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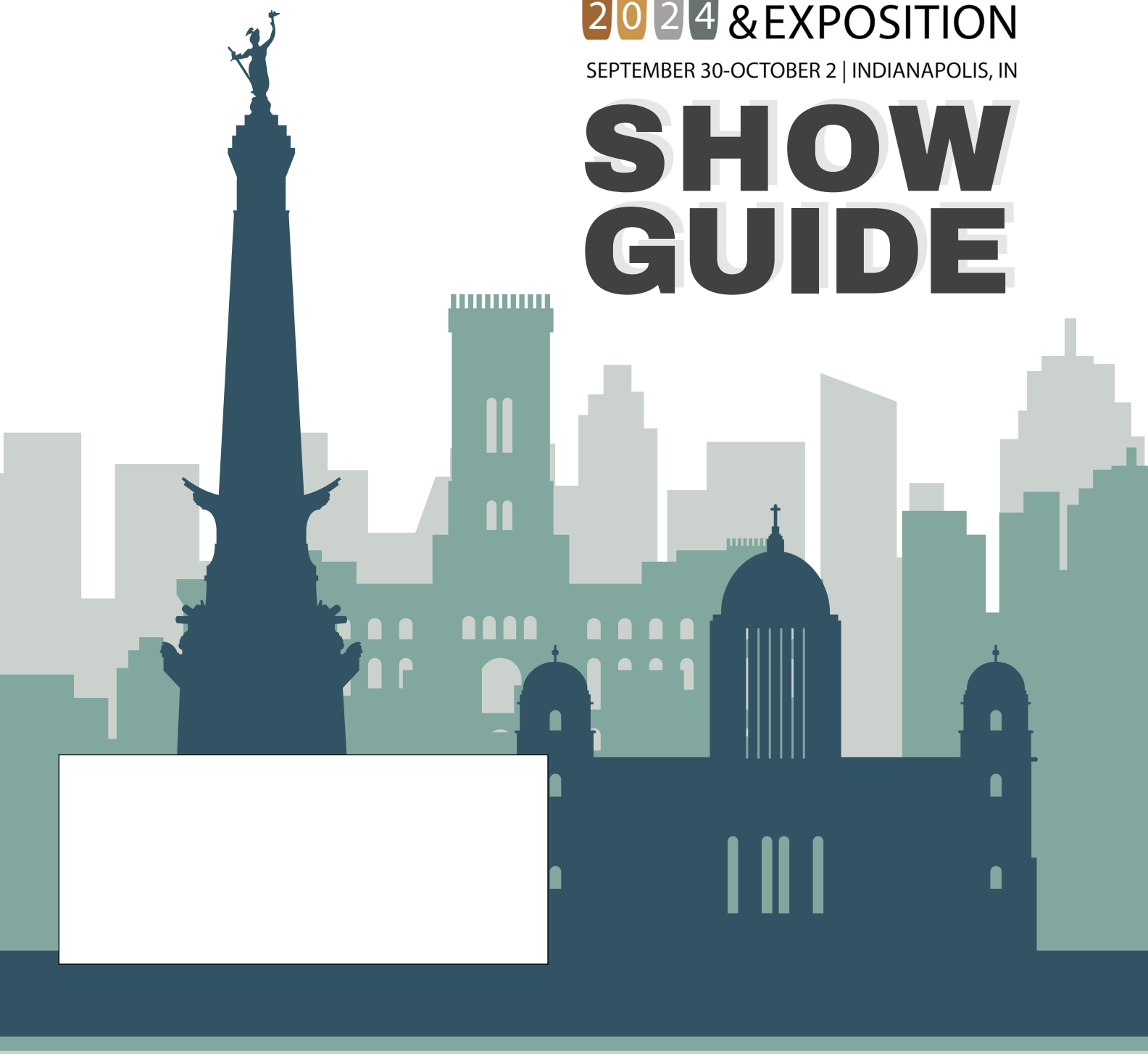
2024 DIE CASTING CONGRESS & EXPOSITION

