AMRC ADVANCED MANUFACTURING RESEARCH CENTRE

The University Of Sheffield.

Catapult SME engagement

Lofrix cutting trials

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CATAPULT High Value Manufacturing

European Union
European Regional Development Fund

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Introduction

- The AMRC through the Catapult program have conducted cutting trials to understand the properties and performance of a new coating
- The trial was undertaken using two identical 12mm standard carbide end/mills (OSG Hy-Pro)
- One of these cutters was coated by the customer, we would run back to back trials and compare/monitor performance.
- The results and equipment used in the trials are documented on the following slides

Equipment

DMG Mori NVX5080

Kistler Dyno
Type 9255C

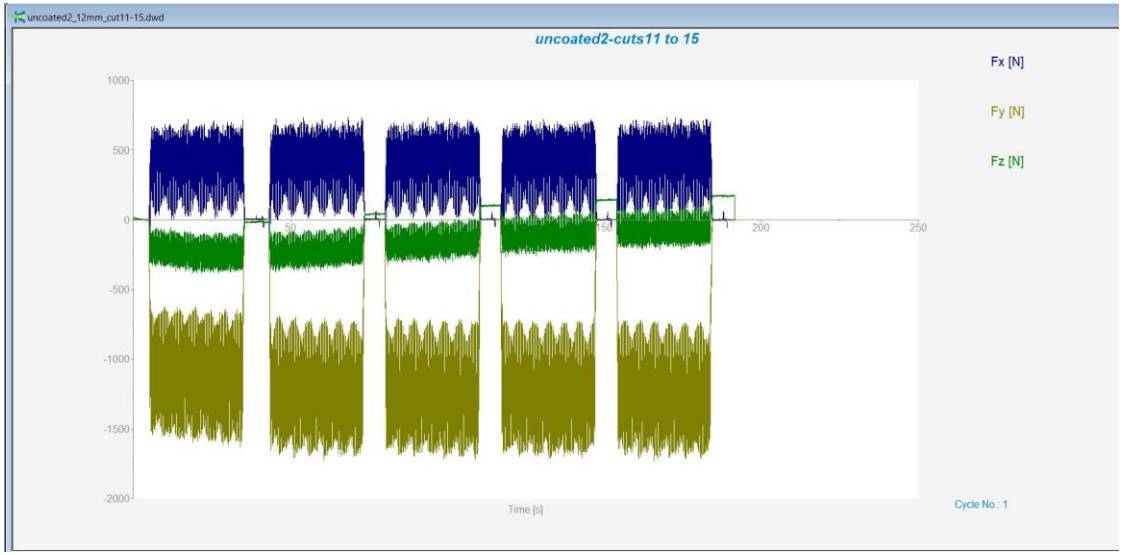
2off Nikken-NBT40-C20-70 tool holders with (OSG) cutter

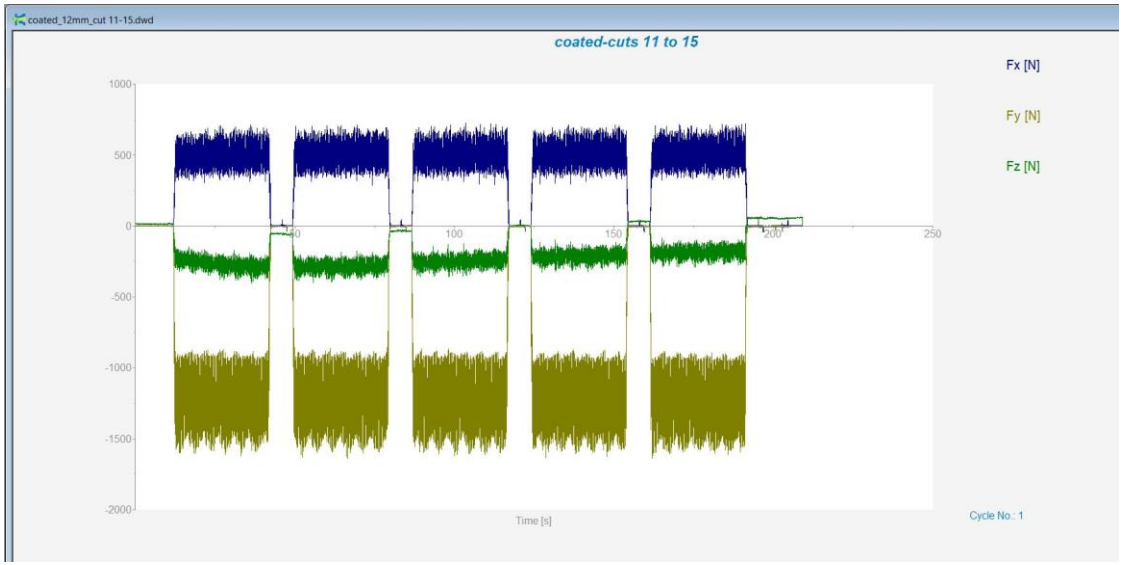
Dynamometer readings cuts 11-15 both tools

First observation:- whilst the maximum forces in Fx and Fy are similar in both graphs a quite significant reduction in amplitude was observed for the coated trial.

