The competition, which promotes increased use of die castings by recognizing and publicizing outstanding designs, is open to aluminum, magnesium and zinc die castings. Within those alloys, there are more specific levels: aluminum under 1 pound; aluminum 1-to-10 pounds; aluminum over 10 pounds; aluminum squeeze/semi-solid; zinc under 6 ounces/non-electroplated; zinc over 6 ounces/non-electroplated; zinc any size with decorative finish; magnesium under 1 pound; and, magnesium over 1 pound.

Castings are judged on design, quality, cost savings, ingenuity and industry changing potential. The judging was conducted by an independent panel of experts within the die casting industry, with no ties to eligible casters.

The winning castings serve the automotive, consumer electronic and aerospace end markets. For entry, die casters are asked to supply information and photographs describing the design process. When possible, that information is printed in Die Casting Engineer, but due to proprietary reasons, not all information can be shared.

NADCA would like to thank all the die casters that submitted a part to the competition and congratulate this year's winners. The winning die castings were showcased at the 108th Metalcasting Congress and Tabletop held this past June, and are highlighted in the following pages.

Entries are now being accepted for the 2005 International Die Casting Competition. Winners will be on display during CastExpo '05, taking place April 16-19 in St. Louis, Missouri. This event, sponsored by NADCA and the American Foundry Society (AFS) will be the largest metalcasting show in North America.

TO COMPETE: 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 they 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.

Download the entry form at www.diecasting.org/c&e/2005 and send it, along with a sample casting and descriptive material to:

NADCA
241 Holbrook Drive
Wheeling, Illinois 60090

All entries must be postmarked by February 11.

For more information, please call NADCA Project Engineer Jerry Wilkey at 847.808.3164.
SQUEEZE/SEMI-SOLID CASTING

WHAT: GQ cylinder head for an air conditioner compressor to be used in a consumer vehicle

PROBLEM: The part needed to be leak resistant. The bolt holes were critical for assembly, since the part is assembled as cast. Other concerns were porosity in the suction and delivery ports.

SOLUTION: By implementing a quick fill time, taking the alloy flow pattern and vent design into consideration, the part is able to be cast porosity free.

PROJECT LEADER(S): Ken Degler, Executive Vice President of Manufacturing, Kevin Turner, Brad Day, Mike Robak, Ganesh Ramu, Mike Popp

ALLOY: MPP Special- A383

WEIGHT: 1.375 lbs.

CASTER’S COMMENTS: “The GQ cylinder head is cast in a single cavity mold in a 350 ton die cast machine, which involves high skill factors. The design of the vents, flow pattern and fill time are also contributors for this type of critical, heavy and dense casting. Squeeze pin technology is used to obtain a porosity free casting.”

MACHINE SUPPLIER: Toyo

ALUMINUM UNDER 1 POUND

WHAT: Heat sink for a CD Player

PROBLEM: This is a complex casting, thin, with a series of perforated holes. It is used for absorbing heat and cooling the PCB boards in the CD player. The part is assembled as cast, and there is no machining involved. The location of the holes for assembly and perforation for heat dissipation are critical.

SOLUTION: Exact control of trim dies helps to maintain the flatness and to punch and maintain the hole locations within specification.

PROJECT LEADER(S): Ken Degler, Executive Vice President of Manufacturing, Kevin Turner, Brad Day, Mike Robak, Ganesh Ramu, Mike Popp

ALLOY: MPP Special- A383

WEIGHT: 0.42 lbs.

CASTER’S COMMENTS: “The heat sink is cast in a two-cavity mold in a 350 ton die casting machine. The flatness is important; the hole dimensions are critical since it is assembled as cast. The parts are further sand blasted and anodized in the secondary operation to withstand the heat dissipated.”

