

WHITE PAPER

Cast-In-Place: Insert Casting

High Pressure Aluminum Die Casting (HPDC)



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INSERT CASTING

INTRODUCTION

Aluminum is a key manufacturing raw material in automotive, aerospace and general industries. Product Design Engineers often choose aluminum over other metals because it is light weight, strong, flexible, low corrosive and readily available. Aluminum die casting is the process of forcing molten metal under high pressure into a mold cavity. An effective part design is imperative and Engineers are constantly working to improve product designs and develop engineered components that can be produced at a reasonable cost to consumers.



When developing die castings that are fastened to another component, Design Engineers have to consider the attachment method. A common way to mount a die casting to a mating component would be the use of threaded fasteners. Tapped holes in aluminum die castings can result in stripped threads which can cause the part to fail.

An effective solution to this problem is to use cast-in-place steel threaded fasteners directly into the die casting. This method is known as cast-in-place or insert casting. **In this process, components are inserted directly into the die cast tool then molten aluminum or zinc is cast around the insert, creating a uniform all-in-one component.**

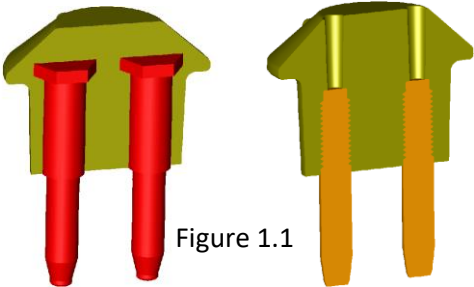
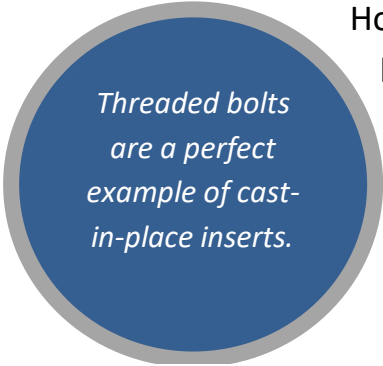


Figure 1.1

This process is very similar to overmolding which is done in the plastics industry.

However, instead of plastic, insert casting uses the high pressure die casting process to inject molten aluminum or zinc into a die containing the pre-placed insert. Originally, we developed our insert casting process for automotive anti-vibration components, however, insert casting can be used for virtually any application and it has infinite growth potential.



Threaded bolts are a perfect example of cast-in-place inserts.

Figure 1.1 Insert Casting Design Options

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CASTING & INSPECTION PROCESS

The steps that each of our cast-in-place inserts encounter before reaching the customer is part of a unique process in which **QUALITY** is our **PRIORITY**.



First, fasteners such as bolts, studs, pins or bushings are loaded into each die cavity.



The ladle pours molten aluminum or zinc into the shot sleeve which forces metal into the die cavity.



The shot is then ejected from the die with the fastener now embedded into the casting.



Lastly, each part is 100% digitally inspected in a vision machine to verify customer specific quality criteria.

DIGITAL VISION INSPECTION

Each insert casting is digitally inspected in an automated machine. Our vision systems were designed specifically for cast-in-place components. This state-of-the-art technology has inspected over 20 million parts with **ZERO** defects passed. Detection includes flash, thread presence, thread length, or an absent bolt, stud, pin, or bushing.

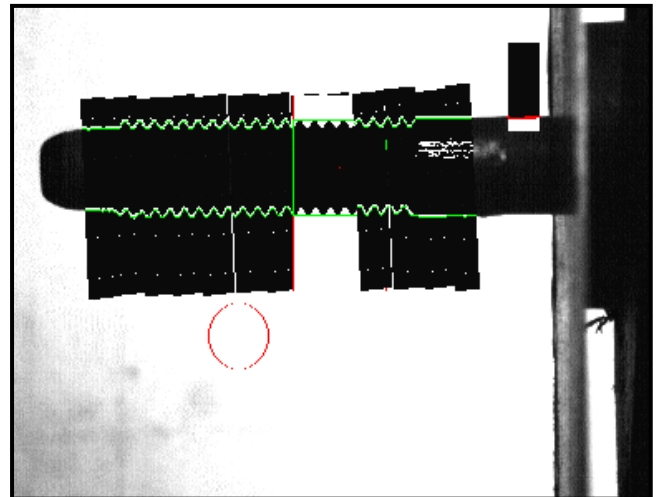


Figure 1.2

Figure 1.2 Measurements from Vision System showing thread presences

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ADVANTAGES

When determining how to fasten a die cast component to a mating part, there are several options. If you elect to use a bolt as the attachment method consider the torque and pull out forces of a threaded hole (drill and tap) versus a cast-in-place bolt. Another important consideration is the labor cost to drill and tap the threaded hole in comparison to insert casting. The drill and tap method is done in a secondary operation which drives cost for both the operation itself and the machining equipment needed to drill and tap. By choosing the cast-in-place process, Engineers are able to improve product performance and reduce manufacturing costs.

