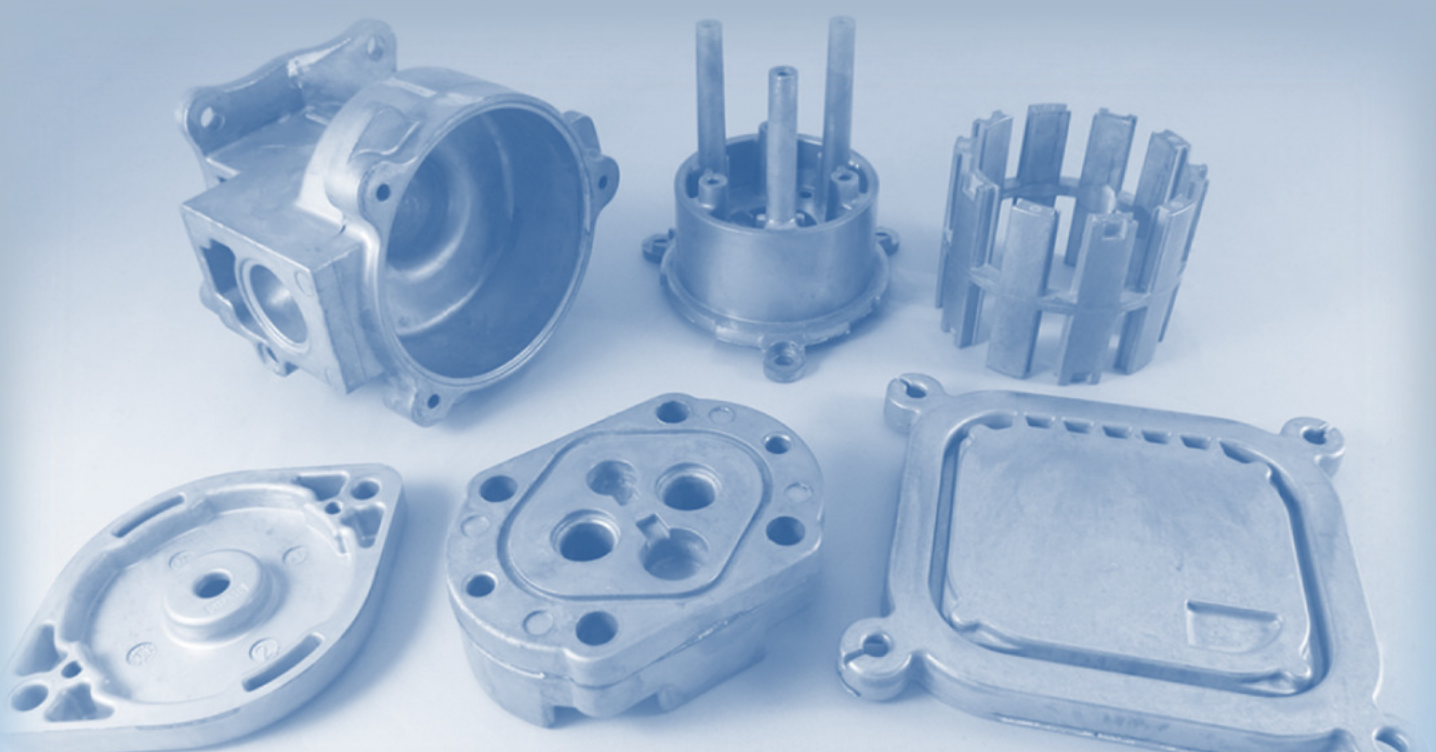
10 WAYS

To Reduce the Cost of Custom Die Casting

These 10 product planning and design strategies can aid OEM product designers and engineers in achieving improved product performance at significantly lower part costs.



This guide is based on the depth of experience of Chicago White Metal Casting with every phase of custom die casting design, production, and post-casting machining and finishing in Al, Mg & Zn.

Most design engineers are aware of the drill: preplanning for production savings can't begin too early. But too often planning for die casting that fully integrates manufacturing realities fails to happen.

The updated strategies presented here can help. They cannot, of course, replace a personal consultation with a CWM die casting engineer to address the unique issues of a specific component design.

1 ALL REQUIREMENTS UPFRONT

Perform design preplanning of all parts of an assembly in tandem, to assure lowest casting costs

Engineering practice often calls for completion first of the detailed design for what is considered the critical component of a new product assembly.

With many housings, key internal components, CPU boards, etc., move from evaluation to final locked-in hardware designs while external housings are still concept sketches. Thin, rigid housing features can be die cast, but finalized designs of internal units may preclude such a desirable housing.

By moving mating part designs forward at the same time, with die casting process input, tradeoffs can often be made early and easily in all mated parts for sizable total cost savings. Additional cost drivers here involve the importance of providing the die caster with all operation details upfront, whether they are performed by the die caster, a third party, or the OEM itself.

