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Die Casting Design Strategies– Part 1

Leveraging DFM Prior to Part Design Commitment

An OEM Mini-Seminar on
Leveraging Design for Die Casting Manufacturing Considerations
Prior to Part Design Commitment

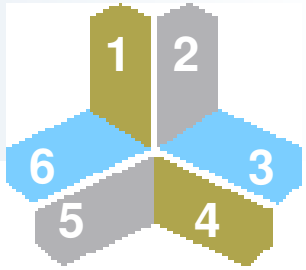
This is a silent Webinar presentation, approximately 10 minutes In length.

Click Attached "Notes" for viewing, in panel at left, before advancing with "Forward Arrow."

Your Webinar Sponsor

CWM operates under third-generation family management from a modern 136,000 sq. ft. facility in Bensenville, IL near Chicago's O'Hare Airport. Founded in 1937, the CWM organization represents a unique depth of experience in the design, engineering and production of exceptional Al, Mg and Zn die cast housings and components for OEMs worldwide.

Leveraging DFM Prior to Part Design Commitment



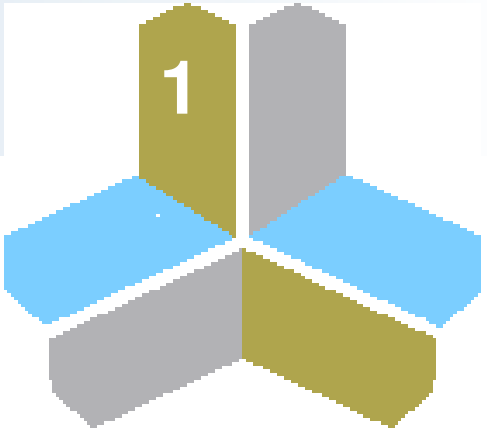
Overview: Die Casting Design Strategies– Part 1

1. Get up to speed on advanced die casting technology
2. View entire product for possible part consolidations
3. Clarify mating specs for the part's final assembly
4. Design out costly process conversion holdovers
5. Ask about the cost-saving "Unit Die" alternative
6. Look at casting/alloy flexibility for future savings

See more in Notes

1

Get up to speed on die casting technology



- Use all available die caster and industry resources at every level to inform & leverage your designs
- Understand the key operations, advantages and limitations of advanced net-shape die casting

See more in Notes

1

Get up to speed on latest die casting technology

Use resources available at every level

Dig in to the CWM OEM Website Resource Center instant downloads

- Engineering & Buyer Bulletins
- Application/Tech Briefs
- Die Casting Case Studies
- Design Guides, Manuals, CD-ROMs
- Die Casting Design FAQ
- On-Demand Webinars

See more in Notes

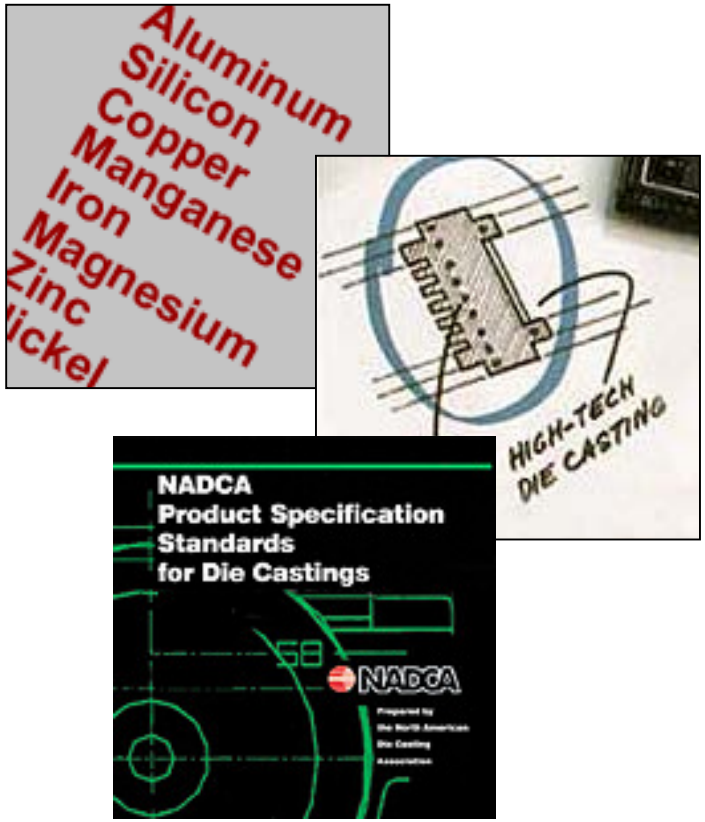
1 Get up to speed on die casting technology

