CASE STUDY

A 2015 Grand Prize Winner in the in the Lawn & Garden/ Off-Highway category.

Catcher, Tension Bar, and Base Cap & Body

Process:
Metal injection molding

Materials:
MIM 17-4 PH stainless steel & 4605 low-alloy steel

Density:
Minimum 7.5 g/cm^3

Ultimate Tensile Strength:
1,550 MPa

Yield Strength:
1,400 MPa

Hardness:
42–48 HRC

End Use and Function

These parts are used in proportional valves used in hydraulic circuits of off-highway and farming equipment.

Fabrication

The two parts forming the new base are made of MIM 17-4 PH stainless steel, while the catcher and tension bar are formed of 4605 low-alloy steel. All dimensions of the two parts forming the new base are achieved in the as-MIM condition, including the internal thread in the body. The catcher receives a grinding and burnishing to attain the OD tolerance and surface finish, while the tension bar needs only a turning operation to form an external thread without a parting line. Heat-treated properties include a minimum density of 7.5 g/cm^3, 1,550 MPa ultimate tensile strength, yield strength of 1,400 MPa, 3% elongation, and 42–48 HRC hardness range.

Results

The parts were formerly produced via machining, welding, conventional PM, and fastening. By completely re-designing the parts to maximize the advantages MIM offers, the customer obtained savings estimated at 65%, with annual production of 350,000.