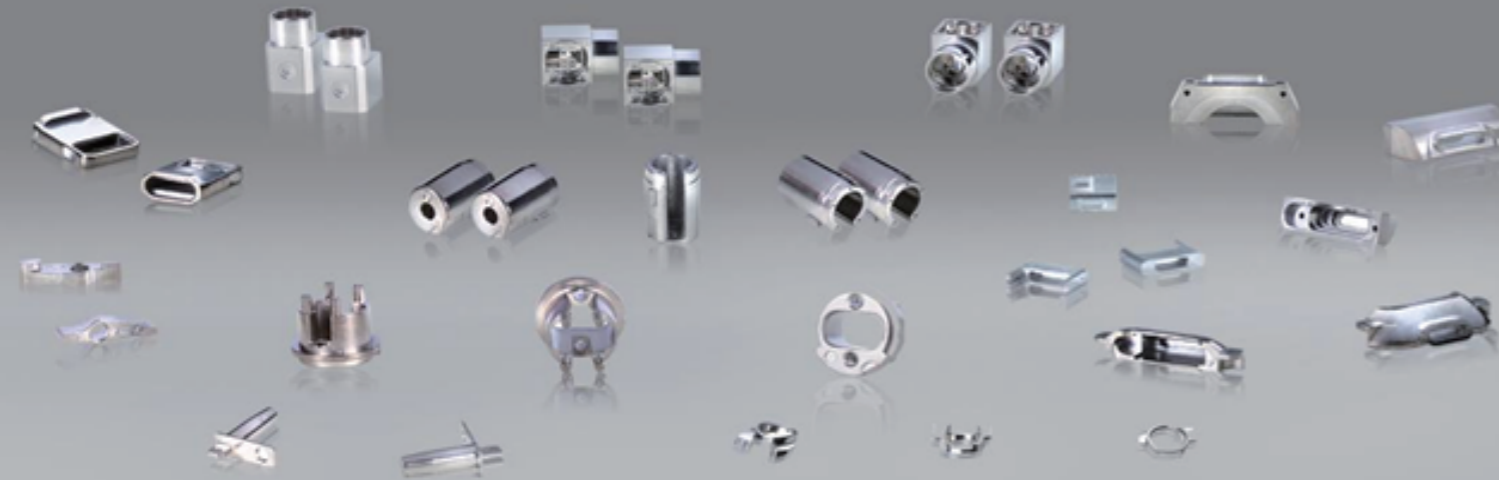


## VVT's Advantages of MIM

- \* From equipment fabricating to foundry all in one technology conformed.No.1 in industry.
- \* 25 years-old experiences on heat treatment & materials knowledge for customised services.
- \* Flexible production capability and short cycle time

## Applications

3C、Consumer Products、Firearms Industry、Automotive Industry、Power Hand-Tools and Medical Devices . . . .



## Metal Injection Molding (MIM)

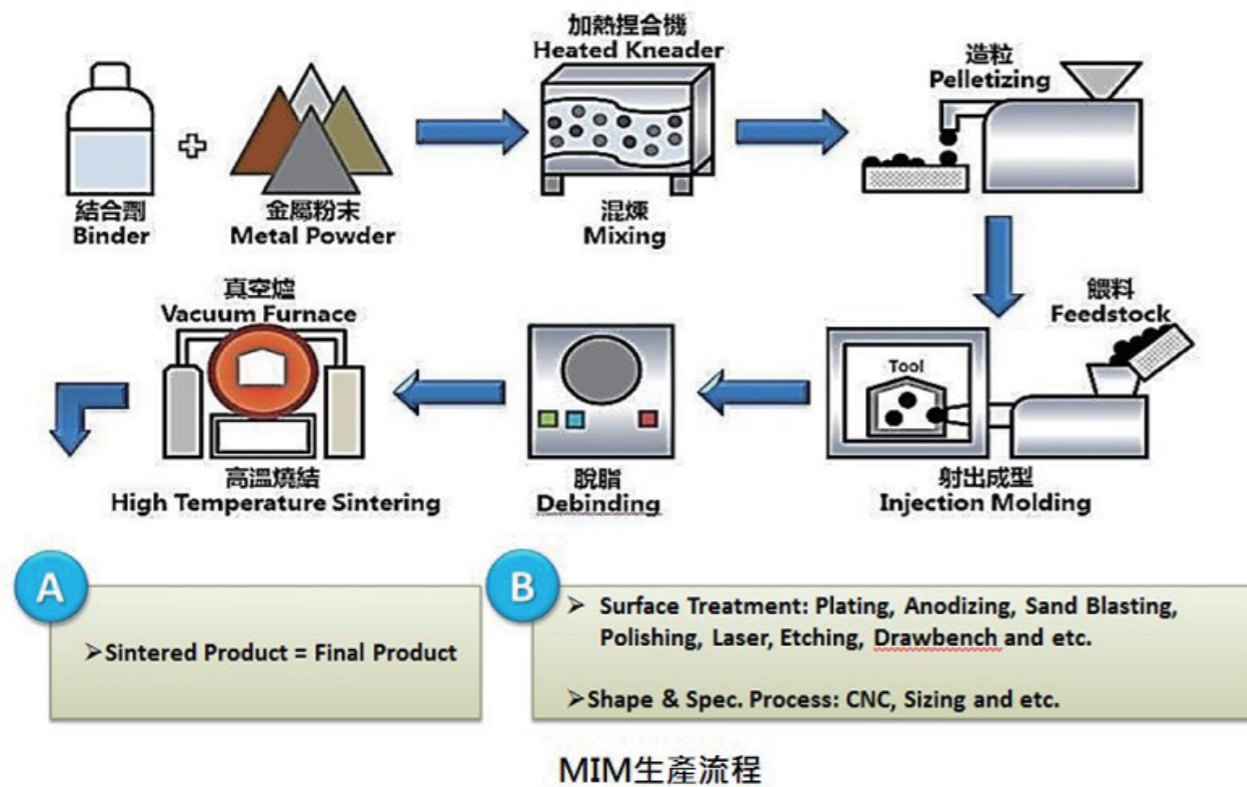
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## Description of MIM