Use resources available at every level

Get specific answers

from a qualified die caster

- Clarify alloy choice questions in terms of specific applications
- Discuss tolerance guidelines for a proposed part design
- Obtain industry reference material to aid your design decisions



See more in Notes

1

Get up to speed on die casting technology

Use resources available at every level

Send a team to visit

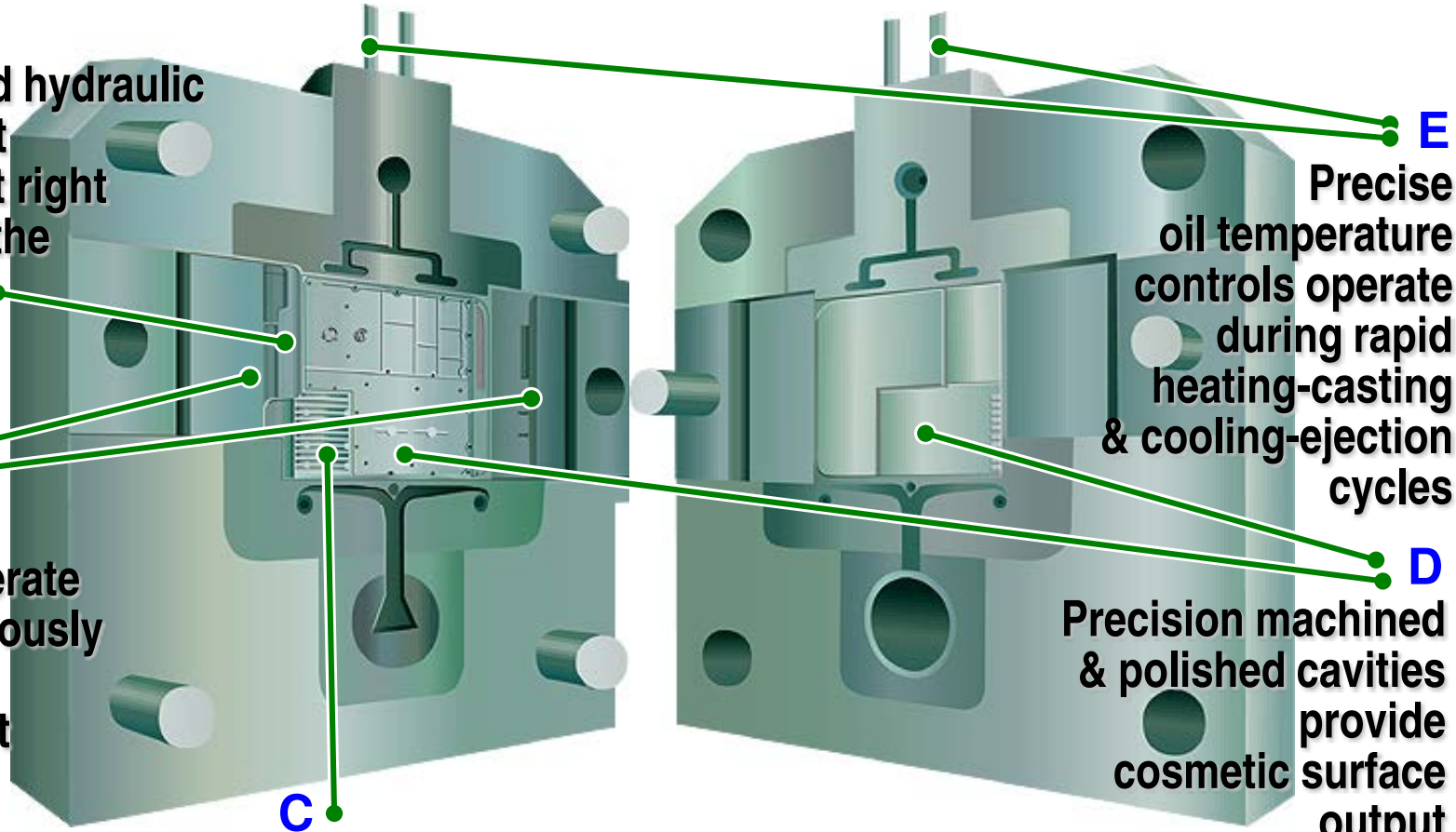
a custom die caster's plant

- See the workflow that impacts your part's production success
- Gain a fuller understanding of the die casting process in action
- Examine parts & best practices for cost-saving opportunities