MACHINE SUPPLIER: Toyo

ABOUT THE DIE CASTER: Madison Precision Products, Inc. maintains a position of leadership through innovative die casting technology and quality. They use the most advanced production methods and machining technology available. Located in Madison, Indiana, the die caster’s 176,650 square foot facility offers state-of-the-art die casting. Madison Precision Products, Inc. has continued technological advances in the field of die casting since its inception in 1987. The company specializes in casting and machining high quality aluminum parts for the automotive industry, as well as exploring new technology for the use of die cast products.
ALUMINUM 1 TO 10 POUNDS

WHAT: Heat sink, front and back plate for G1000 airplane control panel system

CUSTOMER: Garmin International

PROBLEM: While aluminum die cast heat sinks have long been used to disperse heat from a wide variety of heat generating equipment, this is to be the first die cast heat sink used to extract and disperse heat generated by the printed circuit board for a liquid crystal display unit.

SOLUTION: The intricacies and uniqueness of design, combined with the desired thermo-characteristics afforded in a die casting enabled Garmin® International to justify the capital expense necessary to build the tooling packages. Considerable trouble was experienced when using machined parts, due to a lack of repeatability, resulting from the individual set-up of each piece of plate stock. Switching the process to die casting has all but eliminated this problem.

PROJECT LEADER(S): Ray Marsh, Operations Manager and Doug Guzinski, Project Manager, both from Nebraska Aluminum Castings, Inc.; Sheldon Wheaton, Manager of Engineering for Mechanical Aviation; Stephen Reid, Mechanical Engineer, Jared Klein, Mechanical Engineer and Laura Rippel, Mechanical Engineer, all with Garmin International.

ALLOY: A360

WEIGHT: Front part, .76 lbs., Back part 1.15 LBS.

CASTER’S COMMENTS: “The two heat sinks are truly necessary, they maintain the temperature within the unit and will improve the life and performance of the electrical components involved. This type of technology has been available on high-end business jets and airline transport aircraft for some time now. The G1000 system now makes this technology available to everything from single engine piston aircraft up to business jets.”

BENEFITS TO CUSTOMER: Increased production rate of finished product results in substantial cost savings of 85-90 percent.

ABOUT THE DIE CASTER: Nebraska Aluminum Castings, Inc. (NAC) was founded in 1975 and has followed a steady course of growth in size and expertise. The company’s determination to produce first-rate aluminum die castings, regardless of the size of the order, has established its reputation as one of the Midwest’s finest aluminum die casting facilities. From product and mold design, to material selection and prototype, to packaging and shipping the finished products, NAC assures the strictest adherence to quality and specification. The company’s QS/ISO certification demonstrates its commitment to continual improvement. NAC is located in Hastings, Nebraska, virtually in the center of the U.S.
ALUMINUM 10 POUNDS AND UP

WHAT: Gear case for automotive end market product
ALLOY: A383
WEIGHT: 14.6 lbs.

PROBLEM: An under-designed die, inherited from another caster, caused porosity and lacked thermal control, thus massive heat led to premature deterioration. Because of that, the project was hampered by excessive down time, slow cycle times, high scrap, low yielding on tooling and higher piece prices.

SOLUTION: A new die was designed with a large slide with massive amounts of seal-off and shut off angles. Ejector and cover dies were built into the design, reversed from the inherited design to eliminate a sticking problem of the casting in the die. The casting was modified to change the gating structure. Also, stress, deflection and vent calculations were all performed in order to determine the best possible design.

PROJECT LEADER(S): Aaron Nowak, Engineering Manager

CASTER’S COMMENTS: “Joint meetings were held numerous times between the customer’s engineers, our engineers, and the tool shop. The meetings are tagged ‘AEQP’ — Advanced Engineering and Quality Planning Meetings. The purpose of the meetings were to make the die design more robust and reduce scrap rates for the caster and customer. Throughout this project, all aspects of concurrent engineering were utilized. CAD, CAE, FEA and CAM were all necessary to meet the delivery requirements and to ensure there was as little as possible fine tuning to do on the end product.”

BENEFITS TO CUSTOMER: Scrap and sorting time (as well as associated costs) were virtually eliminated. Weight was reduced in the casting, resulting in reduced pricing. Cycle times were greatly enhanced as well as yield from this tooling package, with the ability to be run fully automated using an ABB robot. All of these improvements help extend die life, reduce costs for both parties, increase productivity, ensure on time delivery and strengthen customer/caster relations.

