TECHNOLOGY CHARACTERISTICS

Metal Injection Molding

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METAL INJECTION MOLDING

Technology **Characteristics**

SSI Sintered Specialties is a leading pioneer in the advancement of Metal Injection Molding (MIM). Below are technology characteristics for this process.

MATERIAL AVAILABILITY

Material options for conventional Metal Injection Molding are open to a wide range of opportunities. MIM materials offered through Tundra Innovations include: 316L, 17-4 PH, and 420. Standard materials and engineered custom grades are possible.

Expected material properties can be aligned with the MPIF Standard 35 for Metal Injection Molding.

DESIGN FEATURES:

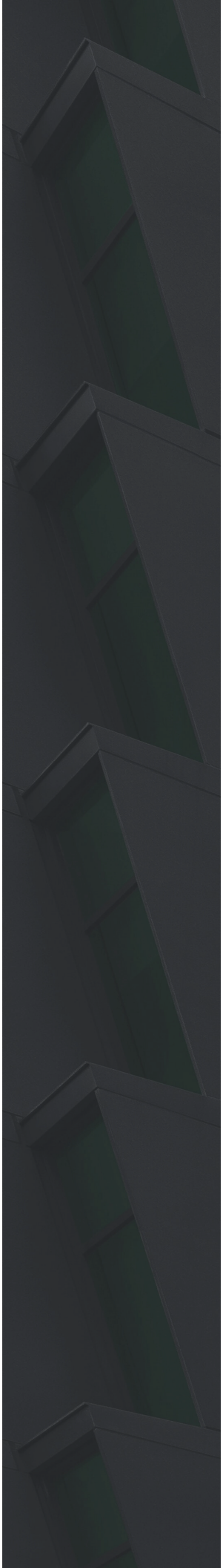
- **3D parts with high complexity, similar to plastic component designs:**
  - Combining multiple parts into one
  - Undercuts, grooves, slots & depressions
  - Holes at angles to one another
  - Stiffening ribs
  - Knurled surfaces
  - Labeling: partner numbers, names & logos
  - External and internal threads
  - Light weighting: only putting material where needed
  - Protrusions, bosses & studs
  - Nonsymmetric, prismatic, square & freedom features

PART WEIGHT

- Conventional MIM:
  - Minimum: 0.5 grams
  - Maximum: 50 grams
- Tundra Dynamik®:
  - Minimum: 10 grams
  - Maximum: 450 grams

FEATURE THICKNESS

- Conventional MIM:
  - Minimum: 0.5 mm
  - Maximum: 6.35 mm
- Tundra Dynamik®:
  - Minimum: 1.0 mm
  - Maximum: 10 mm



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DIMENSIONAL PRECISION

Dimensional precision is in line with the industry standard of +/-0.3%.

MINIMUM RADIUS

- Conventional MIM: 50 microns
- Tundra Dynamik®: 100 microns

MINIMUM SURFACE FINISH

- Conventional MIM: 0.8 Ra micro inches as-sintered
- Tundra Dynamik®: 2.5 Ra micro inches as-sintered

TOOLING

Tooling is required, with cost based on application complexity, number of cavities, and design elements like gate type, unscrewing cores, collapsible cores, and hot-runner systems.

MOLDING

- MIM molding is similar to plastic in: parting lines, ejector pin marks, gate witness, flowlines, sink, etc.
- Avoid sharp corners for best molding characteristics

ADDITIONAL CONSIDERATIONS

- MIM has uniform wall thickness (small cross sectional thickness transitions when uniformity is not possible)
- Support structure helps manage shrinkage and distortion during sintering
- Draft is typically not required
  - Exception: deep blind holes with an aspect ratio of 4 (depth) to 1 (diameter) or more, requiring 0.5 degrees draft per side