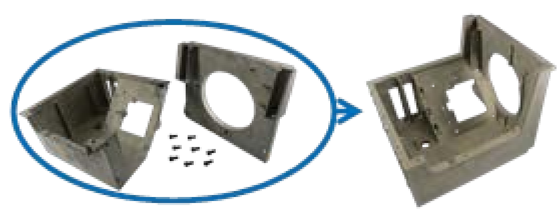
Post-casting machining details impact on die design options and, of course, on final machining costs. Specific finishes, especially cosmetic-level surfaces, call for alternate approaches to initial die tooling and trim tool construction decisions, as well as the type of part deburring to be specified. All of these post-casting operations should be planned for at the earliest stages. Post-casting surprises can mean unnecessary costs.

Note that a die caster with full ancillary service capabilities, including contract manufacturing, may be in the best position to reduce the total costs of a custom process production and product subassembly.

2 PART CONSOLIDATIONS

Be alert to the significant cost reductions possible with multiple part consolidations

Since advanced die casting can achieve extremely intricate, complex shapes difficult to execute in virtually any other high-speed metalforming process, opportunities for part assembly consolidations should always be considered.



Part count reductions and resulting significant assembly cost reductions can often be realized. Most designers and engineers are familiar with the value of plastic molding part consolidations when new molds are required. Similar consolidation principles and resulting benefits can be gained in the case of an assembly incorporating die castings: fewer individual parts, fewer fasteners, and fewer assembly steps.

Value analyze the new die casting in a project together with the entire assembly plan.

3 UNNECESSARY OVERDESIGN

Take full advantage of die casting capabilities on new or converted designs

Match die casting material properties fully to the required performance specifications, not to possibly excessive material specs used in a previous manufacturing process.

Take advantage of all of the design freedom and benefits unique to die casting manufacturing as they apply to the function and performance of the proposed new component.

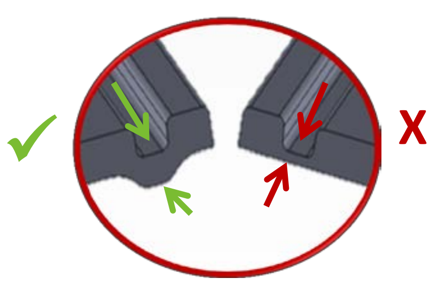
Think thin: An overdesigned structural feature, such as wall thickness, may remain in a part redesign based on the dictates for performance of an earlier process.

Think tapped threads: Molded plastic parts may require metal inserts or through bolts, while die casting can employ tapped threads.
Think cast-in threads: Die castings can be designed with as-cast external threads for substantial cost savings.

4 DIFFERING WALL THICKNESSES

Understand the cost impact of widely varying wall thicknesses on production cycle time

Die casting production cycle time is directly related to the uniformity of a part's wall thickness. Designing adjacent thick-to-very thin walls can be a killer of efficient production, making smooth metal flow and high cavity fill rates difficult or impossible, depending on the alloy being cast.



Talk to a custom die casting engineer early about the ideal wall thickness range for your design in Al, Mg or Zn. When varying wall thicknesses are essential, use transitions to avoid abrupt changes. While high-tech die casting can produce thickness variations once very difficult, they should be specified with care.

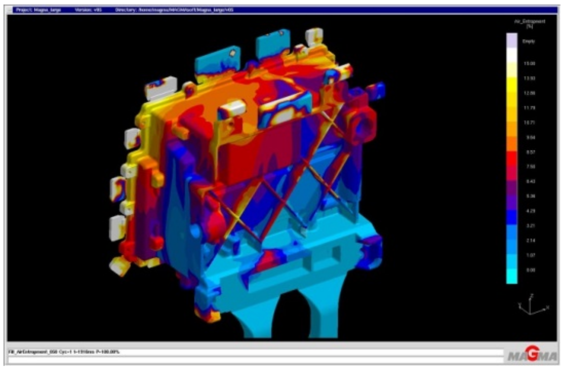
5 MOLD FLOW ANALYSIS

Predict the manufacturability of your design before the tool is finalized

Multiple benefits can be gained by performing a mold flow analysis during the design phase. Computer-generated 3D screen animations can accurately predict expected metal flow patterns across the part's critical surfaces based on initial cavity, runner, gate and overflow configurations of the initial die cavity design.
The system's simulations can be used to optimize final die casting part quality in the following ways:

- Optimization of gating layout
- Reduction of air entrapment
- Reduction or elimination of cold shuts
- Reconfigurations to reduce and/or eliminate porosity in critical areas
- Optimization of shot profiles for assured die cavity fill

This understanding of a design's predicted performance through the die cast process allows adjustments prior to the tool build, eliminating costly mistakes. An optimized die