The process combines the shape making capability of plastic injection molding with the material flexibility of powder metallurgy. MIM is ideal for tight tolerance parts, and complex shaped metal parts with high strength requirements. Besides, the MIM process can significantly shorten the development cycles and lower cost.



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## Material and Design Reference

| Material Properties |                        |                      |                |          |                |   |
|---------------------|------------------------|----------------------|----------------|----------|----------------|---|
| Material            | Tensile strength (MPa) | Yield strength (MPa) | Elongation (%) | Hardness | Heat Treatment |   |
| Stainless Steel     | SUS 316L               | 520                  | 180            | 63       | HRB 70±5       |   |
|                     | SUS 630                | 1300                 | 1030           | 5        | HRC 40±2       | v |
| Tool Steel          | SUS 440C               | 1550                 | 1500           | <1       | HRC 60±2       | v |
|                     | SKD11                  | 880                  | -              | <1       | HRC 60±2       | v |
|                     | SUS 420J2              | 1400                 | 1040           | <5       | HRC 45±2       | v |
| Low Alloy Steel     | 4605                   | 1850                 | 1500           | >2       | HRC 55±2       | v |
|                     | Fe-8Ni                 | 1500                 | 1320           | -        | HRC 50±2       | v |
|                     | Fe-2Ni                 | 1250                 | 1200           | >2       | HRC 50±2       | v |

Standard : MPIF 50

| Material Properties |                     |         |            |              |                  |
|---------------------|---------------------|---------|------------|--------------|------------------|
|                     |                     | 粉末冶金 PM | 金屬射出成型 MIM | 精密鑄造 Casting | 壓鑄成型 Die casting |
| Design              | Material selection  | ★★★     | ★★★★★      | ★★★★★        | ★                |
|                     | The complexity      | ★       | ★★★★★      | ★★★          | ★★★★★            |
|                     | Precision           | ★★★★★   | ★★★★★      | ★★           | ★★★★★            |
|                     | Minimum thickness   | 1mm     | 0.25mm     | 2mm          | 0.8mm            |
| Product Features    | Surface roughness   | >Ra 2.0 | <Ra 1.2    | >Ra 3.0      | >Ra 2.0          |
|                     | Mechanical strength | ★★      | ★★★★★      | ★★★★★        | ★                |
|                     | Density             | 90~93%  | 97~99%     | 98~99%       | 97~99%           |
|                     | Electroplatability  | ★       | ★★★★★      | ★★★★★        | ★★               |
| Productive          | Mold cost           | ★★★★★   | ★          | ★★★★★        | ★                |
|                     | Mass production     | ★★★★★   | ★★★★★      | ★★           | ★★★★★            |
|                     | Production speed    | ★★★★★   | ★★★★★      | ★★           | ★★★★★            |

| Process | 粉末冶金 PM | 金屬射出成型 MIM | 精密鑄造 Casting |
|---------|---------|------------|--------------|
| 0~5     | ±0.04   | ±0.03      | NA           |
| 5~10    | ±0.04   | ±0.03      | ±0.25        |
| 10~25   | ±0.075  | < ±0.07    |              |
| 25~40   | ±0.075  | < ±0.12    | ±0.40        |
| 40~60   | ±0.075  | < ±0.20    | ±0.60        |
| 60~100  | ±0.13   | < ±0.30    | ±0.80        |