See more in Notes

1 Get up to speed on die casting technology

Key operations of net-shape casting



A
Automated hydraulic slides cast features at right angles to the die cavity

B
Multiple slides operate simultaneously with each metal shot

C
Complex details can be cast to tight tolerances

D
Precision machined & polished cavities provide cosmetic surface output

E
Precise oil temperature controls operate during rapid heating-casting & cooling-ejection cycles

See more in Notes

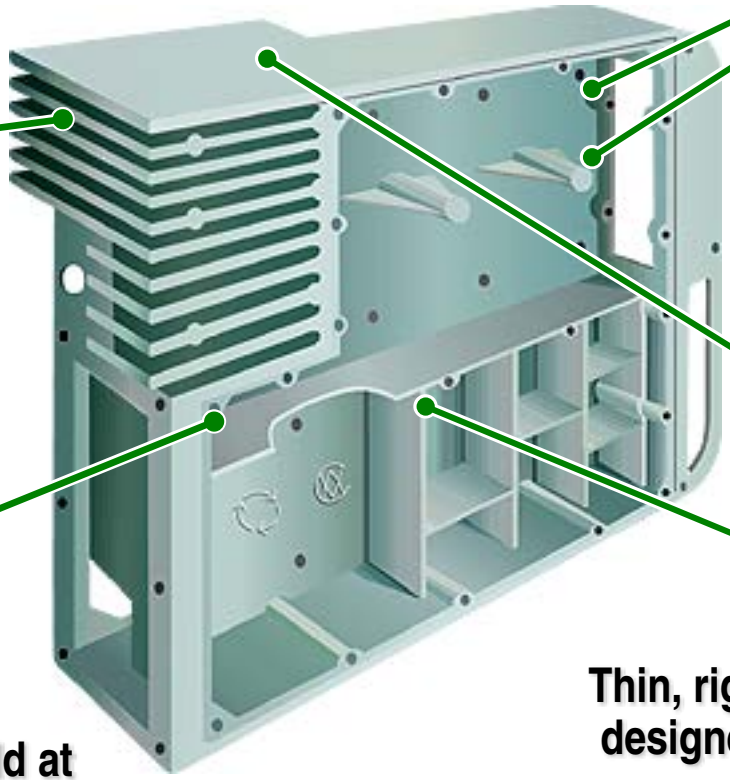
1 Get up to speed on die casting technology

Net-shape casting: Advantages

A
Intricate part design features are routinely die cast in place

B
Heat sink fins can be integral to the design: thermal conductivity, EMI shielding are givens

C
Tight dimensional tolerances can be held at high cycle speeds



D
Thin, rigid walls can be designed for minimum package size

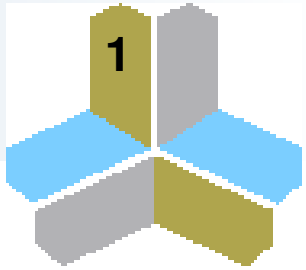
E
Cosmetic surfaces can be produced, as-cast

F
Cored holes, bosses and even external threads can be cast in place, often eliminating all machining

See more in Notes

1

Get up to speed on die casting technology



Net-shape casting: Limitations

PRODUCTION COST TRADE-OFF

- Very complex core slides may require production operation at somewhat slower cycle speeds, with a resulting increased piece-part cost

DIE INVESTMENT COST TRADE-OFF

- The additional cost of die design and construction with added hydraulic core slides, plus possibly higher production cycle times, should be weighed against significant savings in post-casting machining costs

—**Your die caster should provide you with a value analysis of net-shape casting costs vs post-casting CNC machining**

See more in Notes

1

Get up to speed on die casting technology

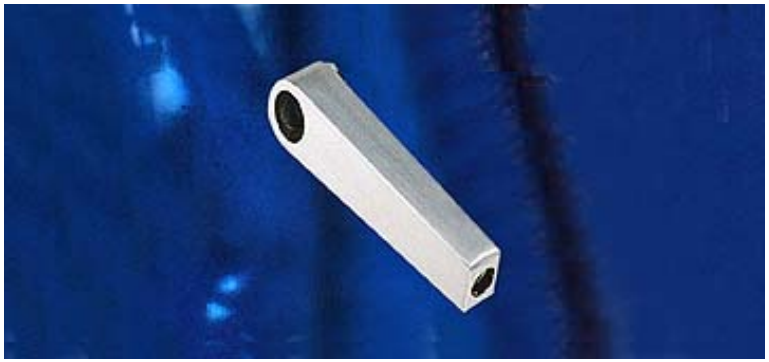
2 examples after trade-off analysis:

- **Higher-Tech Tooling for Cast-to-Spec Features** (a)

  Elimination of more costly post-casting machining

- **Post-Casting Machining to Final Specs** (b)

