Each year since 1973, NADCA has sponsored its international die casting design competition to showcase outstanding die cast designs while acknowledging the continuous contribution die casters provide to the manufacturing industry.

Submitted castings are reviewed by a panel of independent judges from which winners are selected. Categories are grouped by material and include aluminum, zinc and magnesium. For each category, a die casting is evaluated based on ingenuity of casting and product design, overall quality, cost savings and contribution to expanding the market for die casting.

This year, eight winners were on display at the 113th Metalcasting Congress in Las Vegas, NV in April. The top eight submissions and two honorable mention winners represent a range of products touting innovative designs and a vast array of applications.

“For this year’s competition, there was no sign of slow down in the area of innovation and pushing the limits of what the die casting process is capable of achieving. Many of the winning die castings utilized revolutionary part and die designs,” said NADCA design engineer Dan Meyer. “The die designs allowed production of die castings that greatly increased yields on many fronts. Methods such as automatic de-gating, direct injection, multiple-cavity dies for complex high tolerance parts, as well as new gating and die designs requiring minimal or no machining of the final die casting, were some of the areas die casters showed their applied creativity.”

NADCA wishes to thank all the die casters who submitted their entries in the 2009 competition, while congratulating the winners.
**Aluminum under One Pound**
Chicago White Metal Casting Inc.

**What:** Aluminum Mirror Mount for Gentex Corp.

**Challenge:** The main critical features of the mirror mount are its structural integrity and dimensional accuracy of the “ball” diameter. The part needed to be strong to withstand years of operation through the wide changes in temperature and humidity experienced in an automobile interior. The ball has a tolerance of +/-0.1 mm that must be maintained over potentially hundreds of thousands of parts.

**Solution:** To achieve the required production volumes and part geometry, the caster tooled the part in a two-cavity die with two side actions per cavity. Excess material was removed wherever possible to minimize weight without sacrificing strength.

**Project Leaders:** Josh Owen, Gentex Corp.  
Michael Novesky, Chicago White Metal Casting

**Alloy:** Aluminum 380 Alloy  
**Weight:** .14 lb.  
**End Market:** Automotive

**Caster’s Comments:** “Thoroughly understanding the customer’s requirements and being able to incorporate them into a complicated tooling design makes for successful program launches.”

**About the Die Caster:** Chicago White Metal Casting operates under third-generation family management from a modern 136,000 sq. ft. facility in Bensenville, IL near Chicago’s O’Hare Airport. CWM’s top management team represents more than 160 years of experience in design, engineering and production of Al, Mg and Zn custom die cast housings and components to OEMs worldwide. High-precision in-house CNC machining, as well as complete contract manufacturing and assembly, are also a part of CWM’s total services.

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**Aluminum One to Ten Pounds**
Chicago White Metal Casting Inc.

**What:** Control Head Baseplate for an A-dec Dental Chair

**Challenge:** The control head baseplate is the support structure for a dentist’s work station. Various lines for air, water and pneumatic controls need to be mounted to the aluminum cast base and then concealed with a cosmetic cover. The casting is particularly difficult to fill because across the center of the 8.5 in. wide part are cut out features totaling approximately 6 in. in length. This restricts the flow of metal from one side of the casting to the other. Additionally, there is a 2.25” tall boss directly behind a large obstruction.

**Solution:** The aluminum die cast base provided a strong, rigid platform for mounting components. Chicago White Metal Casting relied on its simulation software to develop the gating system for this part, which was provided to the customer cast, trimmed and machined with 15 tapped holes.

**Project Leaders:** Patrick Berry, A-dec  
Michael Purciarello, Chicago White Metal Casting

**Alloy:** Aluminum 380 Alloy  
**Weight:** 2.3 lb.  
**End Market:** Medical

**Caster’s Comments:** “When challenging design requirements are encountered, good communication between the part designer and die caster are critical in achieving the best possible outcome.”

**About the Die Caster:** Chicago White Metal Casting operates under third-generation family management from a modern 136,000 sq. ft. facility in Bensenville, IL near Chicago’s O’Hare Airport. CWM’s top management team represents more than 160 years of experience in design, engineering and production of Al, Mg and Zn custom die cast housings and components to OEMs worldwide. High-precision in-house CNC machining, as well as complete contract manufacturing and assembly, are also a part of CWM’s total services.
**Aluminum over Ten Pounds**

**Pace Industries – St. Paul Division**

**What:** Right and Left Hand Snowmobile Clips for the 2010 Polaris RUSH Snowmobile.

**Challenge:** This assembly was originally made up of 27 parts. Customer desired decreased parts, weight and cost of production.

