



## INTRODUCTION

The die casting process is relatively simple to understand. It is often called high pressure die casting because both halves of a steel die are held closed together under high pressure. In the Aluminum Die Casting Process, molten aluminum alloy metal is poured into a steel cylinder. Inside the cylinder is a shot rod and shot piston. The molten metal is then pushed, or injected like a fluid in a syringe is injected through a needle, into the part designed cavities between the two steel die halves held together under high pressure. Hydraulic fluid under pressure pushes the piston and molten metal. The molten aluminum alloy metal is pushed until the cavities fill completely and is then held between the die halves under high pressure until it solidifies from liquid molten metal into a solid metal part. Modern die casters use computerized controls to control much of the die casting process. Advanced aluminum die casting companies use [Vacuum Die Casting](#) to remove air from the cavities before the molten metal is injected. As a result, high-precision, high integrity, high-strength die cast parts are rapidly produced.

Some of the advantages of high pressure die casting are: low cost parts, high integrity pressure-tight castings, close-tolerances and dimensional control, part design and shape flexibility, reduced or eliminated secondary operations, smooth die cast surface finishes, and a wide variety of possible secondary finishes.

## HOW TO DETERMINE YOUR BEST OPTION

The die casting process produces consistent, repeatable metal parts, faster, at much lower costs compared to other manufacturing methods, a wide range of both simple and complex shapes, close tolerances, die cast parts to finished dimensions, minimizes or eliminates extra costly operations.

Design and Process Engineers need solutions to their problems. An experienced die casting company that really knows the die casting process and can provide real solutions - [From Design to Finished Products](#) - who understands the design and fit, form and function of parts, can provide expert part design development assistance and deliver high quality, high integrity, cost effective die cast parts consistently and on schedule.

The majority of die cast parts are made from aluminum die casting alloys. Zinc die casting alloys are very common as well. Other less common alloys include copper and magnesium, which are normally used only for specific applications. Aluminum die casting alloys offer excellent dimensional stability and a smooth surface finish, and many of its alloys are well suited to die casting. Most die cast parts are specified as replacements for machined parts or other casting methods, typically achieving significant cost savings through faster production and/or eliminating secondary operations such as milling, drilling and mechanical fastening.

## DIE CAST DESIGN FACTORS

To obtain the maximum benefits from the die casting process, it's vital to communicate with the die cast design engineer as early as possible in part design and development. Part design can then be optimized and potential tooling and manufacturing issues can be prevented. An experienced die cast tool and die designer can help reduce premature wear and prolong die life by using optimum die steels and locating gates, runners, overflows and slides for maximum efficiency and minimum porosity.

An experienced die cast design engineer can also identify potential cost saving opportunities in the design of the part and tooling that may not be apparent to others. Such as part redesigns to reduce or eliminate sub-operations and related costs, coring holes to reduce machining costs, multi-cavity dies to produce multiple parts at a time and reduce part costs, family dies to make sets of parts at the same time, and replaceable inserts or slides to produce parts with similar geometries and reduce costs.

Here are some of the key factors in the [die casting design](#) process:

**Custom Shapes:** Custom shapes can be easily produced and is one of the many benefits of designing parts to be die cast.

**Wall Thickness Dimensions:** Aluminum die castings can be produced with a minimum wall thickness of .060". Zinc die castings can be produced with even thinner walls. NADCA Die Casting Standard's minimum dimensional tolerances for aluminum and zinc die castings are typically +/- .005".

**Radii and Draft:** Sharp corners of a part can be difficult to produce and can cause metal shrinkage cracks or tears to occur. Insufficient draft on walls can cause difficulties as well. The solutions are simple. Design sufficient drafts on walls and radii on sharp corners to allow the molten metal unrestricted flow and the benefits become obvious after observing before and after results. It is important in the die casting design process to account for sufficient wall drafts and corner radii.

**Dimensional and Surface Finish Repeatability:** By nature, die casting delivers excellent dimensional and surface finish repeatability. But many end users have found that quality issues are a significant challenge when production is outsourced internationally as well as nationally. Engineering changes in particular can be difficult when dealing with an overseas supplier. In selecting a die caster, look for a stable die casting company with many years of experience, certification to ISO 9001 Quality Standards, and a proven record of producing high quality products.

**High and Low Volume:** Many die casting companies are unable to produce high volumes of castings. And of those that can, some are unable to consistently produce high quality castings. Die casting production rates are much faster than other casting methods, enabling high volume and low cost benefits.

**Large and Small Castings.** A professional and experienced die casting company that produces high quality die cast parts at competitive prices will have an experience team, an established quality control system, state-of-the-art equipment, is continuously improving processes and methods, and is willing to produce both large and small production volumes of both simple and complex part designs.

**Casting Strength:** In some applications, physical properties such as casting strength can be an issue. Depending on the die cast alloys used, die castings can be produced with very high strength characteristics. The design of the die cast part can make a big difference, such as adding radii to improve metal flow and ribs to improve strength as well. When even greater strength or durability is required for a part, inserts such as bearings or bushings can be cast into a die cast part to deliver the required physical properties and perhaps replace machined or fastened components. Helicoils are another proven option to increase the thread strength of tapped holes.

**Vacuum Die Casting:** Experienced and professional die casting companies use vacuum die casting equipment to consistently produce high quality, high integrity die cast parts that are solid and have minimal air entrapment. For such die casting companies, impregnation is unnecessary. For other die

casting companies less qualified, an impregnation process must be used that seals air entrapped porosity and voids.

**Sub-operations.** There are a wide variety of [secondary finishing](#) operations to choose to obtain the finished end product desired. Amongst them are drilling, tapping, grinding, deburring, ball burnishing, sand blasting, satin sand finishing, buffing, polishing, CNC machining and many other sub-operations.

**Cosmetic Finishes:** Die cast parts can be cleaned and treated with many types of cosmetic and protective coatings, such as chemical film, anodizing, chrome plating, powder coating and other many other cosmetic and protective coatings.

## DIE CASTING & RECYCLING - PROTECTING THE ENVIRONMENT

Die casting is basically a system of recycling. The die casting process is clean, non-toxic and based on recycling, making it one of the cleanest manufacturing processes in the world. The metal alloys used by die casters are produced from virgin or recycled raw materials and are recycled back into use right in the die cast foundry. The excess aluminum or zinc is re-melted and re-used to cast additional die cast parts. In addition, some die casters recycle and reuse their machine hydraulic fluids, filters and other supplies. KenWalt Die Casting Company in Sun Valley, California uses Solar Energy to reduce and conserve energy usage and protect our environment. An estimate of more than 95% of aluminum die castings produced in North America are made from post-consumer recycled aluminum. Overall, the die casting process is a very clean and efficient process of manufacturing and recycling.

## TYPICAL APPLICATIONS FOR DIE CASTINGS

Die castings are used in virtually every industry. NADCA (North American Die Casting Association) states that 90% of all finished products contain one or more castings. Volumes range from one to millions of parts per year.

Aluminum and Zinc Alloy die cast parts are commonly used in industries such as: Automotive, Aerospace, Computers, Commercial, Die Cast Toys, Fitness Equipment, Industrial, Medical, Military, Telecommunications and are used in many types of products such as Connectors, Covers, Faucets, Enclosures, Frames, Heat Sinks, Housings, Levers, Valves and many others.

For more information, Call 1-800-KENWALT (1-800-536-9258) or [Click Here to Email Us](#)



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