SEPTEMBER 30-OCTOBER 2 | INDIANAPOLIS, IN

SHOW GUIDE



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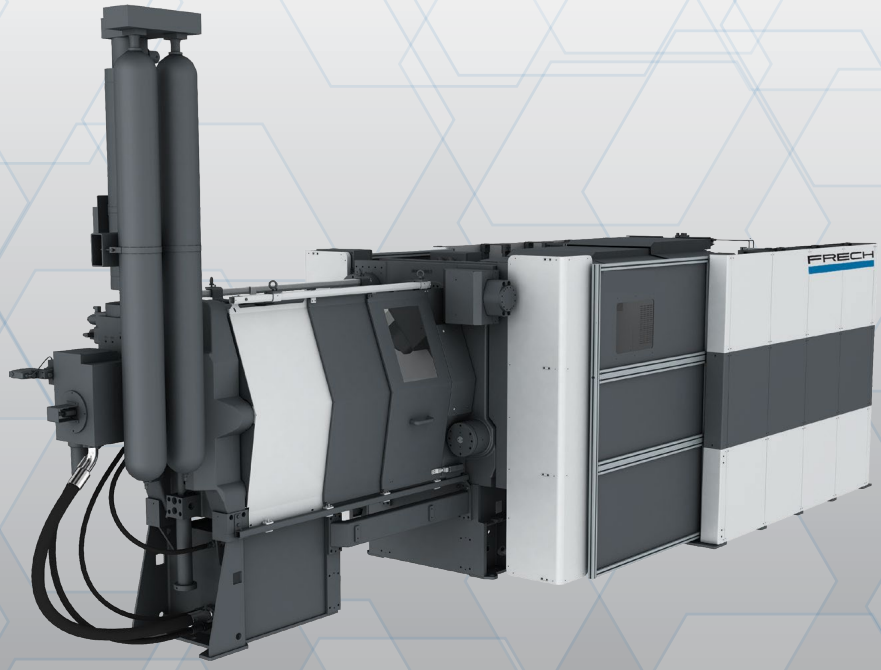

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Chairman's Note

The 2024 Die Casting Congress & Exposition

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Welcome to the September issue of Die Casting Engineer, featuring the 2024 Die Casting Congress and Exposition. Indianapolis, Indiana has become the home for the North American Die Casting Association's premier industry exposition, and is an event die casters and suppliers look forward to attending every third year.

Over the three days of this event, attendees will have the opportunity to see firsthand the latest developments from casting industry suppliers in the exhibit halls, participate in the technical round table discussions, learn in the congress sessions, celebrate industry awards, and network with peers from the global die casting industry.

As an association we are pleased to welcome global industry representatives who attend this internationally renowned exposition and participate in this event. With increasing international investment and involvement in many North American markets, we welcome those who bring new technologies and opportunities into our industry. We thank you all for participating.

This year we have over 160 exhibitors from around the world presenting the latest technologies for our industry. This is a great opportunity to learn about new tools and techniques which can help organizations become more profitable by raising productivity and quality.

Attendees can look forward to attending more than 30 technical sessions led by global experts covering topics such as die casting and quality control with AI, innovative die casting materials, advanced tooling materials and processes, structural die casting challenges, additive manufacturing and much more. These presentations promise to deliver cutting-edge technology, ongoing research insights, and effective management tools to bolster company competitiveness.

The NADCA awards luncheon is a great time to interact with fellow industry members and together celebrate milestones in company safety, quality, casting designs, and industry involvement.

The presentation of the die casting industry's highest honor, the Herman H. Doehler Award, recognizes the outstanding contributions made to the advancement of the die casting industry, or the art of die casting, and always is a highlight of the awards luncheon.

This year's recipient, Patrick Greene, CEO Cascade Die Casting Group, epitomizes the spirit of this award. Congratulations Pat for your contributions to the die casting industry and to NADCA.

The North American die casting industry and our association continue to grow in a competitive global environment. Our industry remains vibrant and is full of opportunities for corporate and personal development. Take full advantage of this event to expand your network of industry connections and further develop your industry knowledge base of best practices and new developments that can be used to make your company more successful.

Expand your personal knowledge, skills, and abilities through participating in the many options available at the NADCA 2024 Die Casting Congress and Exposition.