Insert castings have been tested for strength and durability (torque and pull-out forces) for various applications. Our Engineers have created a bolt design that reduces the risk of flash and increases the strength and durability of the component. A simple but effective design option is to use a hex head bolt which significantly increases test results for torque and pull out forces.

Cast-in-place has many advantages including but not limited to; reduced cost, reduced post casting assembly, increased reliability, and increased strength.

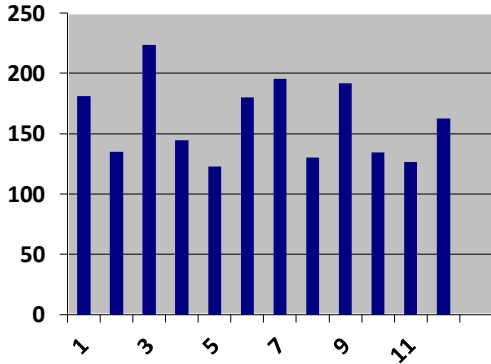


Figure 1.3

In figure 1.3, we tested 12 parts with an average torque test of **160.7N-m**. Even at this force, the bolt never turned inside the casing, nor did it pull out. Instead, the bolt broke in half and the hex head remained embedded inside the die cast component. Similar results can be duplicated through the use of several anti-rotation features that we offer. The benefits of our cast-in-place process have enabled us to provide a quality product and a cost savings to our customers since 1985.

Figure 1.3 Torque Test Performed on a Hex Bolt All-In-One Component

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CONCLUSION

By using the cast-in-place method, manufacturers and OEM's receive a component that is strong, reliable, and cost effective.

Insert casting can play an important and beneficial role in the die casting industry. It's an efficient and effective way to incorporate a fastener for component assembly. Design advantages of **strength** and **quality** for cast-in-place components along with a reduction in manufacturing costs, serves as a testimony to the industry-changing power of insert casting. With an infinite number of applications, insert casting can benefit your product design and we are here to help.

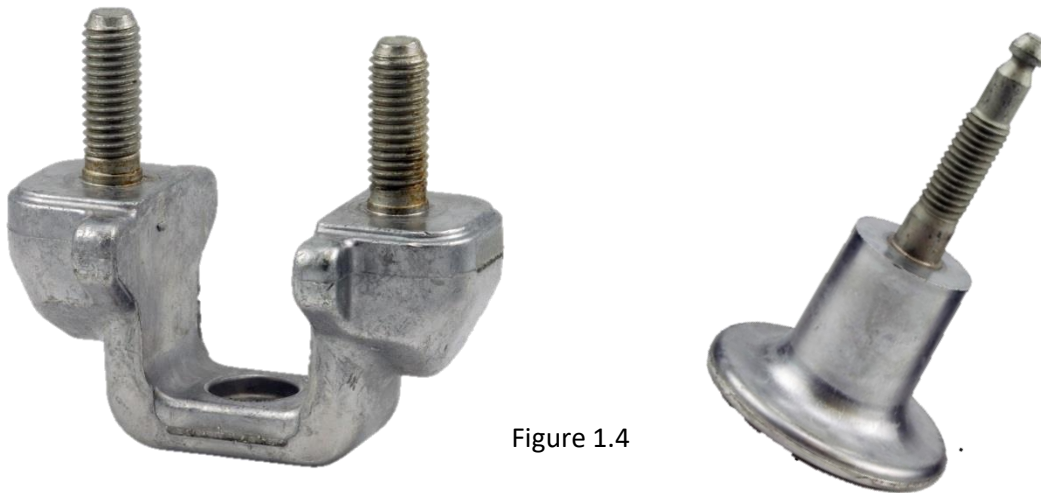


Figure 1.4

Figure 1.4 All-In-One Components using Cast-In-Place Method

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CONTACT

To learn more about Insert Casting contact Jay Schermond.

My team is here to help bolster your product design with insert casting technology. It offers improved performance and is a cost-effective way to attach your die casting to mating components.

As your primary point of contact, you can count on me to assist with your product design and development from beginning to end. My role is to provide sales and service to my customers with a focus on understanding their buying experience. Supplying custom engineered components is the business of my business and my purpose is to help customers get what they want in the most economical way.

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Making the buying experience economical is all about creating value for the customer and meeting their needs.