



ArcLub One

Case study #2

Milling of 40CrMo4 Steel with LCO₂ + MQL provides **lower tool wear and surface roughness** in comparison to dry and flood cooling



1. Introduction

- Application: 40CrMo4 steel used for components in automotive industry
- Flood cooling results in poor tool life, dry milling in poor surface roughness – solution?



2. Methods

- Through-tool delivery of LCO₂ + MQL with ArcLub One; high-pressure through-tool flood cooling
- Tool holder with 2 cutting inserters
- $v_c = 300$ m/min; $a_p = 1$ mm; $a_e = 10$ mm; $f = 0.1$ mm/rev



3. Results

- Best tool life when using LCO₂ + MQL (Fig 1)
- Lowest surface roughness when using LCO₂ + MQL (Fig 2)
- LCO₂ flowrate of 160 g/min – most optimal



4. Discussion

- Benefits of LCO₂ + MQL when milling 40CrMo4 also result in cleaner manufacturing
- Due to near-dry machining, post processing of parts is easier and smoother.

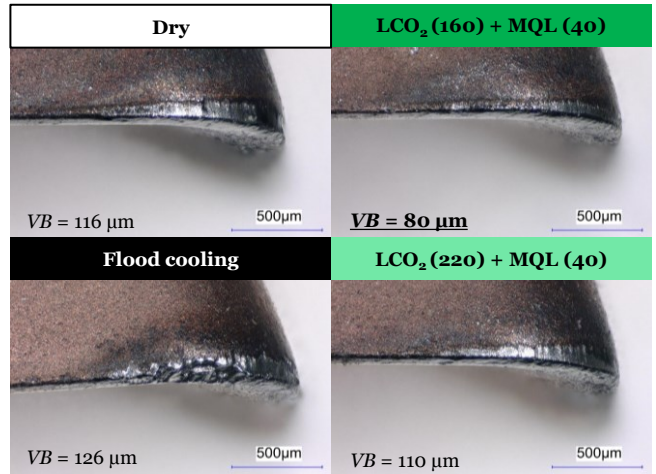


Figure 1. Tool wear under different cooling-lubricating conditions. Note: Values at LCO₂ denote flowrate in g/min, at MQL in mL/h.

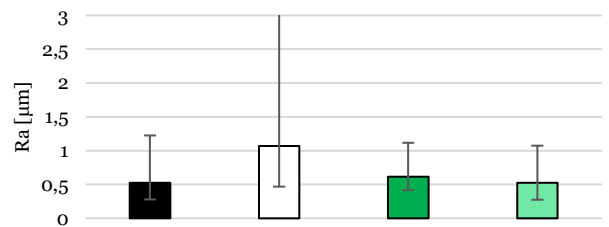


Figure 2. Surface roughness Ra for flood cooling, dry, LCO₂(160) + MQL(40) and LCO₂(220) + MQL(40).



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