

CASE STUDY



A 2012 Award of Distinction winner in the Lawn & Garden/Off-Highway category.

Garden Tiller Gear Output Box

Process:
Conventional powder metallurgy

Secondary Process:
Machining and drilling

Density:
6.8 g/cm³ min.

Hardness:
HRC 28 min.

Ultimate Tensile Strength:
720 MPa

End Use and Function

This powder metallurgy (PM) component is a gear output box used in a tiller application and is composed of a total of five PM gears. When created, this part was a brand new design. The challenge in creating this component comes from the total length and overall geometry, as longer and multi platens compaction is challenging.

Fabrication

This component is 62 mm in total length. The multi-stage appearance is created using two upper and three lower punches for compaction. Powder movement technology is used for adjusting a more uniform density distribution. Additional sizing and a calibration process is introduced for creating a radius on the inner rib

for better gear engagement. Secondary machining was used to keep tight tolerances for inner and outer diameters. Drilling was also performed to provide holes or assembly purposes.

Results

Overall gear accuracy and strength were qualified by severe field testing. Manufacturing this component using powder metallurgy resulted in saving more than 50% of manufacturing cost as compared with forging and machining processes, with high stability of the mechanical strength and accuracy. Additionally, the complex design is suitable for mass production using PM.



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