MACHINE SUPPLIER: Prince Machine  DIE BUILDER: Quad Tool & Design Inc.

ABOUT THE DIE CASTER: RCM Industries is a privately owned, custom die casting company operating four facilities. Two plants are located in the Southeastern U.S., and two are located in the Midwest. All four facilities have acquired ISO and QS registration to meet demanding quality and process requirements. RCM maintains full in-house capabilities to handle any project from concept through maturity. Founded in 1951, RCM has coupled a history of accomplishment in the metals casting industry with a commitment to state-of-the-art technology and equipment. Its commitment to meeting and exceeding customer expectations extends to the development of a highly trained and skilled technical workforce. RCM has more than 60 die casting machines ranging in size from 400 tons to 1600 tons capacity to meet customer’s needs. RCM casts all of the common aluminum alloys, but also has the ability to melt and cast more exotic alloys. It also performs secondary machining in horizontal, vertical and specialty machines. Various casting finishes can be provided by RCM, upon request.
MAGNESIUM UNDER .5 POUNDS

WHAT: Radio housing for an ITT “Spearhead” Military Radio

CUSTOMER: ITT Industries

PROBLEM: To design a component that is light enough to be used for the creation of the smallest VHF handheld radio made. Including the battery, the total product weight is 500 grams.

SOLUTION: Combined with the radio front housing, these two components are mated in the assembly of the radio. The tooling was created with two slides, one that shut off on the tangent. The tooling also has a vacuum runner underneath and gating over the top of the slide.

PROJECT LEADER(S): Dave Coon, Project Engineer, Larry Winkler, Tooling Engineer, both from Phillips Magnesium Molding and Robert D. Klein, of ITT, Aerospace/Communications Division.

ALLOY: AZ91D

WEIGHT: 40 grams

CASTER’S COMMENTS: “This was a new product. Past applications were made of plastic, or aluminum die casting, so a new market has now been created for magnesium die casting. The part is much lighter than an aluminum part would be, and no secondary shielding is necessary, as it would be for plastic components.”

MAGNESIUM OVER 1 POUND

WHAT: Aftermarket valve cover for a racing engine.

PROBLEM: Standard fabricated product weighs about 7 pounds per set

SOLUTION: By changing the valve cover to a magnesium casting, weight is reduced by nearly 4.4 pounds per set, to about 2.6 pounds per set, to create a product ideal for racing.

CUSTOMER: Niebel Engines

PROJECT LEADER(S): Alan Totten, Senior Process Engineer; Larry Winkler, Tooling Engineer, both from Phillips Magnesium Molding and Doug VanKloppenburg, President of Niebel Engines.

ALLOY: AZ91D

WEIGHT: 590 grams

CASTER’S COMMENTS: “The casting alloy flows 10” over three turns to produce a back wall thickness of 0.075”. Lifters were utilized for undercuts and thick wall sections were produced with limited sink.”

ABOUT THE DIE CASTER: Founded in 1964, Phillips Plastics Corporation is a privately held custom injection molder of plastic and metal with annual sales of $200 million. The company employs more than 1500 people at 15 locations throughout the United States, occupying 677,420 square feet. Supported by a network of over 100 design, process, and manufacturing engineers, as well as 100 toolmakers, this technology-driven company provides total solutions from design through production for original equipment manufacturers in the automotive, appliance, defense, durable consumer, electronics, industrial, lawn and garden, medical, recreational, and telecommunications markets. The company runs 226 presses corporate-wide, ranging from 7.935 tons. All its manufacturing facilities operate under one or more of the following: ISO 9000, ISO 13485, TS-16949, and FDA standards.
**WHAT:** Date wheel for a time clock.

**CUSTOMER:** Lathem Time

**PROBLEM:** The part was being screw machined, hand engraved and assembled to a stamped ratchet.

**SOLUTION:** By employing the die casting process, and using multi-slide tooling, a unique gating concept and automatic de-gating of castings, the customer was able to see savings in time and costs.

