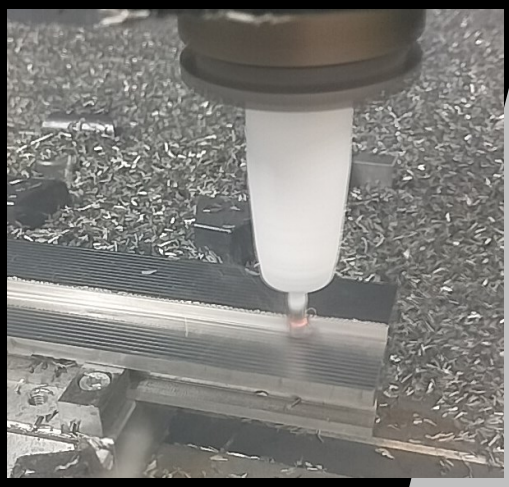
ArcLub One

Case study #1

Milling of Ti6Al4V (GR5) with LCO_2 + MQL shows more than 3x longer tool life when compared to flood cooling with emulsion.



1. Introduction

- Low thermal conductivity of Titanium alloys results in high thermal stresses on cutting tools
- Machining with LCO_2 + MQL is considered as a cleaner alternative to flood cooling

2. Methods

- Through-tool delivery of LCO_2 + MQL with ArcLub One; high-pressure through-tool flood cooling
- Off-the-shelf end mill, 6 mm, w/ coolant holes
- v_c = 200 m/min; a_p = 5 mm; a_e = 2 mm; v_f = 796 mm/min

3. Results

- More than 3x longer tool life in terms of material removed when using LCO_2 + MQL (Fig 1, Fig 2)
- Tool wear criteria: Feeding force (Fig 1)

4. Discussion

- The application of LCO_2 + MQL vastly increases the tool life when milling Ti6Al4V alloy
- Consumption of LCO_2 was 7.7 kg/hour; MQL 60 mL/h. Further reduction possible.

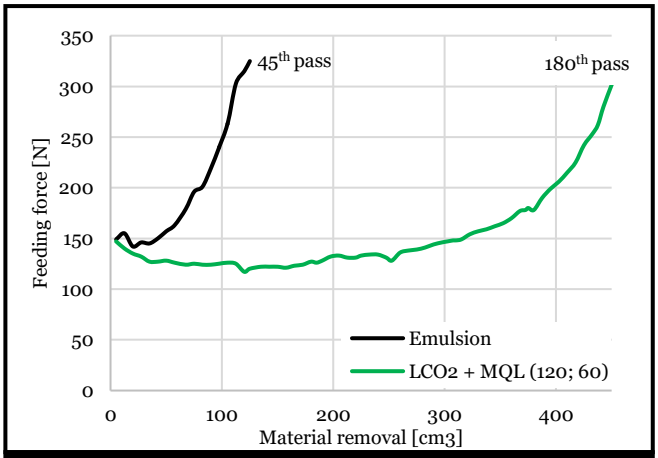


Figure 1. Progression of feed force when milling Ti6Al4V under flood cooling and LCO_2 + MQL conditions. Tool breakage occurred under flood cooling conditions at approx. 330 N of feeding force.

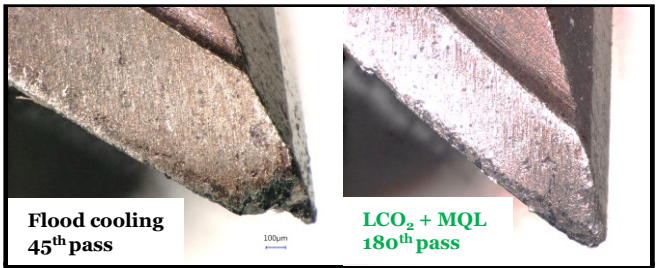


Figure 2. Tool wear comparison between flood cooling and LCO_2 + MQL

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