  CNC finishing offset cost of added or alternate tooling

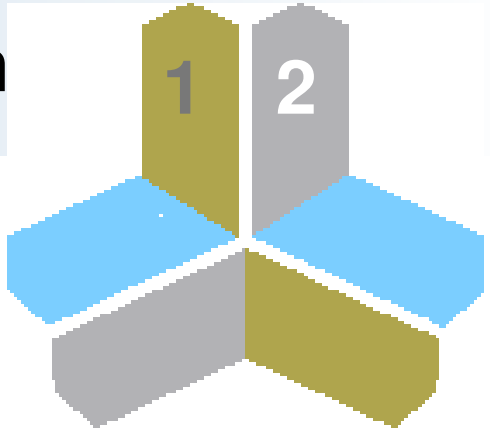


(a) Two long slots at top of frame were more cost-efficiently cast to net shape.

(b) A part with an opening requiring alternate configurations may be more cost-efficiently produced with post-casting machining.

See more in Notes

2 View the entire product plan for part consolidations

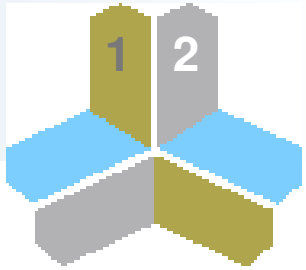


- High-tech die casting and injection molding stand alone in offering significant opportunities for reducing part counts and assembly costs

See more in Notes

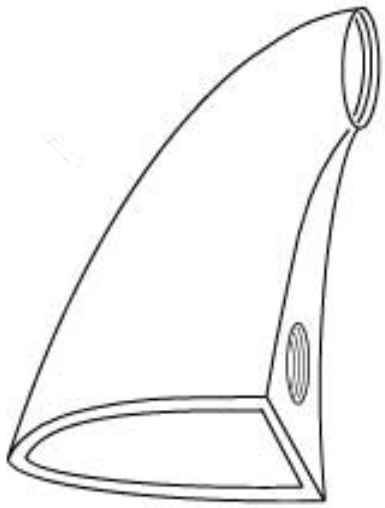
2

View the entire product plan for die cast part consolidations



Value analyze the die casting candidate

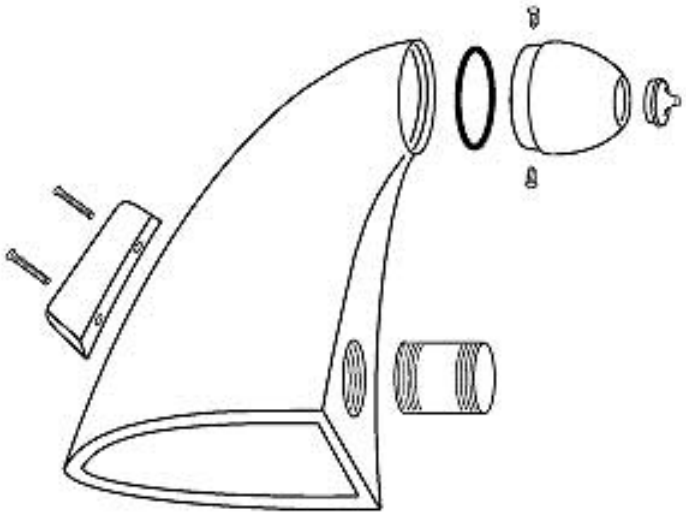
together with the entire assembly plan…



See more in Notes

2

View the entire product plan
for die cast part consolidations

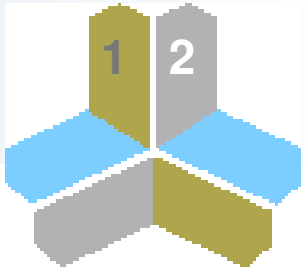


to incorporate one or more adjacent parts into the proposed die casting. . .

