

CASE STUDY



A 2015 Grand Prize winner in the Medical & Dental category.

Planetary Gear System for Surgical Device

Process:
Conventional powder metallurgy

Density:
6.9 g/cm³

Tensile Strength:
900 MPa

End Use and Function

This sinter-hardened steel planetary gear system, featuring a carrier with an integrated sun gear and three planetary gears, is used in multiple stacks for gear reduction in a single-use, portable, physician-operated surgical device.

Fabrication

In addition to the integrated pinion gear, the carrier includes three posts that extend above the flange with a 2-to-1 length-to-diameter ratio. Proprietary press mechanisms were required to achieve the post density, as well as a proper post-to-flange bond. The carrier is pressed, sintered, and tempered to net shape, achieving a density of 6.9 g/cm³ and ultimate tensile strength of 900 MPa.

The part is an outstanding example of a powder metallurgy (PM) medical application, unique in that it is not made of stainless steel nor fabricated through metal injection molding.

Results

The part had originally been fabricated as an assembly of a PM part and wrought posts. By integrating the posts to the flange through advanced PM manufacturing techniques, and by the elimination of a secondary heat-treating operation through the use of modern sinter-hardening materials, the new part design achieved a 60% cost reduction.



PickPM is a resource created by the Metal Powder Industries Federation, a trade association for the metal powder industry, for the benefit of the metal powder industry. To learn more about powder metallurgy, or to find a part fabricator, visit us at PickPM.com