



Overview of MIM Product Costs for Designers and Purchasers

This time, among the fundamental principles of manufacturing—QCD (Quality, Cost, Delivery)—I would like to delve a little deeper into Cost (C), particularly in relation to MIM. Needless to say, QCD elements are closely interconnected, and the key lies in finding the optimal balance among the three. The highest priority factor is Quality (Q). In the case of MIM, quality is entirely defined by the drawings provided by the customer. In competition with other companies, however, it is Cost (C)—which is highly sensitive to Delivery (D)—that often becomes the deciding factor.

Now, let us analyze the cost-determining factors in accordance with the MIM process.

About Powder

The starting materials for MIM are metal powder and resin powder. The resin used is almost the same in all cases and does not significantly affect material cost fluctuations. The key factor is the particle size of the metal powder. For stainless steel powder, which is the primary raw material in MIM, price differences depending on the steel grade are relatively small. However, the price difference depending on particle size is substantial. For example, the ultrafine powder we handle (average particle size: approximately 2 μm) costs about ten times more per unit weight than general-purpose powder (average particle size: approximately 8 μm). Ultrafine powder offers advantages such as superior mold shape transferability (particularly for small and complex-shaped parts) and improved surface finish of the final product (the finer the powder, the smaller the Ra value). However, it is important to select the most appropriate powder based on a balance with the final required quality.

About Molding

The takt time (cycle time) of injection molding remains almost the same for small products, regardless of the steel grade or product shape. The primary cost factor during molding is the number of parts produced per shot.

Based on the capacity of the molding machine and the size of the product, we are capable of producing 1 to 4 pieces per shot (the example on the right shows a two-piece shot). The number of cavities in the mold depends on the production volume. However, increasing the number of cavities also raises the mold cost (which is borne by the customer). Therefore, a precise mold design based on a detailed production plan is required to achieve an optimal balance between production efficiency and mold cost.

About Sintering

The primary cost factor in sintering is the number of parts that can be processed per batch. The vacuum furnace we operate has a total usable floor area of approximately 20,000 cm^2 . In theory, if each product has a bottom surface area of 1 cm^2 and they are arranged side by side without gaps, up to 20,000 pieces could be processed in a single run. In reality, however, as shown in the figure on the right, a certain spacing must be maintained between parts in all directions. As a result, the effective usable area is reduced to approximately 30–40% of the total. When a product has a clearly defined flat bottom surface and can be placed directly on the setter plate, the above applies. However, for complex-shaped parts, support jigs may be required for stable placement or to prevent sagging during sintering. This reduces the effective usable area and adds the cost of additional support fixtures. Furthermore, for very small parts, the labor cost of arranging them in the furnace also increases.

Next, regarding the sintering temperature:

If the powder specifications and product volume are equivalent, and a similar shrinkage rate can be expected, it is possible to co-sinter the product together with other parts in the same batch. However, if individual sintering is required, the cost increases. As described above, the sintering process involves many cost factors and is often the most challenging stage from a cost perspective. First and foremost, key information such as the product volume, bottom surface area, and whether the part can be placed stably in a stationary position are critical points in determining cost.

About Inspection

The products we handle are primarily small, three-dimensional, complex-shaped parts. As a result, three-dimensional measurement technology is one of our core technical strengths (please refer to previous reports such as Vol. 16, 39, and 50). The factor that directly affects inspection cost is, quite simply, the customer's drawing—namely, the specified tolerances. The more numerous and stricter the tolerance requirements, the higher the inspection cost will be. Therefore, if tolerances can be relaxed from the outset for areas that are not “truly necessary,” it is possible to significantly reduce time loss caused by back-and-forth communication and rework during the prototyping stage. This leads to lower development costs, improved yield, and ultimately clear benefits for both parties.

We hope the above points will serve as helpful hints for cost reduction in your future inquiries.

Upcoming Exhibitions

• MD&M West 2026

Feb 3–5 | Anaheim | Booth #3499

• Medtec Japan 2026

Apr 21–23 | Tokyo | Hall E7- Booth #309/#409