See more in Notes

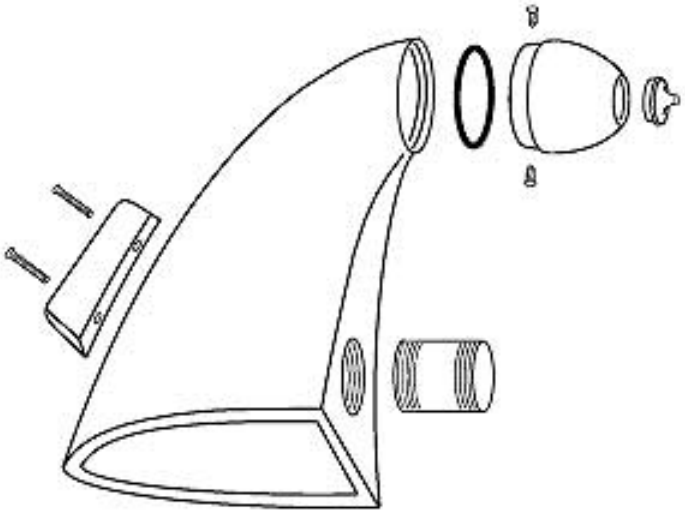
2

View the entire product plan for die cast part consolidations

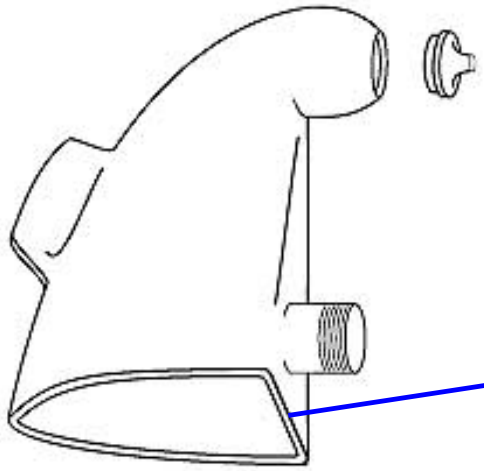


for reduced total part count and lower assembly costs --plus improved performance

BEFORE CONSOLIDATION



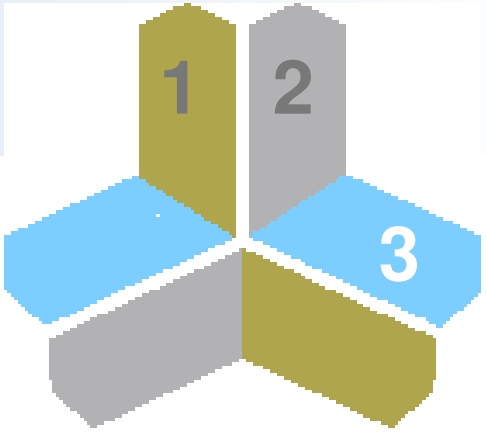
AFTER CONSOLIDATION



Thinner High-Strength Die Cast Walls

See more in Notes

3 Clarify mating specs for die cast part assembly



- Discuss all mating requirements well prior to tooling design, or matching surface finishes and post-casting machining may be unnecessarily costly or impossible.

See more in Notes

3 Clarify mating specs for die cast part assembly

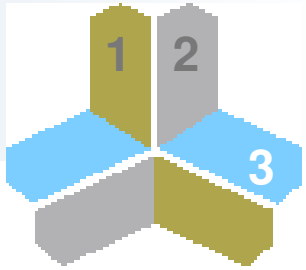
Surface matching to adjacent parts

- Matching die cast surface finishes to adjacent parts, especially cosmetic finishes, should always be discussed in the design stages.

Otherwise severe retooling cost penalties could result, with delays in production

See more in Notes

3 Clarify mating specs for die cast part assembly



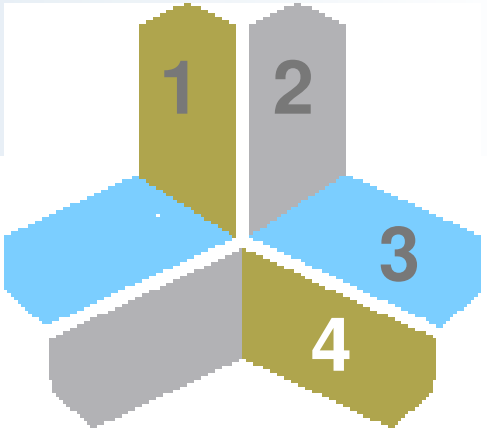
Required post-casting machining

- Net-shape die casting may not be practical for given part designs. Any required post-casting machining should be detailed in the design stage so tooling design can assure later machining, or minor product changes can be made.

Again, costly retooling penalties could otherwise result, plus production delays

See more in Notes

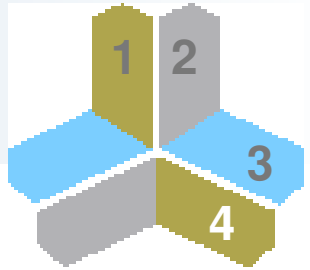
4 Examine process conversion design holdovers for unnecessary overdesign



- For lowest part costs, especially in a conversion, take advantage of all of the design freedom and benefits unique to the die casting process.