"The only real security that a man will have in this world is a reserve of knowledge, experience, and ability" – Henry Ford.

"Indianapolis, Indiana has become the home for the North American Die Casting Association's premier industry exposition."

Welcome to the 2024 Die Casting Congress & Exposition!

Andrew Ryzner
Editor
North American Die Casting Association

"The congress sessions this year should be fascinating with some incredible topics to be presented and to discuss."

Greetings readers of Die Casting Engineer magazine and welcome to the 2024 Die Casting Congress & Exposition. As you may or may not be aware, every three years, the North American Die Casting Association holds this exposition - our biggest show that will feature many much larger booth sizes, machinery, tools and more for attendees to see on the show floor. 2024 is one of those years and we are again back in Indianapolis which has been a wonderful city and venue for us to hold this show in for several iterations now.

Be sure to come say hello to NADCA staff at our registration desk, bookstore or on the show floor. There will be discounted publications for sale and friendly faces to converse with!

The Congress sessions this year are notable with new technology advancing like seemingly never before. The schedule includes sessions about:

- Additive Manufacturing Uses in Die Casting
- Improving Aluminum Die Casting Alloys
- Failure & Quality Analysis of Additively Manufactured Tooling
- Die Casting Sustainability
- Advanced Tooling Materials & Processes
- Process Controls Through Simulation
- Update on US Government Affairs
- Innovative Die Casting Materials
- North American On-Shoring and Near-Shoring
- Die Casting with Artificial Intelligence
- Protecting the Die from Molten Aluminum
- Metal Melting, Treatment & Transportation
- Post Die Casting: Technologies & Techniques
- Thermally Controlling the Die
- Structural Die Casting Challenges
- Optimizing Die Casting with Computer Modeling

One session that I personally think sounds very interesting is "Die Casting with Artificial Intelligence." If you are at all familiar with anything going on with the internet, surely by now you have seen the crazy things that AI can do (we'll call it AI even though it truly is not artificial intelligence at all - Skynet isn't becoming self-aware here folks), from creating pretty realistic images just from text, to doctoring video to make it look semi-believable, to writing code for you and many more things. While some of the things I mention can definitely be taken to be a negative thing, I believe there are positives and I look forward to hearing and reading about them at the Congress sessions this year.

Thank you for supporting NADCA and we look forward to being the best we can be to best help the members of the die casting industry. Have a great time at the show!

Andrew Ryzner

NADCA Government Affairs

Bipartisan Tax Bill Fails in Senate

The Senate failed to advance the bipartisan tax bill aimed at reversing several harmful changes implemented by the Tax Cuts and Jobs Act (TCJA), including modifications to Section 174, the R&D credit, Bonus Depreciation, and the Section 163(j) deduction. The cloture motion on the Tax Relief for American Families and Workers Act of 2024 (H.R. 7024), which required 60 votes to pass, fell short with a vote of 48-44. Senators Josh Hawley (MO), Markwayne Mullin (OK), and Rick Scott (FL) were the only Republicans who voted to advance the measure. Independent Senators Bernie Sanders (VT) and Joe Manchin (WV) opposed it.

The bipartisan, bicameral legislation, co-authored by Sen. Ron Wyden (D-OR) and Rep. Jason Smith (R-MO), had previously passed the House on January 31, 2024, with a vote of 357-70. The bill aimed to reverse detrimental changes to critical tax provisions by reinstating R&D expensing, eliminating capitalization and amortization requirements, restoring 100 percent Bonus Depreciation, and including the full EBITDA standard for interest deductibility on business loans.

Proposed OSHA Heat Rule Announced; CA Heat Standard Now Effective

The Occupational Safety and Health Administration (OSHA) has issued a highly anticipated proposed rule to address heat hazards in both indoor and outdoor work environments. Announced on July 2, 2024, this notice of proposed rulemaking (NPRM) outlines the requirements for employers when the heat index reaches 80°F or higher.

The rule applies to all indoor workplaces where the heat index hits the "initial heat trigger" of 80°F, with an exception for workplaces where employee exposure at or above this threshold occurs for short durations, specifically 15 minutes or less per hour. The proposed standards mandate that all covered employers with more than 10 employees develop a heat injury and illness prevention plan (HIIPP). This plan should detail the policies and procedures necessary to comply with the standard at the worksite.