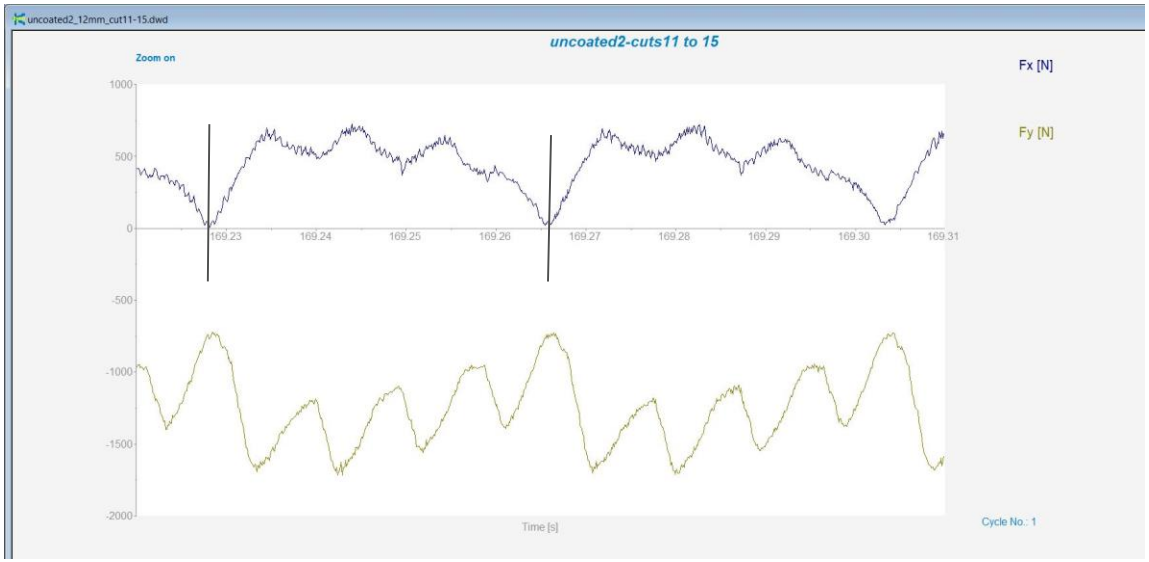
This trend was consistent throughout the entire cutting trial

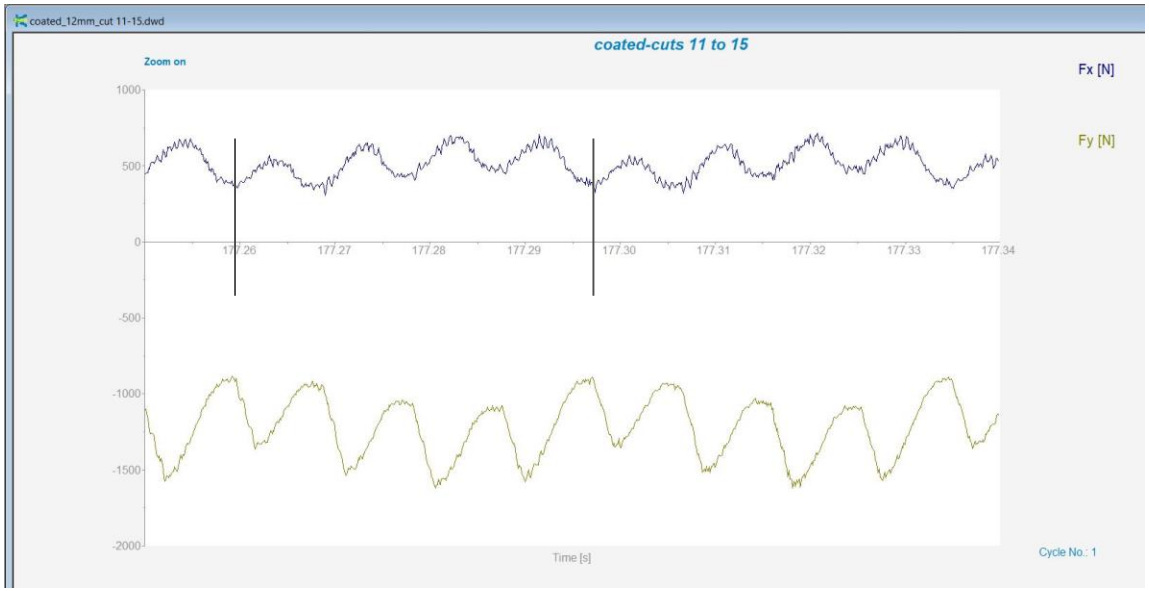
A further investigation was carried out using this data to understand the variation.