See more in Notes

4 Examine process conversion design holdovers

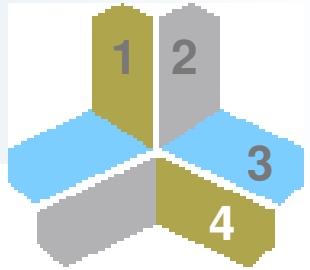


Think function, not previous form

- **Think thin:** Other metal processes may require thick walls; die casting uses strong, thin walls with reinforcement ribs as required.
- **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.

See more in Notes

4 Examine process conversion design holdovers



Follow the specs, not previous overdesign

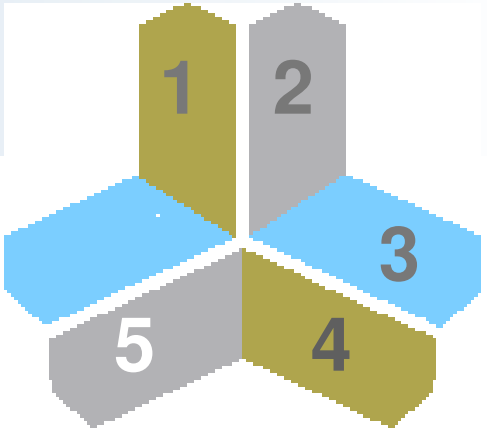
- **Match** die casting material properties fully to the required performance specifications, not to possibly excessive material specs used in a previous manufacturing process.
- **Question** an overdesigned structural feature, such as wall thickness, that may remain in a part redesign based on the dictates for performance of an earlier process.

Advanced die casting technology can more closely meet functional criteria with thinner walls, reduced draft and tighter tolerances.

See more in Notes

5

The “Unit Die” alternative for lower tooling costs

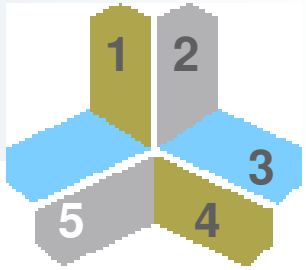


- Die Cavity inserts, placed in standardized “unit” die blocks and holders, offer significantly lower tooling investment compared to “self-contained” custom dies

See more in Notes

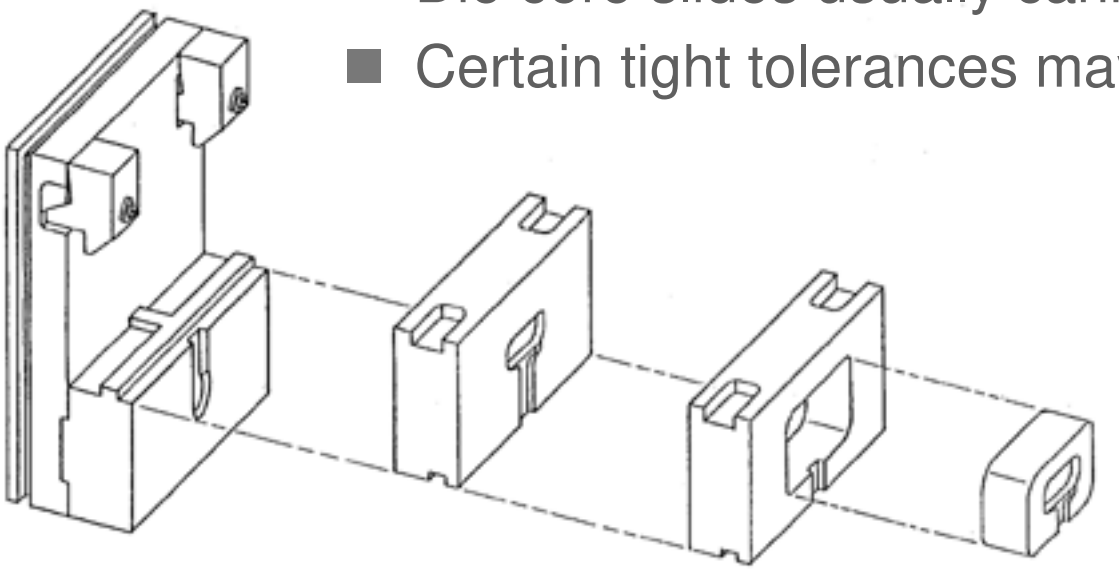
5

The “Unit Die” alternative for lower tooling costs



Unit Die Limitations

- Generally restricted to smaller, simpler parts
- Die core slides usually cannot be used
- Certain tight tolerances may not be possible

