Introduction to PLASTIC INJECTION MOLDING

A short guide by Precision Molded Plastics

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PREFACE

New to **plastic injection molding**?

This guide will give you a brief summary of the subject.

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If you want a waffle, first you need to build a **waffle iron**.
Likewise, if you need an injection molded part, you'll need to build a mold to make it.

At the most basic level, a plastic injection mold consists of **two blocks of metal** (usually steel) that are clamped together in a molding machine.

Molds have **cavities** (impressions) in one half of the mold, and **cores** on the other half, which fit into the cavities when the mold is closed. The space left between the core and cavity is what becomes the part (i.e., the waffle), when molten plastic is injected into it, cools, and then hardens.

Molds (also referred to as "tooling") range in **classification** or quality from Class 105 (Prototype/Up to 500 cycles) to Class 101 (High Volume/1 Million+ cycles).

MOLDS

PARTS

The design of parts to be injection molded includes some unique considerations. Most notably, is the part **moldable**? In other words, reasonably speaking, can a mold produce the part, and can the part be ejected from the mold once formed?

Other design limitations include those related to wall thickness, draft angles, sharp edges, ribs, bosses, threads, and dimensional tolerances.

Before molds are built, your supplier should perform a **Design for Manufacturability (DFM)** study, which analyzes the design of a part with the intent of optimizing the quality of the part and the efficiency of the manufacturing/molding process.

MATERIAL

Plastic injection molding most often utilizes **thermoplastics**, although other materials (e.g., thermosets) can be used, with the necessary equipment.

There are many different **families** of plastics and often multiple **grades** with unique characteristics within each.

Colorants and **additives** can be combined with base resins to modify the hue or qualities of the material.

DOCUMENTATION

Building an injection mold requires a 3D, **solid model** computer file of the part. This is different from a **mesh model** file (e.g., obj or stl), which describes surfaces using geometric shapes and is used for 3D printing.

Additionally, there should be a **drawing** (or print) for each part that contains references to critical dimensions, allowable tolerances, applicable requirements, and any other relevant information.

Other documents may include those related to regulatory, industry, company, and quality requirements and specifications.

The **part application** will dictate certain requirements. For instance, the part may be associated with food or beverages, which would limit the use of some resins.

Likewise, the part might be a component of a larger assembly and have precise **form, fit and function** specifications.

In addition, the demand or **estimated annual usage (EAU)** will influence certain tooling, purchasing and manufacturing approaches.

USAGE

SUPPLIER

A good vendor is a **supply chain partner**, who doesn't just produce parts, they **provide value**. As such, look for a molder who "checks all the boxes" on your list of what constitutes the ideal supplier.

Molding machines (or presses) range from mini/tabletop equipment to thousands of tons of clamping force, with the most common being between 50 to 500 tons.

When designing parts and researching suppliers, consider the need for **secondary operations**, including machining, decoration, assembly and packaging.

Surface finish or texture of a part often is a consideration, and it generally is achieved by polishing or treating the applicable cavity or core.

Particular attention should be paid to the supplier's **quality management system**, including quality assurance planning, quality controls and inspections, and their certifications.

MISCELLANEOUS

CONCLUSION

This guide is intended to serve only as a brief introduction to **plastic injection molding**. If you have any questions or would like to learn more about a certain topic, please visit our virtual **Resource Center** or feel free to contact us.
We look forward to speaking with you.

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