**Solution:** The new part design reduced the part count from 27 to five, weight was reduced by 2.7 lb. and the cost was reduced by 57%. More than 12 feet of welding was eliminated with the new design, lowering assembly costs and increasing repeatability of internal dimensions.

**Project Leaders:** Scott Swenson and Ed Reidell, Pace Industries – St. Paul Division
Todd Zinda, Rick Kerner and Jeff Eaton, Polaris Industries

**Alloy:** Aluminum 369

**Weight:** 11 lb.

**End Market:** Sports/Recreation

**Caster’s Comments:** “Polaris reports a 300% increase in chassis torsional stiffness, resulting in more predictable handling and control since the vehicle’s steering and suspension mounts to the clips. Additionally, the new interlocking design lends itself better for the use of structural adhesives, creating stronger joints and less fatigue cracking through rivets and bolt holes.”

**About the Die Caster:** For more than 45 years, the St. Paul Division of Pace Industries has taken pride in its reputation for dependability and flexibility. Recognized as a leader in die casting, the St. Paul Division of Pace Industries produces custom, close-tolerance zinc and aluminum die castings. Through its years of planned, systematic growth, Pace Industries’ St. Paul Inc. has nurtured pride of workmanship and service.

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**Aluminum Squeeze/Semi Solid**

**Aluminum Complex Components Inc.**

**What:** Turbocharger Impeller for Cummins Turbo Technologies Ltd.

**Challenge:** This turbocharger impeller compresses air into diesel engines to improve horsepower and minimize emissions. The part was formerly forged and machined. The limited net-shape nature of the forging process means that all surfaces of the impellers have to be machined, which is a time-consuming and costly process.

**Solution:** Semi-solid casting produced parts with the complete absence of porosity and other defects based on various testing methods compete with forged and machined impellers at up to 50% cost savings. The die design allowed casting to high tolerances even under extremely high intensification pressure, resulting in minimal final machining of the casting.

**Project Leaders:** Greg Wallace, Aluminum Complex Components Inc.
Dr. Qiang Zhu, Cummins Turbo Technologies Ltd.

**Alloy:** Primary Aluminum 319S

**Weight:** 0.6 lb.

**End Market:** Automotive

**Caster’s Comments:** “Semi-solid castings also have the potential to displace other forged and machined components or other aluminum components produced from wrought alloys. Therefore, the potential market for these types of high quality, fully heat-treated semi-solid castings is huge.”

**About the Die Caster:** Aluminum Complex Components (ACC), located in Denver, CO, specializes in the production of complex-shaped aluminum components having outstanding mechanical and fatigue performance. ACC uses the thixocasting semi-solid casting process to produce components that are essentially free of porosity and other defects.
**Zinc under Six Oz. Non-Electroplated**

*Cast Products Inc.*

**What:** Awning Lock Disk/Sleeve for Dometic Corp.

**Challenge:** The die caster was asked by their customer to redesign a four-piece assembly, consisting of two plastic parts and two aluminum extrusions, as a die casting in order to reduce production costs.

**Solution:** After proving their new design with prototypes in plastic and then in CNC-machined zinc bar stock, the die caster returned to the customer with a single-piece die cast design. In addition, a design feature was identified and integrated into the die cast part design that allowed the lock disk/sleeve to be used across additional product lines. The part is cast in a two-cavity die and is simultaneously stripped of its central core and ejected. The casting is also automatically de-gated in the die.

**Project Leaders:** Dave Haener, Cast Products Inc. Roberto Gutierrez, Dometic Corp.

**Alloy:** Zinc #2

**Weight:** 3.8 oz.

**End Market:** Recreational Vehicles

**Caster’s Comments:** “If die casters want to survive in the 21st Century, they will need to create their own opportunities. By dedicating their own engineering time and money to prove-out design concepts, the caster is directly responsible in the customer’s effort to stake their claim of market share. This reality was the basis of our entry.”

**About the Die Caster:** Cast Products Inc. (CPI) located in Norridge, IL, manufactures custom zinc die castings for various industries. Its services include product design assistance, mold design, tool construction and maintenance, secondary machining, finishing and light assembly. CPI was founded in 1966 to serve customers in all aspects of product projects from design to shipping. The company produced more than 32 million zinc die castings in 2008 with an on-time delivery rating of more than 98%.

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**Zinc over Six Oz. Non-Electroplated**

*Caudle Manufacturing Co. Inc.*

**What:** Fire Truck Pump Intake Screen for Waterous Co.

**Challenge:** The replaceable sacrificial Zinc Intake Screen needs to protect the iron pump components from galvanic corrosion. The machining process required to produce the part was too costly.