Employers are required to identify areas in the workplace where employees might be exposed to temperatures at or above the initial heat trigger and to monitor the heat index or wet bulb globe temperature as close as possible to those areas. Upon reaching the initial heat trigger, employers must implement control measures, including providing cool drinking water, break areas with air conditioning or increased air movement, acclimatization for new or returning employees after an absence of more than 14 days, and paid rest breaks if necessary. Additional controls must be implemented for each work area when the initial heat trigger is reached, such as increased air movement (e.g., fans), air conditioning, or other measures to reduce exposure to radiant heat sources.

The proposed standard also includes a "high heat trigger" of a heat index of 90°F or higher, under which additional control measures would be required. These measures include mandatory rest breaks, continual observation by supervisors or the use of a buddy system for symptoms of heat-related illness, and warning signs and an alert system to inform employees of the high heat danger.

The NPRM is currently awaiting formal publication in the Federal Register, after which OSHA will accept public comments on the draft standard and requests for a public hearing. One Voice will continue to stress to OSHA that an overly broad, one-size-fits-all standard fails to recognize the diversity of indoor work environments and the unique situations across industries and would impose burdensome requirements for manufacturers.

In addition to the proposed federal regulation, California has issued its own standard. On July 23, 2024, the California Division of Occupational Safety and Health's (Cal/OSHA) new regulation the "Heat Illness Prevention in Indoor Places of Employment" went into effect. This standard applies to nearly all workplaces where the indoor temperature reaches at least 82°F when employees are present.

Employers under this standard must have written heat illness prevention plans that ensure access to water, "cool-down areas," acclimatization for new employees, and emergency response procedures. For workplaces where the temperature or heat index reaches at least 87°F, or where the temperature is at least 82°F and employees wear clothing that restricts heat removal or work in high radiant heat areas, employers must implement assessment and control measures such as engineering controls, administrative controls, or personal heat-protective equipment.

Biden Issues Executive Order on Supply Chain Resilience

President Biden issued an executive order on June 14, 2024, formally establishing the White House Council on Supply Chain Resilience. The council, which first formed and met in November 2023, is made up of 30 Cabinet-level members and senior administration officials and is tasked with advising the administration on President Biden's long-term, government-wide strategy to strengthen U.S. supply chains and build supply chain resilience. The Council is undergoing a quadrennial supply chain review, the requirements for which are outlined in President Biden's "Executive Order on White House Council on Supply Chain Resilience."

The report is required to include recommendations on federal incentives and procurement changes and reforms to "attract and retain private sector investments in the supply chains for critical goods and materials and other essential goods, materials, and services"; a strategic plan to guide U.S. engagement with allies to strengthen global supply chains, including "diplomatic, economic, security, international development, trade, and other policy actions"; international and domestic trade reform to "support supply chain resilience, security, diversity, sustainability, and strength"; and education and workforce reforms to "strengthen the domestic industrial base for critical goods and materials and other essential goods, materials, and services."

White House Council on Supply Chain Resilience is required to submit the report to the President by December 31, 2024.

SCOTUS Overturns Chevron Doctrine

On June 28, 2024, the Supreme Court (SCOTUS) overturned a judicial doctrine that had required federal courts to defer to agency interpretations of vague statutes. This doctrine, known as Chevron deference, allowed agencies considerable authority to interpret ambiguous federal laws as long as those interpretations were deemed reasonable.

The ruling on June 28 involved two consolidated cases, Loper Bright Enterprises v. Raimondo and Relentless v. Raimondo. The Court overturned the Chevron deference doctrine, which had been in place since 1984, and determined that the Administrative Procedure Act (APA) mandates courts to "decide all relevant questions of law" and to "interpret...statutory provisions" themselves, rather than deferring to federal agencies.

"The Administrative Procedure Act requires courts to exercise their independent judgment in deciding whether an agency has acted within its statutory authority, and courts may not defer to an agency interpretation of the law simply because a statute is ambiguous; Chevron is overruled," Chief Justice John Roberts wrote in the 6-3 decision.