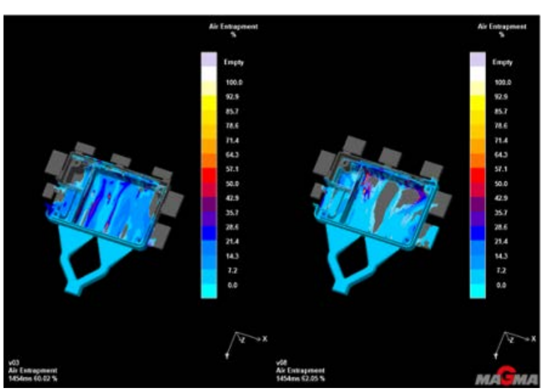
cast design can also lead to a reduction in cycle times, a sharp reduction in casting rejects and an extended tool life.

6 THE PARTING LINE

Determine the optimal placement for the parting line – and do it early

Unless your die cast part will normally be hidden from the end-user, or assembled as an internal component, parting line placement is high on the list of cost drivers. Smart designs for parts with cosmetic appearance requirements make parting line concealment a primary consideration along with key features of the part.

Allowing placement to come after all other design decisions have been made can result in a visible metal bead requiring such costly operations as “shave trimming” of the part and/or hand polishing— thus sacrificing the automated production savings inherent to die casting. Even with non-cosmetic parts, uninformed parting line placement could result in the need for a stepped parting line with more costly two-stage trimming. Again, consult with your die casting engineer early and often.

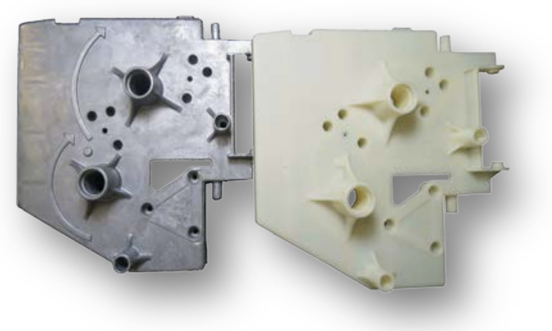


Partner with a die caster that uses mold flow software (see tip # 5). An up-front analysis will assure that the parting line is properly placed for optimal metal flow.

7 LEVERAGE PROTOTYPING

Capitalize on the special advantages of in-house custom die caster prototyping

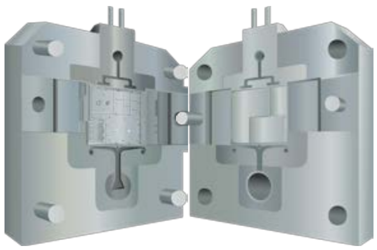
A custom die caster, who offers in-house prototyping, utilizing new rapid prototyping technology and CNC machined prototypes, brings special advantages to OEM die casting product programs in addition to the elimination of buck-passing.



Working from customer CAD files, in-house prototyping allows custom die caster engineers to gain a fuller understanding of special steps that may be required in die design, as the prototype is being developed, as well as final production and finishing requirements. In the case of multiple CNC machined prototypes, identical fixtures designed and built for prototype machining can sometimes be used as is, or only slightly modified, for required post-casting machining.

8 LOWER DIE COSTS

Leverage different cost-saving options to reduce overall tooling expenses



Most OEM engineers recognize that the quality of the die can save thousands of dollars over the life of their product. Poor quality misperceptions related to offshore die manufacturing often limits this sourcing option, creating a lost opportunity to reduce costs. The reality is that there are excellent offshore manufacturers who follow the same International Industry Standards as domestic die makers and are producing high quality dies. Working with a die caster who has an established relationship with a well-qualified offshore die maker can open the door for this substantial cost savings.

Other cost saving options may be realized with multi-cavity and family dies. When multiple components are to be produced, a family tool may be considered. This multi-cavity die produces several components in one unit, eliminating the expense of multiple dies and provides higher production rates with significantly lowered piece costs. The same savings can be achieved with a multi-cavity die that produces several of the same components in a single die. A discussion with your die caster early in the design phase can determine if your design will qualify for these options.

Still greater flexibility and cost savings can be realized by working with a custom die caster who offers unit die production in all of the most widely used die casting alloys—aluminum, magnesium and zinc.

For example, an OEM product program initially planned for aluminum unit die production might later gain a marketing advantage by a change to lighter-weight magnesium.

The multi-alloy custom die caster can offer a low-cost unit die modification for Mg production, with assurance that the modified unit die will run flawlessly. The same die caster can normally also modify a self-contained aluminum die for efficient production in magnesium.