Enlarged Dyno display for one cutter revolution



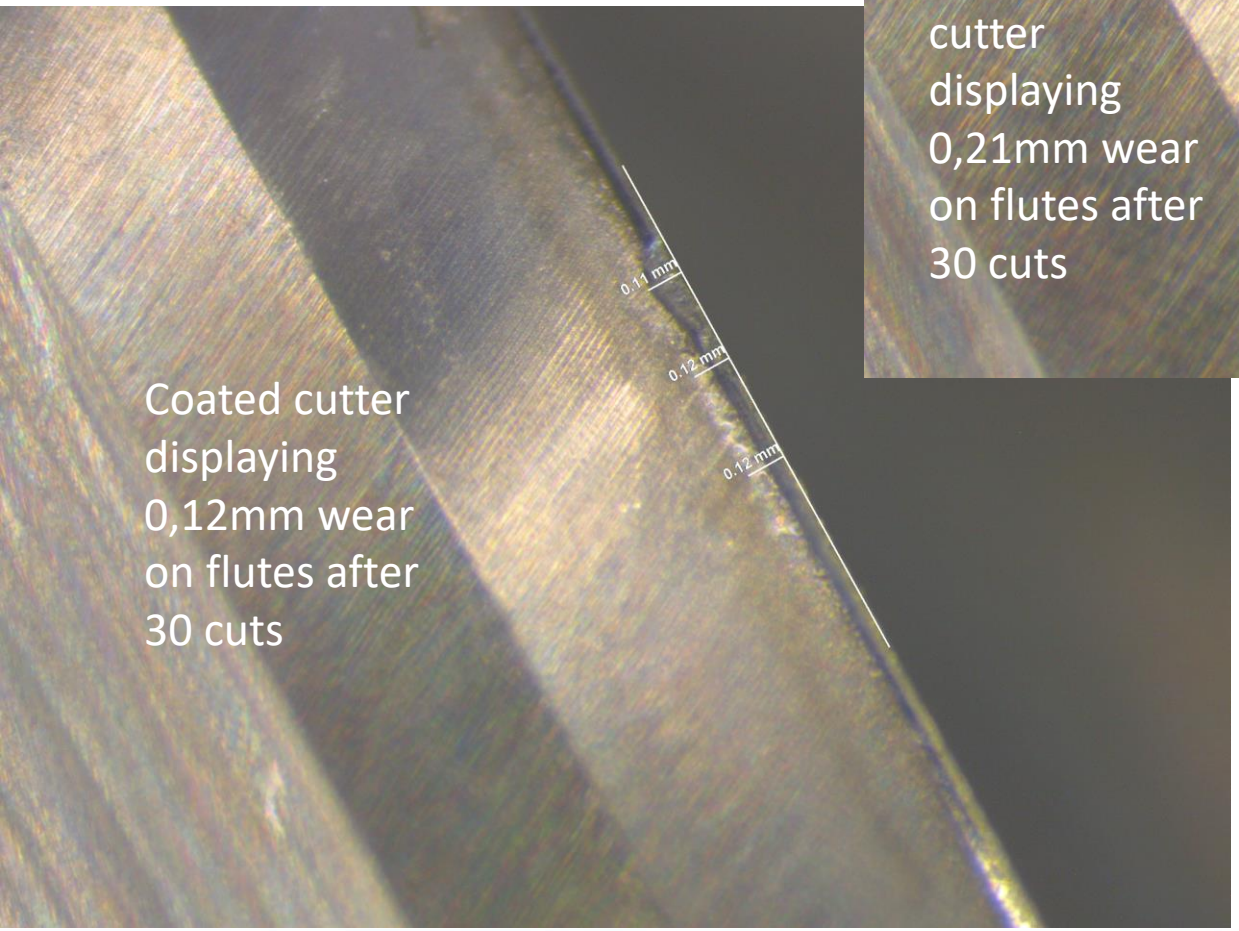


The graphs displayed show the waveform for each cutter edge on one single revolution of each cutter. Time taken for one rev = 0.038 sec