**Solution:** During the design stage, NADCA’s process flow simulation software was utilized to determine the best way to gate the casting so it could be filled without requiring filling bridges across the open windows of the part. The new design allowed the part to be cast and trimmed without any additional machining required.

**Project Leader:** Gilmar Barbosa, Caudle Mfg. CNC/Design Engineering Dept.

**Tool Maker:** John Slingerland, Caudle Mfg.

**Alloy:** Zinc #7

**Weight:** 8.6 oz.

**End Market:** Industrial/Commercial

**Caster’s Comments:** “The success of a component lies in good mold design. This mold had double sided cores to eliminate down time of broken ejector pins. It also allowed for increased cycle time reducing the cost of the part.”

**About the Die Caster:** Caudle Mfg. Co. Inc. (www.caudlemfg.com), established in 1956, designs and builds molds that produce high-tech zinc die castings. The company’s high speed, fully automatic, hot chamber zinc die casting machines allow the company to cast parts ranging in size from a few grams up to seven pounds. Castings are produced at very fast rates, automatically ejected, quenched and delivered by conveyor to the on-line trim press. A CNC division allows for low volume parts composed of wide array of materials.
Magnesium under .5 Pounds
Phillips Plastics Corporation® – Magnesium Injection Molding

**What:** Micro Projector Main Housing for 3M Precision Optics Inc.

**Challenge:** The Main Housing holds critical components such as prisms, lenses and focusing equipment for a micro-projector that measures .9 x 2 x 4.5” and weighs only 5.6 oz. The image projected by the device is up to 50” diagonally.

**Solution:** A four-cavity mold with two side actions per cavity is used to cast multi-dimensional parts to meet specifications tighter than NADCA precision tolerances and with wall thicknesses as low as .020”. Additional locating features were added to the trim die to produce a part of higher quality and consistency.

**Project Leaders:** Dale Ek-Pangerl and Randy Larson, Phillips Plastics Corp.
Ron VanOverloop, 3M Precision Optics Inc.

**Alloy:** Magnesium AZ91D

**Weight:** .01 lb.

**End Market:** Computer/Electronics

**Caster’s Comments:** “The main housing pushes the limits beyond what is typically thought possible for precision magnesium Thixomolding®.”

**About the Die Caster:** For more than 40 years, Phillips Plastics has designed and developed products for original equipment manufacturers in virtually every market. It is one of the major sources for custom plastic, metal and ceramic injection molded components for the automotive, consumer, defense and medical sectors. The corporation provides one-stop service, with development from the drawing board to the packaged product. They are known for keeping pace with trends and innovations, as well as the latest technology, and have a history of guaranteeing confidentiality to those who use their services.

Magnesium over .5 Pounds
Chicago White Metal Casting Inc.

**What:** Medical Imager Side Wall for Codonics

**Challenge:** Two magnesium side wall die castings serve as the main alignment and support structures for a state of the art medical imager that renders images on x-ray film to color paper in up to 16.7 million colors on media sizes up to 14x51 inches. In addition, the part requires excellent as-cast surface finish for subsequent cosmetic finishing operations.

**Solution:** The side wall castings are gated with a proprietary injection system directly into an existing bore on the part. The sprue from the injection point is later machined from the bore. This part was originally cast from zinc in a graphite mold process. Die casting allowed for higher production rates with reduced machining and finishing bringing significant cost reductions to the customer.

**Project Leaders:** Peter Adam – Codonics
Mike Purciarello – Chicago White Metal Casting

**Alloy:** Magnesium AZ91D

**Weight:** 2.2 lb.

**End Market:** Medical

**Caster’s Comments:** The die casting process is well suited to conversions from other processes where material selection or production output is limited. Die casting also allows for the implementation of details not achievable in other casting processes and lowers overall cost.

**About the Die Caster:** Chicago White Metal Casting operates under third-generation family management from a modern 136,000 sq. ft. facility in Bensenville, IL near Chicago’s O’Hare Airport. CWM’s top management team represents more than 160 years of experience in design, engineering and production of Al, Mg and Zn custom die cast housings and components to OEMs worldwide. High-precision in-house CNC machining, as well as complete contract manufacturing and assembly, are also a part of CWM’s total services.
Honorable Mention
Aluminum One to Ten Pounds
Aallied Die Casting Co. of North Carolina

What: Axle Carrier Housing for Dana Automotive Systems Grp.

Challenge: Carrier Housing serves as the front axle differential housing for BMW X5, a sport utility vehicle. The inherited mold and gating system was previously designed with conventional methods, which contributed to the 30-40% scrap rate.

