OEM Tech Brief

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Chicago White Metal Casting
High-Tech Al, Mg, & Zn Die Casting and Miniature 4-Slide Zn & ZA-8 Die Cast Parts
649 N. Route 83, Bensenville, IL 60106
Tel: 1-630-595-4424 Fax: 1-630-595-9160
CWM E-mail: sales@cwmtl.com
CWM Website: http://www.cwmdiecast.com

These Magnesium Myths may be holding you back from better engineered parts

Still Believe These Five Magnesium Myths?

Once a myth takes hold it often continues under its own power. These five so-called "knowns" about magnesium related to the die casting process may be keeping you from realizing the considerable benefits of today's die cast processing in mag.

When considering alternative materials in designing custom engineered components, examine the facts that follow about magnesium used in die casting today— as opposed to the misconceptions.

Myth No. 1
Magnesium is Too Expensive

Fact: Materials are priced and purchased by the pound. In engineered part designs, their material content is based on the volumes actually used in the part. When objective material cost evaluations are based on "equal volume" comparisons, magnesium becomes cost-competitive due to its low density, excellent strength, stiffness and energy absorption characteristics. Mag has the highest strength-to-weight ratio of any structural metal.

Magnesium's thinwall die casting capabilities routinely allow housing walls to be cast to 0.08 in. (2 mm), with some walls cast as thin as 0.03 in. (0.76 mm). The results are greater stiffness, lower part weights and material costs compared to reinforced plastics.

Automated hot-chamber die casting technology, exclusively used by CWM, delivers faster cycle times (30% greater than aluminum processing), plus die life from two to four times longer.

Myth No. 2
Magnesium Corrodes Too Easily

Fact: Today's fluxless hot-chamber mag die casting processing has eliminated the former corrosive effects of flux contamination. New high-purity magnesium alloys provide far higher levels of corrosion resistance for mag parts, as-cast, with many components routinely used with no protective coating of any kind.

Resistance to atmospheric corrosion can be enhanced by a variety of inexpensive chemical treatments commonly used for magnesium parts.

When magnesium components are used in an assembly of parts, normal caveats would naturally be followed as in the case of a component produced in mild steel.

Myth No. 3
Magnesium Can Burn Too Easily

Fact: Misleading experiments demonstrating the performance of magnesium powder and thin strips have helped create the concept of "flammable" magnesium. Actually, magnesium is often

used as an extremely effective heat dissipator. In solid die cast form, it is as free of fire hazard as hundreds of materials commonly used in every manufacturing operation.

Metals, as well as plastics, of course, will burn at high temperatures. Magnesium will not burn at temperature levels two to three times the level that will melt and burn most plastics, often generating toxic fumes.

When Mg die cast parts require post- casting machining operations, they can be readily performed without hazard. Mg machining and handling calls for the normal housekeeping procedures of any well-run machining department.

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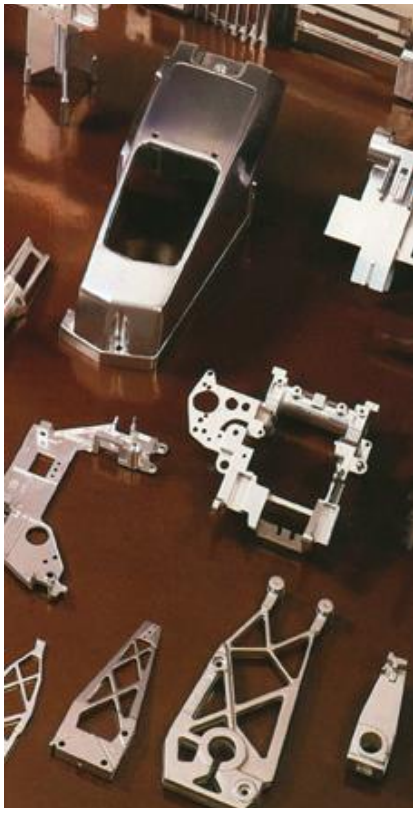
Myth No. 4
Magnesium is Difficult to Machine and Finish

Fact: On the contrary, magnesium has developed a long record of being the easiest metal to machine. It requires less power than other materials, resulting in faster speeds, heavier cuts, better surface finish and longer tool life.

In addition, the use of "fluxless melting" of Mg alloy in the hot-chamber die casting process produces castings with superior soundness and smoother surface finishes as-cast, resulting in less machining and finishing being required.

Complex features can often be die cast to net-shape specifications, eliminating all post-casting machining. When especially tight specs require further machining, hot-chamber die cast Mg parts can be machined at less cost than can any other metal.

Machining mag parts requires no special equipment, only adherence to accepted good housekeeping machining department practices. And Mg castings are highly receptive to a wide variety of coatings.



Myth No. 5
Magnesium Supply is Limited

Fact: Once thought of as an exotic material in limited world supply, it is today documented as the eighth most abundant metal on earth.

The pricing of magnesium alloys has historically been relatively low and stable, as compared to plastic resin pricing which has been relatively high and volatile, with resins being based on commodity prices for oil.

Note that, compared to the limited recyclability of plastics, magnesium is 100% recyclable. As with aluminum, mechanical and physical properties of Mg are not compromised when recycled alloy is used; there is no limitation on the number of times that Mg can be recycled and re-cast.

Mag die castings can be an optimum alternative to many molded plastic components

Mg die casting offers light weight, extra strength, stiffness and built- in EMI/RFI shielding—with greener components as a bonus.

The growing number of conversions from plastic moldings to magnesium die castings highlight the metal's optimal physical properties, as well as its die casting design advantages.

Superior Material Properties

The density of magnesium die casting alloys is similar to reinforced plastics. However, in order to match magnesium's strength, specific (often very expensive) engineered reinforcements are required.

Magnesium, however, will have superior stiffness, essential in many structural applications to avoid excessive vibration and bending. And magnesium offers excellent dimensional stability, high impact and dent resistance, and superior damping capacity.

Design Optimization Opportunities

The reinforcement used with plastic resin to beef up its strength generally prevents the resulting material from achieving walls any thinner than 0.12 in. (3 mm). Magnesium alloy is routinely die cast to 0.12 in. wall thicknesses, and with some housing walls as thin as 0.03 in. (0.76 mm). Maintaining thin walls with reinforced plastic can often result in added manufacturing costs. Plastic's properties also work best when wall thicknesses are uniform. Varying thicknesses can require extra molding steps or eliminate plastic as an alternative entirely. Thanks to the excellent fluidity of magnesium, it is easier, compared to plastics, to cast to varying thicknesses and shapes, with dimensional accuracy and minimum draft requirements. Mag's thinwall capability often allows it to achieve lower total part eights compared to reinforced plastics. The combination of Mg's properties often offers part consolidations for a one-piece net-shape design at a lower weight and unit cost, with better performance compared to aluminum, plastic or reinforced nylon.

Case for fiber-optic monitor: 20% saving over plastic

Mg digital housing resulted in a .25 lb. weight reduction

11.2 oz. Mg GPS case takes 6.5 ft. drop to concrete

Built-in Shielding & Green Bonus

The durability, light weight and thinwall die casting capability of magnesium, combined with its inherent conductivity and EMI/RFI shielding characteristics, makes it ideal for electronic housings such as medical, GPS and commercial and consumer computer products (see housing photos, above).

Die cast magnesium housings and components also deliver an increasingly important green bonus: production of products from 100% recyclable alloy.

For more on how CWM's innovations, skills, and unique experience in magnesium die casting can help assure die cast project success, contact CWM.