

## CASE STUDY



A 2015 Award of Distinction winner in the Lawn & Garden/Off-Highway category.

### Drill Driver Gearbox

**Process:**  
Conventional powder metallurgy

**Secondary Process:**  
Machining and milling

**Hardness:**  
62 HRA

**Density:**  
6.9 g/cm<sup>3</sup>

#### End Use and Function

This part is composed of five components comprising an output gearbox that serves as feedback for an anti-twist lock on a drill driver. This part contains extremely thin sections with highly complex geometries.

#### Fabrication

The parts intermediate flange, anti-twist lock, mount ring, centering sleeve, and planet gears are made from diffusion-alloyed steel. The flange is compacted using two upper and two lower punches, and powder moving technology is employed to achieve a more uniform density distribution. Tight tolerances at the inner and outer diameters is accomplished through machining, and a milling operation provides the holes needed for part assembly.

Properties include a density of 6.9 g/cm<sup>3</sup> and minimum case hardness of 62 HRA. The parts' design, with extremely thin sections and highly complicated geometries, required precise control by a CNC compacting press.

#### Results

The PM design saved more than 40% over the cost of manufacturing through forging and machining.



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](http://PickPM.com)