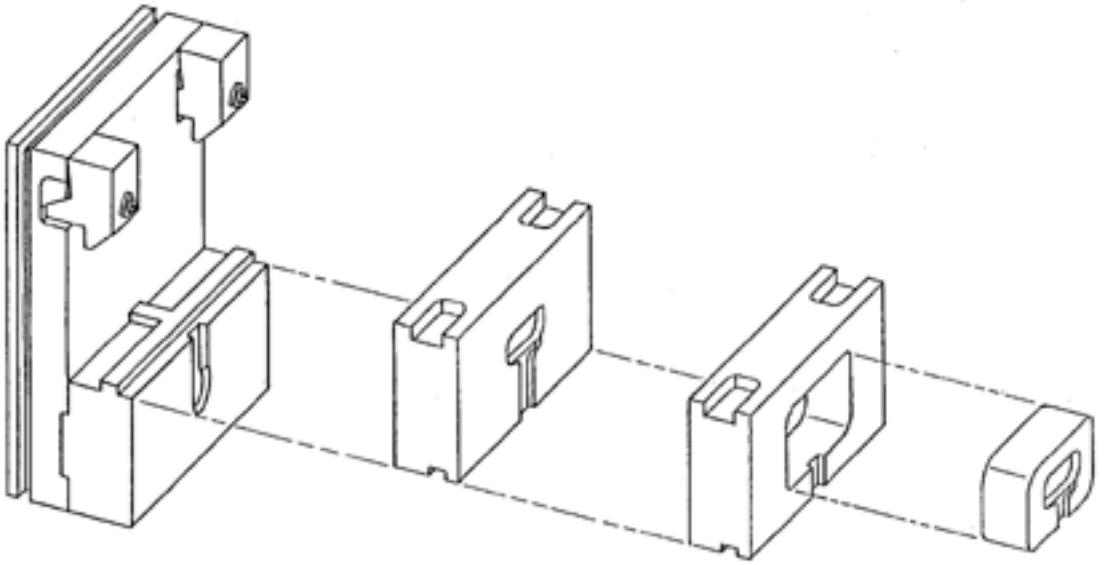


Unit Holder Cavity Block OR Replaceable Cavity Unit Cavity Insert

See more in Notes

5

The “Unit Die” alternative for lower tooling costs



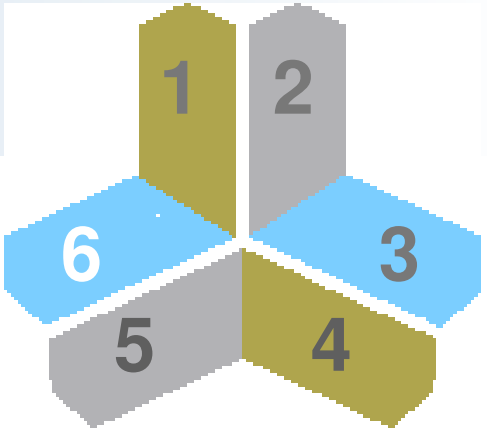
Unit Holder Cavity Block OR Replaceable Cavity Unit + Cavity Insert

Unit Die Advantages

- Simplified die-cavity-only construction costs
- Reduced tooling construction lead time
- Offers most of the process’ inherent benefits

See more in Notes

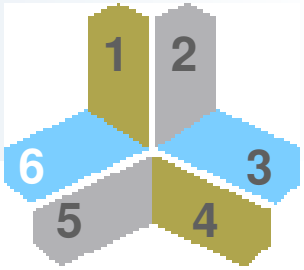
6 Consider future flexibility of the casting/alloy decision for production savings



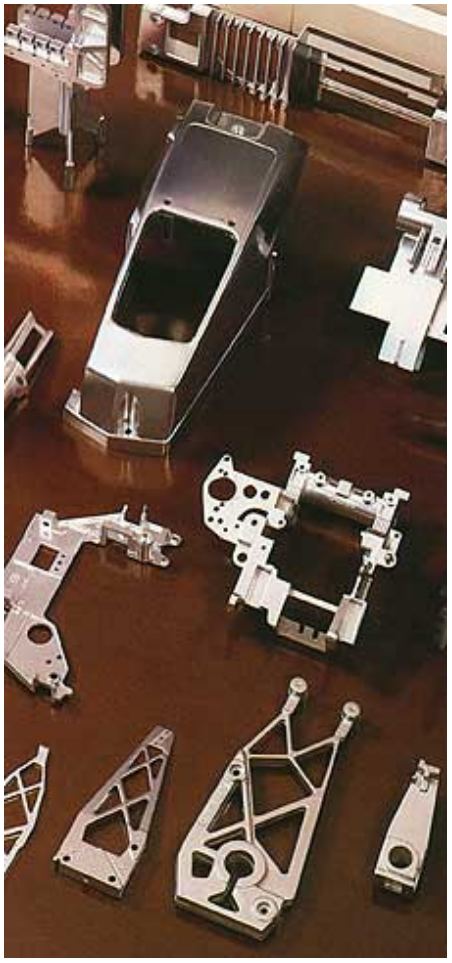
- With either Zinc or Magnesium die casting alloy, you can choose to switch between either of these hot-chamber die cast materials-- based on future alloy price changes.