**ALLOY:** ZA8

**WEIGHT:** 9.9 grams

**DIE BUILDER:** Dynacast

**METAL SUPPLIER:** Allied Metal

**DIE LUBRICANT SUPPLIER:** G.W. Smith

**ABOUT THE DIE CASTER:** “Dynacast is a leader in precision die casting of zinc, aluminum and magnesium alloys. The company operates in 20 countries through 26 locations, 20 of which are manufacturing. Global compatibility in design, tooling and production, provides customers the benefit of liaison with local operations while tool and component manufacture can occur in the best place worldwide to meet their needs.”
WHAT: Gear shift lever bracket for an automotive steering column assembly

CUSTOMER: Delphi Saginaw

PROBLEM: The part had many pieces that needed to be machined.

SOLUTION: The finished part was designed with no draft and several machining features were eliminated.

ALLOY: ZA-8

WEIGHT: 1.1 lbs.

BENEFITS TO CUSTOMER: Using the no draft die casting process, the supplier was able to eliminate several machining features, thereby reducing piece price & tooling costs.

MACHINE SUPPLIER: HPM

DIE BUILDER: INTERMET (Monroe City, Missouri Toolroom)

ABOUT THE DIE CASTER: Continuing to build on nearly 160 years of manufacturing leadership, INTERMET Corporation is one of the world’s foremost producers of cast-metal automotive components. With over 700,000 tons of annual capacity, INTERMET’s 20 manufacturing plants cast and machine precision components in aluminum, magnesium, ductile iron and zinc. The company is organized into two distinct manufacturing groups, Light Metals and Ferrous Metals, each having unique operations but serving a common market. INTERMET’s full-service capability is augmented by sophisticated engineering and metallurgical resources at its research foundry and technical center in Virginia; a design/engineering center located at its Troy, Michigan, headquarters; and three in-plant product feasibility centers. INTERMET also operates engineering centers in Saarbrücken, Germany, and Tokyo, Japan.
Zinc Any Size with Decorative Finish

WHAT: Spot light housing for police and commercial vehicles

CUSTOMER: Unity Manufacturing Company

PROBLEM: Part was being manufactured at too high of a cost, and creating excessive scrap.

SOLUTION: Changed gating and overflow to non-cosmetic area of the part.

PROJECT LEADER(S): Samuel Heredia, General Foreman; Raul Marquez, Die Specialist; Will Vogel, Engineering Manager and Bill Gross, Vice President of Markets; Eric Zhang, Engineer with Unity Manufacturing Company.

ALLOY: ZAMAC #3

WEIGHT: .39 lbs.

CASTER'S COMMENTS: The greatest challenge was the overall shape and adding the O-Ring feature to prevent electrical failures. By redesigning the gating, the pre-plating buffing operations were reduced by 60 percent. The process takes less time, and also resulted in a cost savings of 36 percent.

CUSTOMERS COMMENTS: “Unity is no stranger to castings, and our team, which included DeCardy, wanted a more ascetically contoured part which would update our light’s appearance on the outside of vehicles, where it is mounted.”

MACHINE SUPPLIER: Frech

ABOUT THE DIE CASTER: DeCardy Diecasting is a “boutique” caster producing miniature to mid-size zinc die castings for upper end “fussy” customers. It serves markets from automotive to telecommunications and recently has expanded its medical market penetration. Many of the castings produced have very high cosmetic requirements. The recently purchased “high pressure” equipment helps DeCardy in meeting these customer’s discerning standards. Engineering emphasis is a DeCardy specialty. It has developed a Concurrent Engineering System that has enabled it to become involved in customer projects at the point of conception. Often evaluations and quotations are produced to a solid model long before details are known. Tooling is often begun before final “freeze point” of design and provision made for further modifications as customer product ramps-up to meet market demands. Located in Chicago, in an area not far from where it began, DeCardy is the epitome of a stable company. Owned and operated by Will Vogel and his dad Bill, who represent just the second ownership team in a century, DeCardy is proud of its contribution to its customer base. Employees, many from the local area, have been with the company an uncommonly long time and are committed to those contributions. DeCardy is ISO9000:2001. It has received much support from its casting machinery manufacturers (Frech & Techmire), its Union (Local 743), its governmental bodies, (State of Illinois & City of Chicago), its associations (NADCA & GNPDC), and even its competitors.