

Metal Injection Moulding (MIM)

Metal Injection Moulding (MIM) is a powder metallurgy process that has developed out of plastic injection moulding. In MIM a highly laden powder filled polymer or binder is used instead of a pure polymer is made possible by improved injection moulding machine control systems.

MIM has a wide area of applications which include watch cases, radial rotors, turbocharger rotors, automotive parts, surgical tweezers, gas manifolds and fuel nozzles etc.

The MIM industry has been driven by reduction in production costs as compared to other methods and MIM has become a mature technique for the fabrication of small and difficult to machine parts with complex shapes. Figure 1 shows competing technologies and Figure 2 identifies the optimal application of MIM.

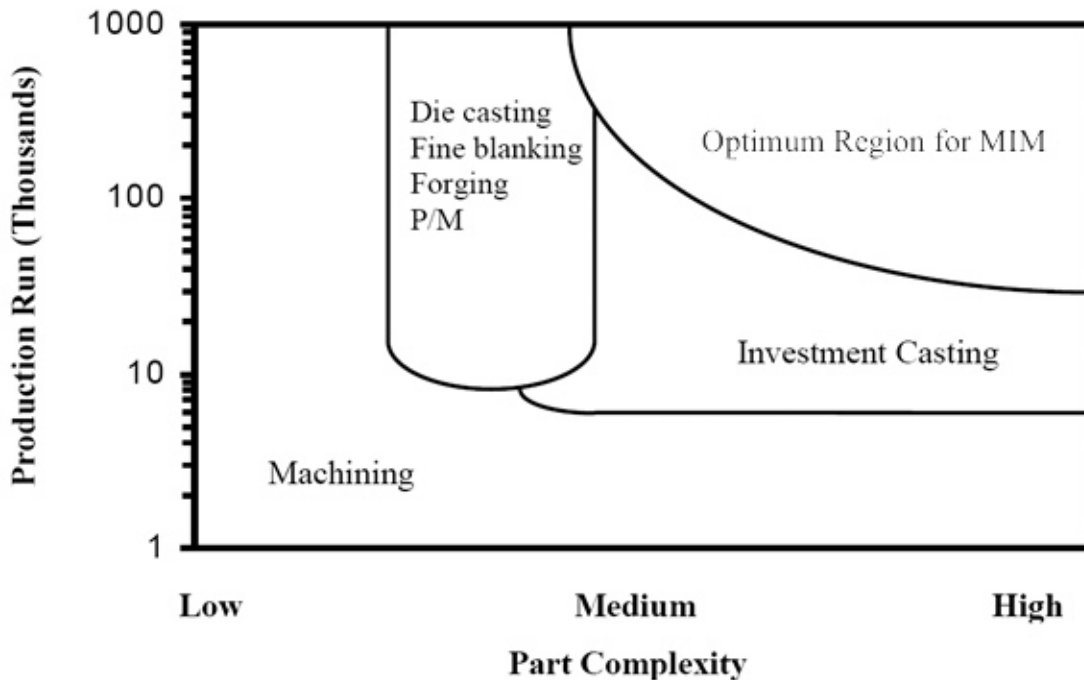


Figure 1. Competing metal component manufacturing.