Solution: The die caster went outside the box on tooling and process design to improve the castability and quality of the carrier housing. Using innovative design (similar to squeeze process), with the help of flow simulation software, the die caster was able to optimize the gating and die cavity orientation to allow production of extremely high quality parts, and resulting in a total scrap rate at Dana of only 0.07%.

Project Leaders: Aaron Nowak, Aallied Die Casting Co. of North Carolina
Jens Schnebele, Dana Automotive Systems Grp.

Alloy: Aluminum 380 Alloy
Weight: 9.06 lb.
End Market: Automotive

Caster’s Comments: “The Aallied Team looked at this project in a completely different light than conventional die casting. That was one of the key factors why this project was such a success.”

About the Die Caster: RCM Industries Inc. owns and operates four separate aluminum die casting companies, including Aallied Die Casting of North Carolina. RCM facilities conform to ISO/TS 16949: 2002 and/or ISO 9001: 2000 quality management systems and serve a diverse number of industries including automotive (U.S., European and Asian), computer/electronics, furniture, industrial, lawn & garden, power tool, recreational vehicle, power generation and others. In addition to both conventional high pressure die casting and squeeze casting capabilities, RCM offers numerous post-casting processes such as CNC machining, light-assembly, heat-treating (artificial aging), sanding/polishing/buffing, painting (wet/powder/e-coat), anodizing and plating (decorative and hard chrome finishes).

Honorable Mention
Aluminum over Ten Pounds
Blue Ridge Pressure Casting Inc.

What: Mack Truck Grill Surround and Air Intake

Challenge: The massive Grill Surround and Air Intake covers the area around the radiator and head lights as well as the twin side mounted air intakes on the a large heavy haul truck. One of the design criteria was to project an image of confidence and durability. A massive four-inch-wide grill surround and twin cowl-mounted air intakes were needed to portray this image.

Solution: The aluminum die cast parts are cast to a very high surface finish quality and then chrome plated. Aluminum die cast parts were chosen over injection molded plastics to maintain the image of durability to the end user. The die caster achieved plate-able quality aluminum on very large parts through innovative die design assisted by careful process simulation.

Project Leaders: Andrew D. Behler, Blue Ridge Pressure Castings
John Besz, David Critchley and David Onopa, Mack Trucks Inc.

Alloy: Aluminum 380 Alloy
Weight: 51 lb.
End Market: Automotive

Caster’s Comments: “A substantial amount of engineering was required to design dies that would produce these parts with a superior surface finish, good structural integrity and dimensional stability. Many additional features such as vacuum assist were incorporated into these dies to help achieve the high surface finish standards required for chrome plating. The head-light bezel is manufactured using a 3-plate die which helps to achieve good flow characteristics for this part.”

About the Die Caster: Blue Ridge Pressure Castings has become the go-to expert for clients with challenging aluminum parts and components for more than 60 years. The company’s professional team works with clients from concept through production delivery to ensure that they achieve their product goals for performance, cost and quality. They welcome opportunities to develop tooling and production processes to deliver on difficult assignments.
If you have an innovative die casting design, you should consider entering the 2010 International Die Casting Design Competition. Winners will be displayed during the CastExpo'10 in Orlando, FL, March 20-23, 2010.

To Compete:
The annual industry competition is open to those companies producing aluminum, magnesium and zinc die castings. Within each alloy group, there are more specific levels: Aluminum under One Pound, Aluminum One to 10 Pounds, Aluminum over 10 pounds, Aluminum Squeeze/Semi-Solid, Zinc under Six Ounces/Non-Electroplated, Zinc over Six Ounces/Non-Electroplated, Zinc Any Size with Decorative Finish, Magnesium under One Pound and Magnesium over One Pound.

Any number of castings may be entered. Send a separate entry form for each casting or assembly of castings. As-cast entries are REQUIRED. The metal surface cannot be improved or concealed by tumbling, shot blasting, coating or other surface treatments. NADCA encourages sending secondary processed samples, but these must be in addition to the as-cast parts.

All castings submitted for the competition MUST have approval in writing from the customer indicating that the customer consents to allowing NADCA to utilize the casting(s) in exhibitions, magazine articles and other publications. When possible, information and photographs describing the design process will be printed in Die Casting Engineer magazine, but because of proprietary reasons, not all information can be shared. Such exceptions should be noted in the entry.

The competition’s judging is conducted by an independent panel of die casting experts, with no bias towards eligible companies.

You may download the entry form at www.diecasting.org/castings/competition.
Send your entry, along with a sample casting and detailed description, to:
NADCA
241 Holbrook Drive
Wheeling, IL 60090

All entries must be postmarked by Friday, Jan. 22, 2010.
For more information, call Dan Meyer, NADCA’s design engineer, at (847) 808-3158 or e-mail him at meyer@diecasting.org.