9 WEIGH COST TRADE-OFFS

Weigh the cost-benefits of postcasting machining vs. casting to specs with die core slides

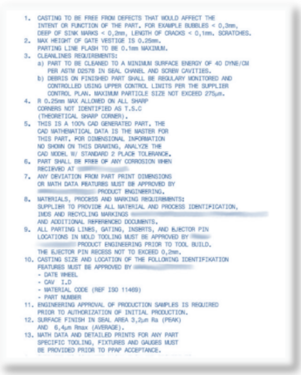
One of die casting's major strengths is its use of core slides to produce parts to final dimensional specifications, as cast.

In many cases, the added investment in such tooling is more than offset by the unit cost savings in eliminating all, or virtually all, of high-cost postcasting machining. Such tooling decisions, however, should always be made with a careful cost-benefit analysis.

Depending on the final design of a feature, side-action core slides, for example, may double the number of parting lines. This could result in "stepped" parting lines with increased part trimming costs. CNC post-casting machining may be the better bottom-line option in such cases. For smaller parts, the unit die tooling alternative (as discussed in No. 8), combined with post-casting machining as required, should be considered.

10 PRINT NOTES

Superfluous print notes can lead to needless confusion, errors, and higher processing costs



While it is important for prints destined for toolmaking to contain all relevant part specifications for die casting production, post-casting machining and finishing, plus references to mating parts and their specific requirements, irrelevant dimensions will only slow down the approval process and may lead to production errors. Prints should be stripped of such irrelevant dimensions and notations prior to submission for die casting quotations and die design.

Appropriate, clear print dimensioning will help ensure production repeatability and reduce inspection time. For improved dimensional accuracy and repeatability in die cast parts, datum points should always be kept on the same side of the die casting die.

ADDITIONAL RESOURCES

To aid OEM product design engineers and specifiers in making all of the right design-for-die casting decisions early in the product concept stage, Chicago White Metal offers a variety of resources.

CWM Sales Engineers. As an arm of our engineering and sales departments, CWM sales engineer representatives are located throughout the U.S. and Canada. They can answer your initial questions on die casting, provide you with specific information on CWM's capabilities and arrange a visit to our 125,000 sq. ft. facility. Visit our website to find your local sales engineering representative, or call CWM direct at 630-595-4424.

DC² Die Cast Design Center. 75+ downloadable design aids and specification guides, reference manuals, and case studies are available in our free, online OEM Die Casting Design Center (DC2). The in-depth knowledge is information you can rely on — compiled by leading trade organizations and CWM's own die casting experts. Learn more at www.cwmdiecast.com/resource.cfm.

On-Demand Webinars. Archived recordings of CWM die casting webinars are available 24/7 for viewing at your convenience. They offer a concise, convenient way to bring you practical knowledge from die casting experts. Most on-demand webinars are approximately one hour in length and will provide in-depth technical information to aide in your product design. Available in our DC² Die Cast Design Center online at www.cwmdiecast.com/resource.cfm.

Tolerance Calculator iOS App. This handy free calculator was developed by Chicago White Metal Casting's engineers to provide die casting tolerance guidelines (English and Metric) based on feature size, tool design and alloy. Available on iTunes.

CWM's Online Store. Order publications and other resources to support design success. Includes manuals from the North American Die Casting Association at discounted prices. *Coming soon!* Order samples of high pressure die casting coupons in a variety of finishes. This valuable aid to the decision process allows OEM engineers to see the actual finish on the metal. Visit www.cwmdiecast.com/resource.cfm.

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ISO 9001 and ISO 14001 Registered

About Chicago White Metal's

Die Casting Design Center

DC²

57 Design Pre-Planning Assets

49 Material Evaluation Tools

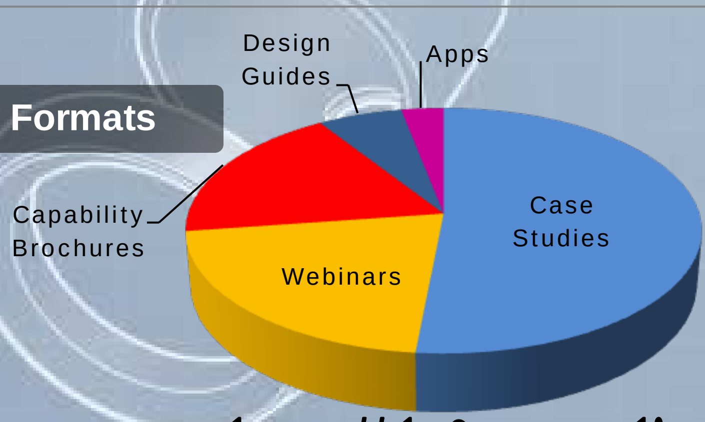
33 Cost Evaluation Aides

25 Sourcing Articles

14 Die Cast Standard Resources

75+ Die Casting Assets to Download

Multiple Formats



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