diecast solutions no. 33

Chicago White Metal Casting
High-Tech Al, Mg, & Zn Die Casting
Rte. 83 & Fairway Dr., Bensenville, IL 60106
Tel: 1-630-595-4424 Fax: 1-630-595-9160
CWM E-mail: sales@cwmdiecast.com
CWM-CM E-mail: sales@cwm-contractmfrg.com

More on the art & science of elastomer overmolding of die castings

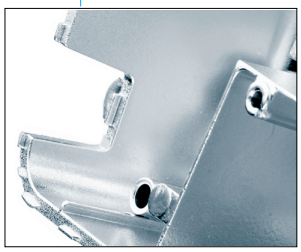
Notes on Overmolding Die Cast Parts: A Preliminary Guide

A soft-to-the-touch overmolded urethane exterior can add impressive user benefits to a die cast housing: enhanced grip and feel, added case damage protection, water resistance, and, in the case of electronic enclosures, even added heat dissipation. A die cast housing itself, of course, will provide built-in EMI/RFI shielding, plus, in thin-wall magnesium, one of the the highest strength-to-weight ratios of any cast material.

Dual Process Advantages

While die casting offers similar opportunities to plastic molding in reducing part counts and assembly time by the design of as-cast features into a housing itself, overmolding allows the additional integration of mechanical features in the overmold which would otherwise require added cost and assembly, such as rubber seals, hinges & doors.

High-tech die cast housings can incorporate detailed features with tolerances critical to exacting shut-offs required in the overmolding process, with dimensional consistency vital to a part destined for use as a cast insert in the overmold tool. Tiny "gripper" teeth can be cast along a part's entire perimeter, designed to attach the low durometer elastomer overmold to the die casting in precise position. Post-casting machining may be required to deliver the part to final dimensions required for successful overmolding.



Gripper projections of 0.200 x 0.050 x 0.040 in. "lock" the overmold to the die casting.

Guidelines for Die Cast Overmolds

Designers experienced in designing a die cast and overmolded part have suggested a series of guidelines which those product engineers new to the process marriage should be aware of in their planning for a success in producing an overmolded die cast housing.

First and foremost, all planning should be a fully concurrent effort from initial product concept to final production. The development team should include the mechanical designers, the die caster, die cast toolmaker, post-casting CNC manager, overmold toolmaker, production molder, and a material expert. The mechanical product designer must become knowledgeable in all of these areas to assure a robust design. Passing the design "over the wall" to the toolmakers, casters and molders is a recipe for problems.

The following specific design considerations should be addressed.

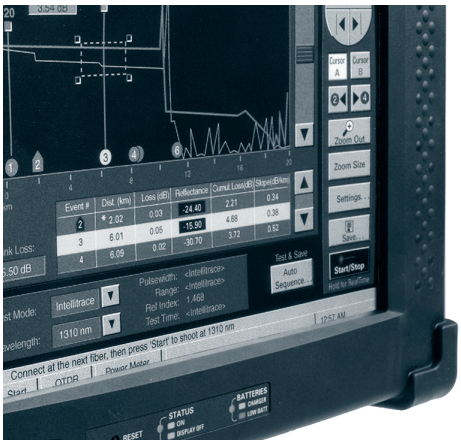
- **Part Tolerances:** Careful review of the tighter tolerances required for the die cast part to serve as a repeatable cast insert in the overmold tool. The die castings can require a maximum 0.070-in. gap between the outside surface of the casting and overmold cavity.
- **Part Flatness:** Determination of the part flatness necessary to insure good shut-off between the die casting and the overmold steel tooling.
- **Parting-Line Tolerances:** The nature of the die casting process results in larger, or "plus" side, parting-line tolerances only. How do you compensate for dimensional part variations at the parting line in designing the overmold tool?
- **Shut-Offs:** How much tool steel and how tight a fit is required for a repeatable shut-off? If the overmolding "flashes" you will have a process out of control.
- **Insert Fitting:** How close do you decide to fit the die cast insert to the overmold tool? Injection pressures of 10 to 15 kpsi will crush the die cast insert if not properly supported during overmold injection.
- **Overmold Gating:** It is critical to establish the optimum path for elastomer material flow over the cool die cast insert.
- **Thermal Effects:** How do you compensate for the die cast part heating up after overmold injection,with expansion in size?
- **Molding Tool Ejection:** Design of the ejection configuration of the molding tool is critical to getting a cosmetically acceptable overmolded component.
- **Elastomer Shrinkage:** What design specifications must be factored in to compensate for urethane shrinkage after the overmolded part cools down?

There are no hard and fast rules for many of the above considerations. Careful consultation and research, and a well documented program of testing, modification and further testing, are the only alternatives.

With the final result of the process marriage cost-competitive with injection-molded plastic, it can be well worth the effort.

For more on high-tech die casting and overmolding, contact the CWM Sales Dept at 630-595-4424, or E-mail sales@cwmtl.com.

Thanks to Jim McGrath, project leader for the NetTek™ fiber optic cable analyzer, for input on guidelines outlined here. ■



A 0.070-in thick polyurethane skin over a CWM mag die cast case offers protection in 4-foot drops to concrete for this electronics tester.