



Introduction

There are many prototyping techniques available for zinc die casting, and all have advantages. One technique that has become very popular among many zinc die casters is machining parts from zinc con-cast bar stock.

This article explains some of these prototyping processes, and describes the benefits of prototyping using machined parts from Con-Cast Zinc Bar stock.

Why Prototype?

Prototyping is a very important stage in product development. There are many reasons to prototype, including:

- Prototyping helps engineers determine if parts can or cannot be made in the material being tested.
- Prototyping can be very easy and can give quick results to the end user for fast decision making.
- Prototyping helps eliminate costly retooling procedures required when parts fail preliminary testing. Changes can be made to the part instead of the tool.
- If prototyping is not used, the end user may give up after the first round of testing because of the added time and expense of retooling the die for additional parts.



Figure 1 General view of various shapes of con-cast zinc bar stock

Prototyping Methods

Some prototyping methods available for zinc components include sand casting, graphite permanent mold casting, spin casting, plaster casting, investment casting, etc. Each of these processes has specific advantages and disadvantages.

Considering what type of prototyping method to choose depends on what physical or mechanical property is in question. For instance, if the end user is prototyping a Zamak 3 die casting component and is interested in the part's strength, it is sometimes recommended to use ZA-12 or heat treated ZA-27 in a gravity casting technique. If the part is plated, and surface finish is important, a plaster casting process is required to achieve the appropriate surface finish.²

A quick and easy alternative to these processes is machining parts from con-cast zinc bar stock.

Advantages of Con-Cast Zinc Bar Stock

The con-cast zinc bar stock process was specifically designed so that the machined con-cast parts have comparable properties to zinc die cast parts.

Some of the advantages of using con-cast zinc bar stock are:

- All of the zinc die casting alloys are available in con-cast form, each having similar properties as the final die casting products. This is less complicated for the end user to understand.
- Con-cast bar stock can be used for functional testing **as well as** aesthetic properties (plating, powder coating, etc.)

- The material is readily available – so there are no long lead times (unless unusual sizes are requested).
- There is no wait for tools to be machined.
- There are many sizes and shapes available (see Figure 1), including diameters ranging from 3/4" to 9", and rectangular sections of 5/8" to 8".

Properties of Con-Cast Zinc Bar Stock

As mentioned earlier, the properties of zinc con-cast bar stock components are similar to those of zinc die casting components. The following table compares these properties:

	Tensile Strength (ksi)	Yield Strength (ksi)	Elongation (%) in 2" bar	Hardness Brinell (500/10/30)
Zamak 3 Concast ³	45.6	38.1	1.6	101
Zamak 3 Die Cast ⁴	41	32	10	82
ZA12 Concast ³	67.8	53.3	2.5	130
ZA12 (HT) Concast ³	45.5	35.6	11	93
ZA12 Die Cast ⁴	59	45-48	4-7	95-105
ZA12 Sand Cast ⁴	40-46	31	1-3	89-105

Table 1: Comparison of the properties of con-cast zinc alloys with die casting alloys.

Although there are some differences in the properties between the con-cast and die casting alloys (specifically elongation), this process has been found to be a very viable prototyping method, and the most accurate of all the prototyping methods.

When considering con-cast bar stock for prototyping, contact Eastern Alloys to ensure that the right stock material is chosen to achieve the most similar results to die casting.

Examples

Inject Solutions Plug:

The Inject Solutions Plug is a newly patented product designed to offer a long lasting and unobtrusive solution to the treatment of

common pest or moisture problem in walls, floors, windows, doors, ceilings, attics, under cabinets and vanities.



Figure 2 – Inject Solutions plugs, exterior (top), Interior (middle). Pesky Carpenter ant (bottom left)

Once installed, chemicals are simply injected through the plug. After the treatment has been completed, a plastic plug cap snaps in place leaving a clean look to the housing surface eliminating the need for additional patching and painting. This also allows for easy access for future applications.



Figure 3 – Inject Solutions Plug. Con-cast bar stock (left), Die Casting (right).

This zinc die casting was originally design with 90 degree offset slots for the infusion of the pesticides. After discussions with the die caster it was decided that thousands of dollars could be saved in tooling by making the slots closer together.

This new design was tested using parts machined out of concast bar stock. Testing was successful, and the die cast program successfully began.

Parts for a Power Seat Drive Assembly:

The parts shown in Figure 4 show the graduation for prototyping components for a power seat drive assembly. The figure

contains the con-cast bar stock (left), the machined prototype (center), and the resulting zinc die casting (right).

Often existing parts undergo design changes, modifications or consolidation. In these cases prototyping is an important step to eliminate costly changes to the die during this testing procedure.



Figure 4 - Male Drive Spline for A Power Seat Drive Assembly

Summary

In today's global competition for die casting components, it is good practice to market the zinc die casting process to all industries for potential zinc products. As parts convert to zinc, prototyping becomes an essential step to ensuring a successful zinc program.

Machining from zinc con-cast bar stock has become an increasingly popular method of prototyping zinc parts. It is a quick and easy process, and gives very similar properties to a zinc die casting component.

In addition, this process has become a favorite of many zinc die casters due to its fast turnaround time, readily available material, and ease of machining.

For most cases, the zinc con-cast alloy chosen for prototyping should be the same as the die cast alloy. However, certain cases may require artificially aging the con-cast alloy to achieve properties even closer to the die casting alloys.

For more information on prototyping, technical help, or purchasing con-cast zinc alloys, please contact Eastern Alloys.

References:

¹Quarterly Aluminum & Zinc Die Casting Shipments (Image), Die Casting Industry Links, October 2005, pg. 6.

²Interzinc – Zinc Casting, A Systems Approach. Michigan: Interzinc, 1992.

³Adams, G.R., Sakuye, R.T., & Redden, T.J. Prototypes from Con-Cast Zinc-Aluminum Alloys" 15th Die Casting Congress & Exposition, October 16-19, 1989. Paper No. G-T89-091.

⁴Zinc Alloy Properties Guide, New York: Eastern Alloys, Inc., 2001.

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