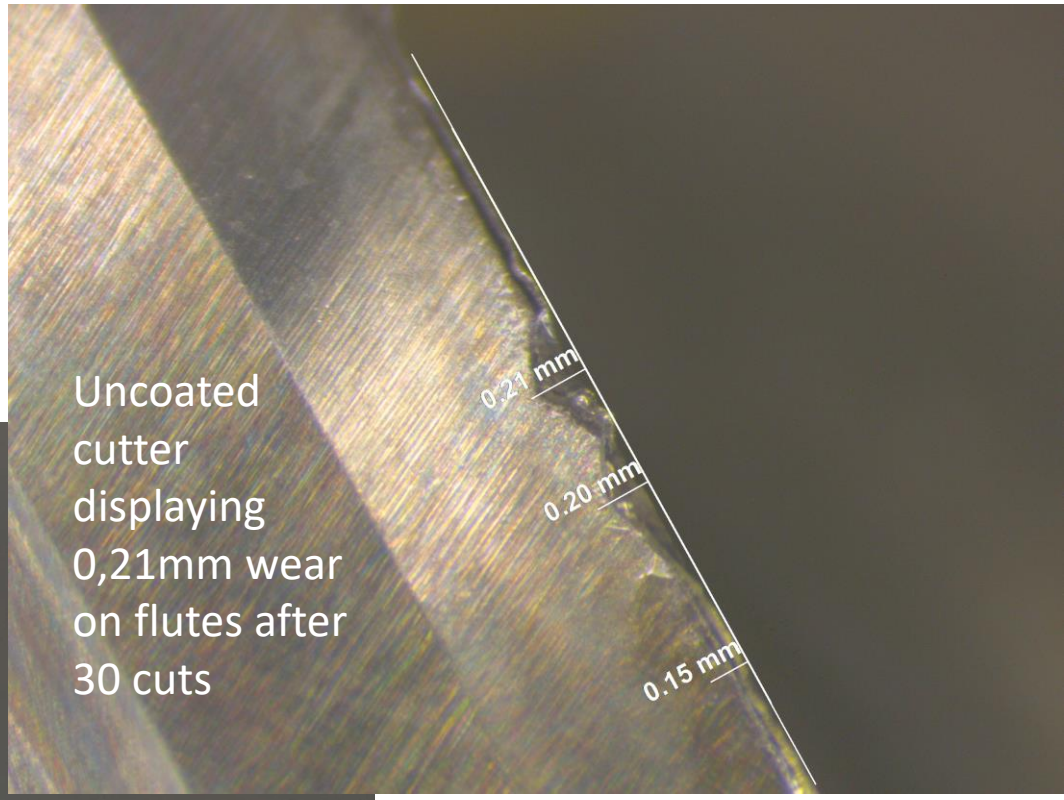
The waveform for Fx is quite uniform on the coated cuts compared to the uncoated cutter.

This would suggest that the coated cutter is cutting more efficiently and experiencing less applied force in cut than the standard cutter.

Cutter wear cuts 1-30



Coated cutter displaying 0,12mm wear on flutes after 30 cuts



Uncoated cutter displaying 0,21mm wear on flutes after 30 cuts

Cont.

Cont.

0,2mm wear on cutters as seen on then previous slide is a benchmark that our Machinability Group use at the AMRC

This wear was evident after 30 cuts on all flutes on the uncoated cutter

The coated cutter had minimum wear on the all flutes after 30 cuts, further trials were carried out on this cutter to achieve the same wear (life)

Intermediate checks were made on the coated cutters condition until 0,2mm wear was observed

After we had run 60 cuts in total 0,2mm of wear was visible on one of the flutes of the coated cutter, the other flutes still showed wear below the 0,2mm benchmark

Summary/Observations

Actual cut time for uncoated cutter 30 cuts = 15 mins

Actual cut time for coated cutter 60 cuts = 30 mins

Cutters and parameters used in trial supplied by OSG

Flood and through spindle coolant used for trial

Ap (Axial Depth of cut) = 20mm, Ae (Radial Depth of cut) = 2,4mm, Vc (Surface Speed) = 60m/min, Fz (Feed per tooth) = 0,06mm

Material used 303 grade S.S. actual spindle speed 1591 r.p.m. feedrate 382mm/min

1 cycle run consisted of 5 cuts of 190mm in length = 2.5mins total, 0.5mins/cut

Thank you.

For further information please contact or visit:

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