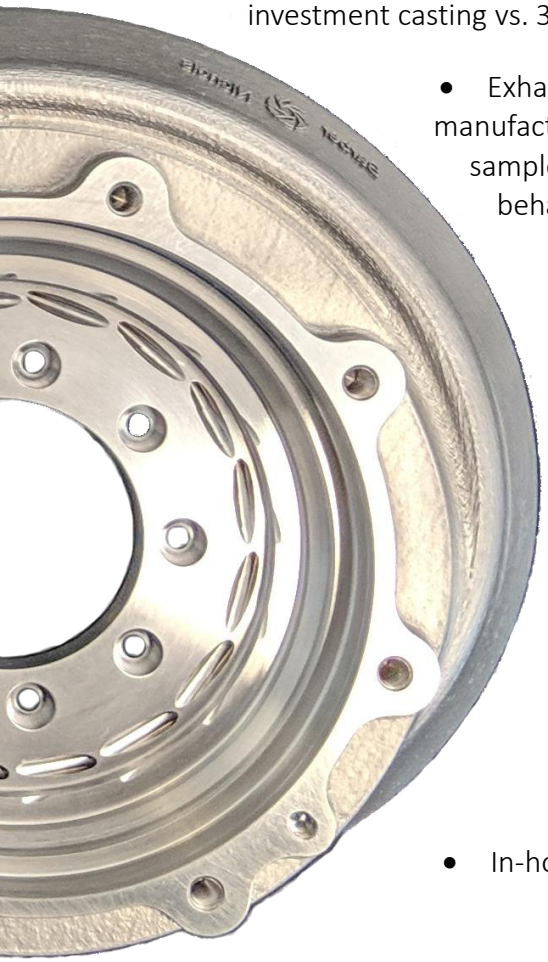
Barber Nichols

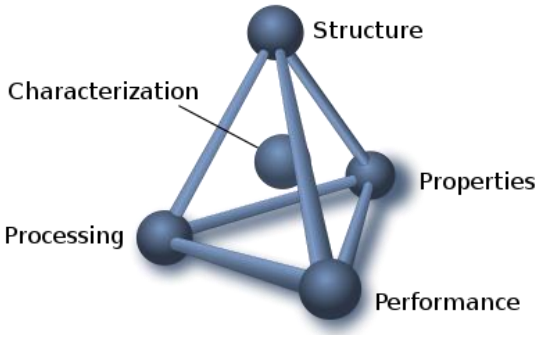
Additive Manufacturing
Why Choose Barber-Nichols?

We don't just print "best-effort" parts - we design, analyze, and optimize to print parts that meet your requirements, offering:

- Comprehensive understanding of application requirements
- Informed selection of candidate components for additive manufacturing
- Help build your business case comparing conventional 5-axis milling vs. investment casting vs. 3D printing



- Exhaustive material property database of additively manufactured materials with results from over 1,000 samples, including high-temperature, fatigue, and creep behavior of:
  - Inconel 718
  - Inconel 625
  - Haynes 282
  - 316 Stainless Steel
  - 17-4 Stainless Steel
  - Monel K500
  - AlSi10Mg



- Full structural, thermal, electromagnetic, and CFD analysis
- In-house DMLS additive manufacturing capacity and parameter development
- World-class machine shop and advanced electrochemical machining (ECM) and polishing

barber-nichols.com/additive-manufacturing | info@barber-nichols.com | 303-421-8111

Additive Manufacturing in Action

Optimized design for product performance in real world application

Application Expertise - Reducing fuel consumption is a growing priority as Large Commercial Vehicles (LCV) contribute to increasing levels of greenhouse gas emissions. Organic Rankine Cycle (ORC) systems recover power from engine waste heat to increase efficiency. BNI has designed an additively manufactured dual-entry turbine to reduce the cost and complexity of the ORC system for our customer.

Internal Material Properties Database – Printed x/y/z-axis test coupons internally to characterize Inconel 718 material properties including low and high temperature yield/tensile strength, LCF, HCF and elongation with sufficient sample sizes to ensure statistical confidence.

Designed for AM - Optimized the dual-entry inlet plenum geometry using CFD to enable co-location of the low and high-pressure inlet flanges maximizing available space.

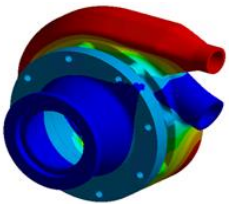
Analysis - Utilized BNI's internal material property database to perform detailed Finite Element Analysis (FEA) and confirm sufficient structure margins to meet operational requirements.

Onsite Printing and Final Machining - Printed the dual-entry turbine expander in Inconel 718 using our onsite EOS M290 DMLS machine followed immediately by final precision machining utilizing 5-axis simultaneous milling for converging-diverging nozzles. Improved surface finish via ECM to minimize skin friction.

Tested - Obtained test data with the AM development unit in dual pressure ORC test loop to demonstrate the viability of the dual-entry turbine concepts which met performance targets.

Integrated - Additive manufacturing is fully integrated into the BNI design process to optimize cost, lead-time and performance while ensuring AM components meet customer operational requirements.

Material Characterization



CFD& Structural Analysis

EOS M290

Precision Machining

Finished Part

End-User Testing

barber-nichols.com/additive-manufacturing | info@barber-nichols.com | 303-421-8111