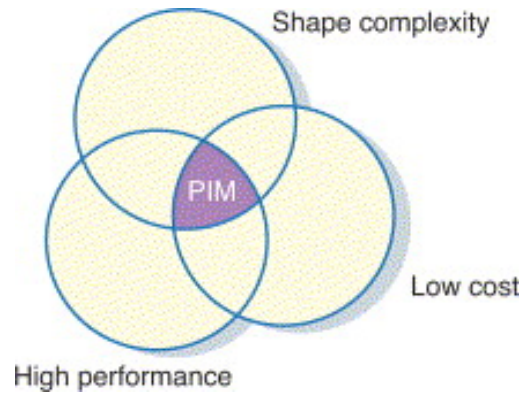


Figure 2: Venn diagram identifying the optimal application of MIM

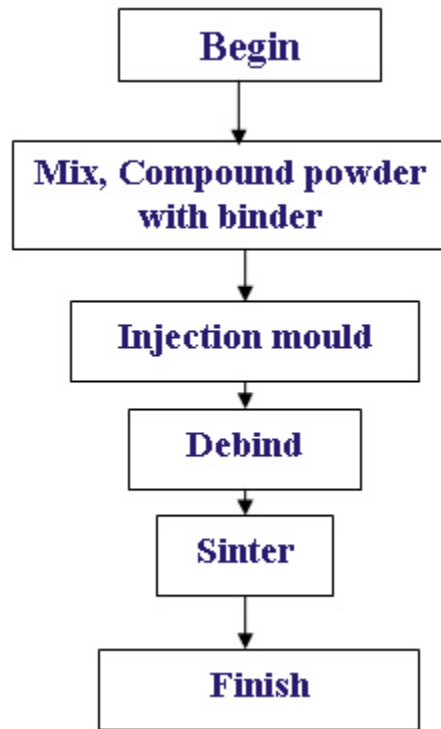


Figure 3: The MIM cycle

The Metal injection Moulding Cycle:

The MIM cycle begins with preparation of a feedstock by mixing together very fine metallic powder with a binder comprising waxes, polymers, lubricants and surfactants as shown in Figure 3. The resulting feedstock is then granulated.

An injection moulding machine is used to heat up the feedstock before injecting it into a mould cavity under pressure. The molten feedstock is allowed to cool, solidify and become what is known as a "green" part.

The binder components are then removed by the process of debinding and the brown moulding becomes a highly porous “brown” part. The brown part is sintered at elevated temperature and shrinks during the process typically to more than 95% density.

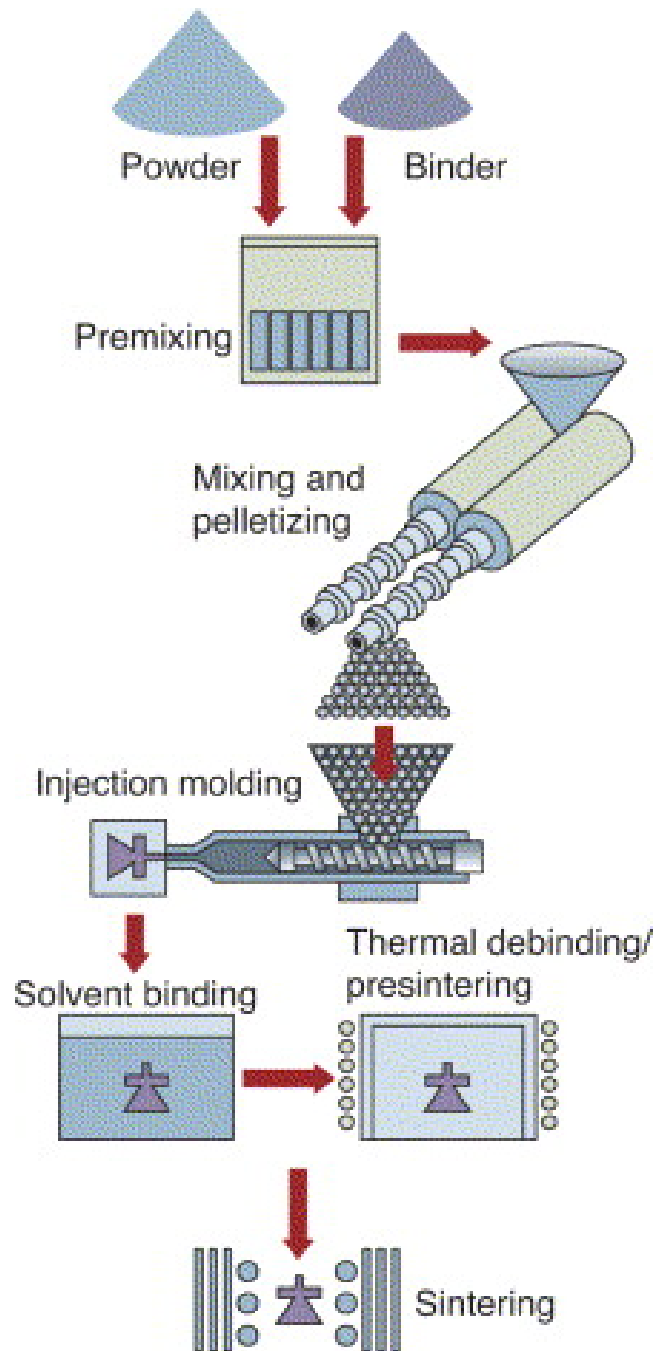


Figure 4: Detailed MIM cycle