CASE STUDY

A 2014 Grand Prize Winner in the Electronic/Electrical category.

Nozzle Assembly

Process:
Metal injection molding

Material:
316L stainless steel

Density:
>7.6 g/cm^3

Tensile Strength:
520 MPa

Yield Strength:
175 MPa

Hardness:
67 HRB

End Use and Function
This nozzle assembly is composed of a three-piece assembly—nozzle interface, outer nozzle, and metal collar—that go into high-end sound-isolating earphones that enable user-customizable frequency responses.

Fabrication
Made via metal injection molding (MIM) from 316L stainless steel, the components achieved the objective of producing final net-shape parts that not only met the cost demands of the highly competitive professional-audio market but maintained a cosmetically perfect surface so critical in a consumer product with a clear exterior. Each component nests within another component utilizing either locking lugs or fine metric threads to join the assembly seamlessly.

The parts have a density >7.6 g/cm^3, an ultimate tensile strength of 520 MPa, a yield strength of 175 MPa, an elongation of 50%, and an apparent hardness of 67 HRB.

Results
MIM was the ideal choice, as alternative fabrication methods, such as die casting or machining, could not have provided the precision needed at a reasonable cost, nor been able to provide the required material performance.

- MIM is most effective and efficient with small, high tolerance, and extremely complex components—an accurate description of the three part assembly.
- Necessary geometric details, material strength properties, and end-use precision were achieved while providing the user with an effective customizable product.
- Significantly lower component price—allowed the OEM to enjoy a competitive advantage as it launched its product.