See more in Notes

6 Consider future flexibility of the casting/alloy decision



< The die cavities for these **Zn** die cast parts could be converted virtually unchanged for **Mg** die cast production

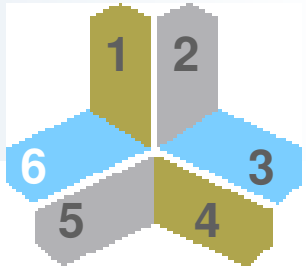


< As could the dies for these **Mg** die cast parts be converted to **Zn** production

See more in Notes

6

Consider future flexibility of the casting/alloy decision



Facts affecting future Zn/Mg/Zn switch

- **Close-tolerance casting compatibilities**
  Both Zn 3 and Mg AZ91D cast extremely thin walls and detailed features in the hot-chamber die casting process
- **Required material properties**
  When either Zn or Mg alloy can satisfy your part performance and material properties, the identical hot-chamber die can usually be used in future production.
- **Custom die caster production capability**
  Future alloy conversion costs will be very low with a die caster using the hot-chamber casting process for both Zn and Mg alloy

See more in Notes

Leveraging DFM Prior to Part Design Commitment

Die Casting Design Strategies

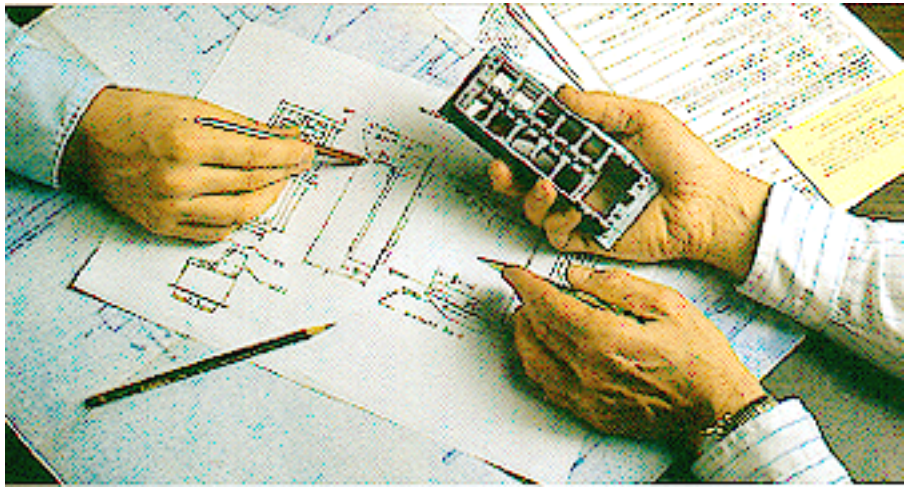
1.
2.
3.
4.
5.
6.

And to aid with all of the above....

See more in Notes

Lean early on a qualified custom die caster

- To help optimize **manufacturability**



- Assure resolving important **issues** early
- To enhance the **performance** of your part
- To assure that final **quality** will be maximized

All at lowest die investment & part production costs

See more in Notes

Reference Materials for this Webinar

Access these resources at the CWM Web OEM Resource Center

A "Design & Production Planning Guide" (# 5114) under Engrg. Bulletins, provides hot-links to items below. Download the PDF with above "Attachments" Tab.

	Res. Ctr. Subsection
Die Casting Design & Spec Guide, CWM, 16p (# 0325)	**Design Guides**
Product Design for Die Casting, NADCA, 178p (# 3101)	**Reference Manuals**
Engineering Bulletins & Tech Briefs: Engineering Bulletins # 020, 021, 022, 071, 074, 075. Application/Tech Briefs # 024, 031, 034	 **Engrg. Bulletins** **Applic/Tech Briefs**
Die Casting Product Standards, NADCA, 223p (# 3103)	**Reference Manuals**
Quick Guide to Surface Finishing, CWM, 8p (# 3318)	**Design Guides**
Checklists: Tooling, Production, Finishing, NADCA D.C. Tooling (#065), D.C. Production & Finishing (#090)	 **Engrg. Bulletins**
CWM Custom Production Capabilities Credentials: Complete D.C. Capabilities (#3100), Mini D.C. Capabilities (#3400) CNC Machining (#3300), Contract Manufacturing (#3200)	**Capabilities Brochures**

See more in Notes