ArcLub One

Case study #3

Robotic drilling of 42CrMo4 steel with LCO_2 + MQL greatly reduces the driling torque, thrust force and temperature

1. Introduction

- Drilling with anthropomorfig robot is usually performed dry
- No lubrication, poor chip evacuation and cooling when drilling dry

2. Methods

- Through-tool delivery with ArcLub One
- Carbide drill bit, 4 mm
- v_c = 30-70 m/min; f = *0.1 mm/rev*
- Variation of cutting speed, LCO_2 and MQL flow rates; thrust, torque, temperature measuements

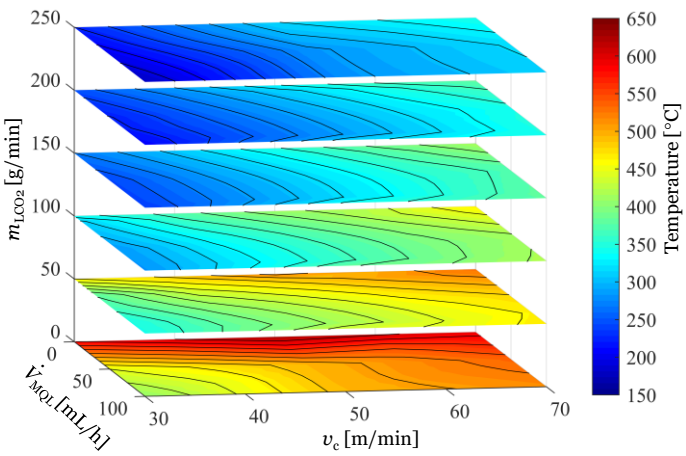

Figure 2. Drilling temprature at the drll exit point, dependent on cutting speed, LCO_2 mass flow rate and MQL volumetric flow rate.

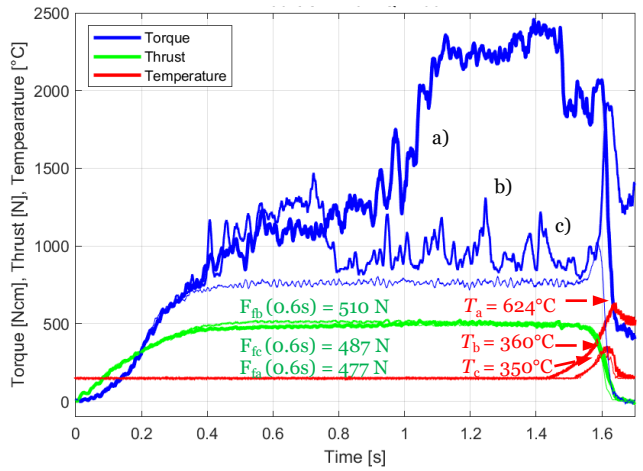

Figure 1. Drilling torque, thrust force and temperature when drilling 42CrMo4. a) Dry; b) Pure LCO_2; c) LCO_2 + MQL

3. Results

- Dry drilling – chip clogging (Fig 1a), high torque
- LCO_2 – torque reduced (Fig 1b), poor lubrication
- LCO_2 + MQL – stabilized torque values (Fig 1c)
- Finding ideal cutting temperature – effect of parameters (Fig 2) ... T_{ideal} = ??

4. Discussion

- LCO_2 + MQL greatly improves drilling process
- Implementation for robotic drilling (composites, large structues)
- Adjustable cutting temperature - optimisation

Authors

1. Luka Sterle, PhD
2. Franci Pušavec, PhD
3. Damir Grguraš, PhD

ArcLubSystems

info@arclubsystems.com

Scan the QR code to reach ArcLubSystems webpage