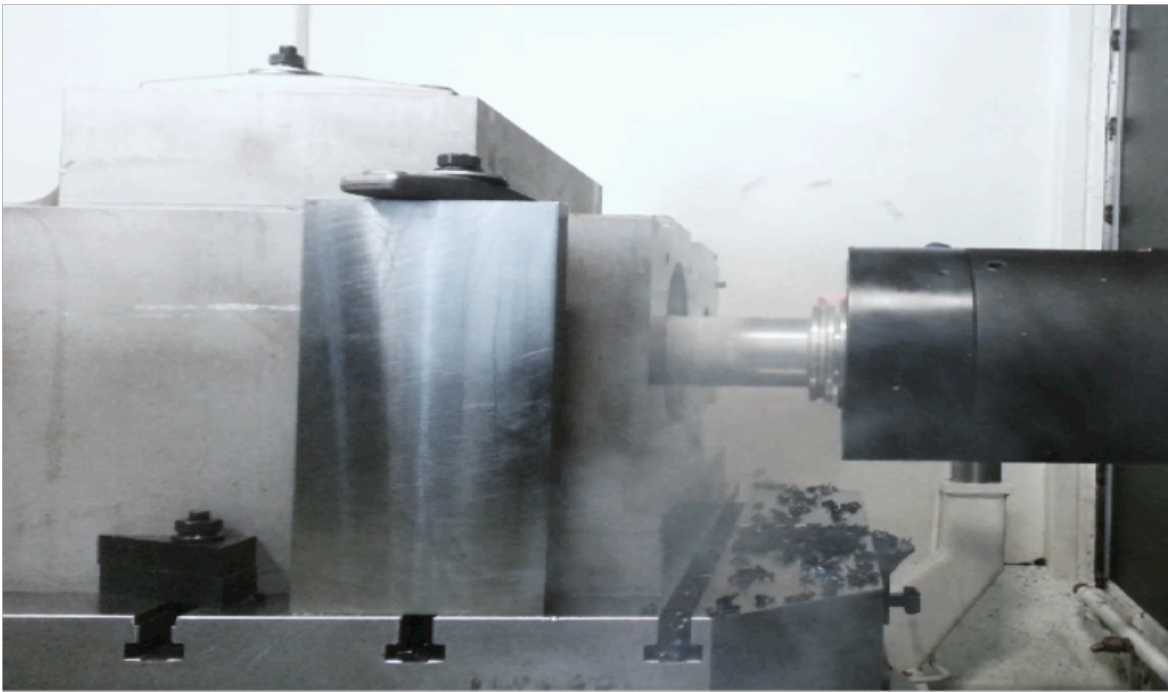


# CASE STUDY: CRYOGENIC MACHINING OF MODIFIED 4340 STEEL



## Objective & Results

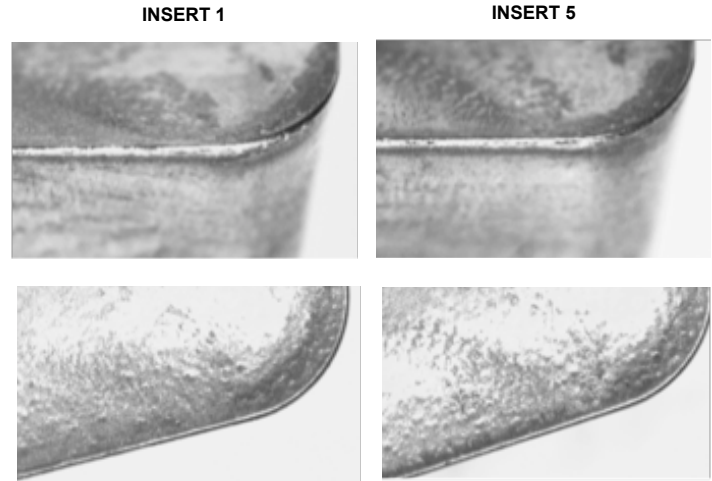
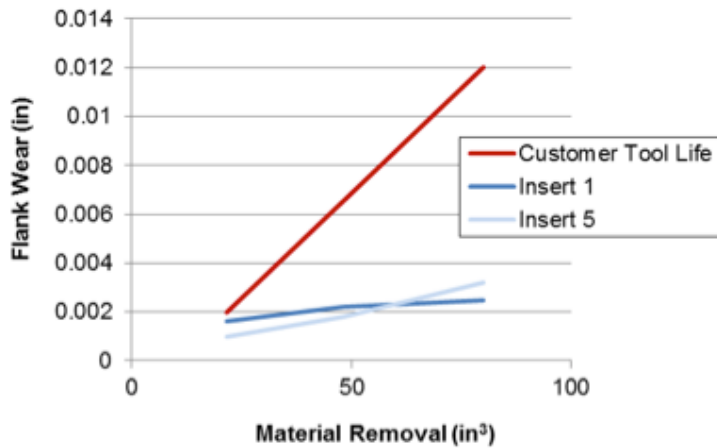
Modified 4340 Alloy Steel utilized to manufacture fluid cylinders ('frack pumps') presents unique manufacturing challenges. To maintain the desired properties, the material is heat-treated to a hardness of 40 RC. With conventional coolant, cutting time is long, and tool life is short. Coolant systems are dirty, expensive to maintain, and do not facilitate sustainable manufacturing. By applying through-the-spindle and through-the-tool Cryogenic Machining Technology, the cutting edge is cooled while maintaining normal shear temperature that the process requires. The end result is a clean, dry environment with improved tool life and increased cutting speeds.

## Cryogenic Advantages

- > 60% Increase in Cutting Parameters With Equivalent Tool Life
- > 3X Tool Life with Existing Cutting Parameters
- > 50% Reduction in White Layer (Alpha Layer)
- > Removal of Water Soluble Coolant
- > Easy to Manage Dry Chips

## Testing SOW

- > Material: Modified 4340 Alloy Steel
- > Test Part: Fluid Cylinder ('Frack Pump')
- > Tool: 5ME™ Cryogenic 3.00" Indexable Hi Feed Mill, 5 Teeth
- > Parameters: 635 SFM, 0.060" Pitch, 178 IPM Feedrate
- > Machine: Magnum 800XT HPC
- > Location: 5ME Technology Center



The above test description and photos are specific to an Interpolated Boring process. Other processes and tools such as Face Milling, Solid Carbide Drilling from 0.5" to 1.125", Thread Milling, and Reaming also showed increased productivity compared to conventional machining with coolant.

### 5ME, LLC

4270 Ivy Pointe Blvd.  
Suite 100  
Cincinnati, Ohio 45245  
tel: +1 513 719 1600  
fax: +1 513 752 1906

### 5ME, LLC

Tech Center  
6990 Murthum  
Warren, MI 48092  
tel: +1 586 473 5070  
fax: +1 586 983 2575

[www.5ME.com](http://www.5ME.com)

