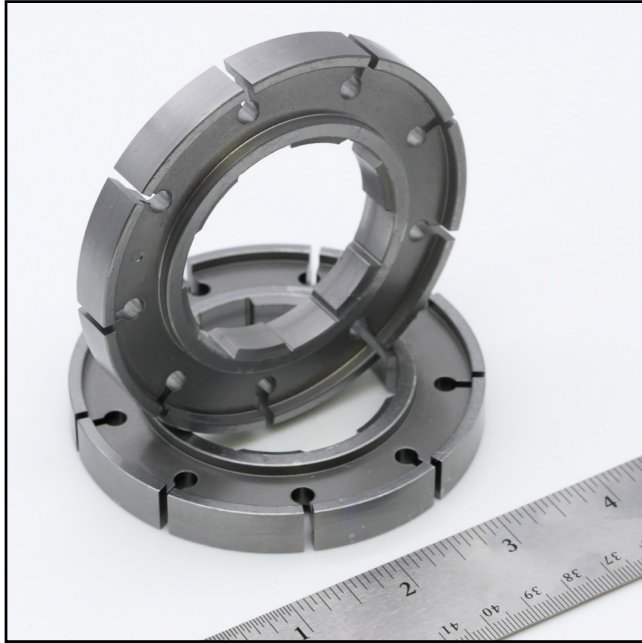# CASE STUDY

A 2019 Award of Distinction winner in the Hardware/Appliances category for Conventional PM Components

Rotor Vane

Process:
Conventional Powder Metallurgy

Material:
Modified FD-0205

Secondary Operations:
Grinding and Deburring

Apparent Hardness:
76 HRB

End Use and Function
This award-winning component is a rotor vane used in an engine lubrication oil-pump system. The rotor vane is a two-level component that must achieve certain tolerances critical to system function with minimal secondary operations. The manufacturing process involves compaction, sintering, and sizing to achieve required net-shape-feature tolerances.

Fabrication
The product application requires a high accuracy of rotor radial dimensions, ID spline, and vane-slot features to reduce internal pump leakage and achieve the required system mechanical efficiency. Made from a modified FD-0205 material to a minimum density of 6.9 g/cm^3, the part has a typical density of 6.95 g/cm^3, minimum yield strength of 340 MPa (50,000 psi), an RBF fatigue limit (90% survival) of 200 MPa (29,000 psi), and apparent hardness of 76 HRB. The part is sized, face ground, deburred and, cleaned.

The materials and component design were validated by the end user through rigorous automotive DV and PV test schedules and fully satisfied all specified requirements.

Results
Approximately 96% of the raw material was retained in the finished assembly. The design and process-control solutions enabled exacting tolerances to be produced as net-shape features reduces external scrap material in waste streams such as machining chips, grinding swarf, and machining coolants. The overall process efficiency reduced both environmental risk and costs associated with waste management and recovery.