CASE STUDY

A 2014 Award of Distinction winner in the Medical/Dental category.

Stainless Steel Shaft Assembly

Process:
Metal injection molding

Secondary processes:
Laser welding, straightened, finish machined, and reamed

Material:
MIM 17-4 PH stainless steel

Density:
7.5 g/cm^3

Tensile Strength:
1,190 MPa

Yield Strength:
1,090 MPa

Hardness:
33 HRC

End Use and Function

This component is a metal injection molded (MIM) shaft assembly used in a novel surgical instrument for passing sutures through difficult-to-reach tissue.

Fabrication

This part's design is highly complex and, unlike most surgical tools, this instrument is single-use, so a precise fabrication process had to be developed that could be scaled up to deliver high volumes at low cost using MIM-17-4 PH stainless steel. That process involves molding the 178 mm (7 in.) shaft in two parts, laser welding them together, and then performing finish machining, ID reaming, heat treating, sand blasting, and passivation to achieve the tightly toleranced dimensions. The parts have a density of 7.5 g/cm^3, an ultimate tensile strength of 1,190 MPa, a yield strength of 1,090 MPa, an elongation 6.0%, and an apparent hardness of 33 HRC.

Results

Using MIM to develop this part resulted in:

- a part that is four-to-five times less expensive than Swiss CNC machining would have been.
- considerable (90%) waste savings over Swiss CNC machining from steel rod stock.