ABOUT THE TECHNOLOGY

METAL INJECTION MOLDING

Precision. Complexity. Scaled production.

Metal Injection Molding (MIM) is a manufacturing process that combines the design freedom of plastic injection molding with the strength and performance of metal. Fine metal powders are mixed with a binder to form a feedstock that is injected into molds, then debound and sintered to create high-density, high-precision parts.

How It Works

- Fine metal powder is blended with a thermoplastic binder to form a moldable feedstock
- The feedstock is injected into a mold cavity, just like in plastic injection molding
- The “green part” is cooled and ejected, then undergoes a debinding process to remove the binder
- The remaining part is sintered to fuse the metal particles and achieve full density and strength
- Optional secondary operations (e.g., surface finishing, heat treating) may follow

If it’s small, strong, and shaped in a complicated way it might be made using Metal Injection Molding.

North Central Pennsylvania **Pressed Materials** Consortium

Want to know more? Visit **pressedmaterials.org** or contact our Regional Innovation Officer, John Williams at jcw5919@psu.edu

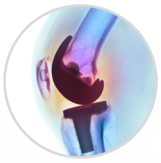
Features and Benefits

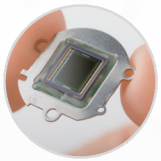
- Ideal for small, complex, high-volume parts that require precision
- Extends the capabilities of powder-based manufacturing into consumer, medical, and electronics sectors
- Uses fine powders, often similar or identical to those used in other pressed materials applications
- Complements press-and-sinter and additive manufacturing—not a competitor, but a companion process

Key Advantages Over Other Processes

MIM Offers...	Compared To...
Exceptional design freedom	Geometric limits in press-and-sinter
High production rates	Slower, more manual machining
Fine detail and tight tolerances	Less precision in casting
Excellent surface finish	More post-processing needed in PM
Miniaturization of parts	Not feasible with traditional forming

Example Applications





- Orthodontic brackets and surgical tools
- Smartphone components and wearable tech hardware
- Firearm components (triggers, safety levers)
- Automotive sensors and locking mechanisms
- Watch cases and other micro-mechanical housings

Real-World Innovation: Surgical Spine Instrument

A complex surgical instrument component with projecting posts was originally machined, but high costs and volume demands required a new approach. By shifting to metal injection molding (MIM) and applying design-for-manufacturing principles, the part was optimized for production, cutting costs and enabling high-volume output with consistent quality.

Future Potential

North Central Pennsylvania manufacturers can expand into high-growth markets such as aerospace, defense, medtech, and advanced electronics—**positioning the region as a trusted source for high-value, next-generation technologies.**