al7075-T651 in dry and chilled air condition. The cutting speed and feed rate were varied to 450 to 650 m/min and 0.15 mm/rev – 0.05 mm/rev, respectively. The depth of cut was fixed to 0.5 mm. The chip formation was observed and measured in term of chip type, chip thickness and co-efficient of friction. It was found that, among the types of chips produced in turning Al7075-T651 were snarled tubular ribbon, loose arc and long washer-type helical. The thickness of the chip increased as the feed increases by 253% hence increased the friction coefficient by 104.7%. Meanwhile, the chip thickness decreased 5.19% when the cutting speed increased, hence reducing the coefficient of friction by 14.6%. Chilled air machining produced 7.11% thinner chips than dry machining, which lowered the friction coefficient by 19.7%. Therefore, it can be concluded that, machining Al7075-T651 at low feed rate and high cutting speed in chilled air cutting environment may help to improve the lubrication and further enhancing the machining outputs. © 2023, The Author(s), under exclusive license to Springer Nature Singapore Pte Ltd.

Author Keywords

Aluminum alloys 7075-T651; Chilled air; Chip formation; Coefficient of friction

Index Keywords

Aluminum alloys, Carbide cutting tools, Carbides, Cutting, Deterioration, Friction; 'Dry' [, Al7075-t651, Aluminum alloy 7075, Aluminum alloy 7075-t651, Chilled air, Chip formations, Coefficient of frictions, Condition, Cutting speed, Feedrate; Turning

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