NLRB Drops Joint Employer Appeal

The National Labor Relations Board (NLRB) has voluntarily dismissed its appeal of a federal judge's decision in Texas to vacate a rule expanding the criteria for establishing a joint employment relationship to include indirect and unexercised control over job terms and conditions. The appeal, filed by the NLRB in May, was officially withdrawn on July 19. Consequently, the standard for determining a joint employer relationship reverts to the one established in 2020, which states that a business is considered a joint employer of workers directly employed by another employer only if the two employers share or co-determine the workers' essential terms and conditions of employment.

On March 8, 2024, the United States District Court for the Eastern District of Texas vacated the NLRB's "Standard for Determining Joint Employer Status" rule, citing that it exceeded "the bounds of the common law" and that the NLRB "failed to reasonably address the disruptive impact" the new rule would have on various industries.

Congress also moved to strike down the rule, with both the House of Representatives and the Senate passing a Congressional Review Act (CRA) measure providing formal "congressional disapproval." However, President Biden vetoed the CRA, and the House fell short of the two-thirds majority needed to override the veto, voting 214-191.

In withdrawing the appeal to the court's decision, the NLRB stated that while it believes the rule meets the requirements under the Administrative Procedure Act (APA) and the National Labor Relations Act (NLRA), the Board wants the opportunity to "further consider the issues identified in the district court's opinion" and continue to "consider options for addressing the outstanding joint employer matters."

The final rule, published on October 26, 2023, aimed to replace the previous standard introduced during the Trump administration, which had protected companies from shared liability in unfair labor practices and union bargaining responsibilities since April 2020. The new rule would have considered employers joint employers if they had a role in determining key aspects of employment like scheduling, wages, and benefits.

EPA Finalizing TCE Rule

The Environmental Protection Agency (EPA) has submitted the final rule regulating trichloroethylene (TCE) under the Toxic Substances Control Act (TSCA) to the White House for review. On July 18, 2024, the Office of Information and Regulatory Affairs (OIRA) within the White House Office of Management and Budget received the regulation titled "Trichloroethylene (TCE); Regulation Under the Toxic Substances Control Act (TSCA)." The review process typically takes about 90 days, though this can vary depending on the specifics of the actions involved. The EPA anticipates issuing the final rule in September 2024.

The proposed rule, released in October 2023, effectively bans TCE by prohibiting its manufacture, import, processing, and distribution for all uses, including as a solvent in industrial cleaning and degreasing.

The rule would phase out most uses of TCE within one year, with a few critical uses granted longer compliance timeframes and subject to workplace controls. These critical uses include Federal agencies making rocket booster nozzles, battery separator manufacturing, and the "critical" degreasing of military vehicles. The rule would mandate a workplace chemical protection program (WCPP) that includes inhalation exposure monitoring and limits, dermal protection, recordkeeping, and downstream notification requirements for limited continued use.

The TCE rule is part of the EPA's ongoing efforts under TSCA to regulate halogenated solvents, joining methylene chloride, perchloroethylene (PCE), and carbon tetrachloride (CTC). A final methylene chloride rule was published in May, and final rules for PCE and CTC are expected in August.

Biden Imposes New Tariffs on Chinese Steel & Aluminum Imported Through Mexico

President Biden has announced new 232 tariffs on steel and aluminum articles that are imported from Mexico but produced elsewhere. The two proclamations "A Proclamation on Adjusting Imports of Steel Into the United States" and "A Proclamation on Adjusting Imports of Aluminum Into the United States," were signed by President Biden on July 10, 2024. Both proclamations aim to address the transshipment of Chinese steel and aluminum through Mexico.

Under the new tariffs, steel articles and derivative steel articles imported from Mexico but melted and poured in any country other than Mexico, Canada, or the U.S. are subject to an additional 25 percent duty. Likewise, a new "country of smelt and cast" requirement is in place for aluminum articles and derivative aluminum articles. An additional 10 percent duty will be imposed on aluminum articles, including aluminum forgings covered under HTS 7616.99.51.70, imported from Mexico for which the "primary country of smelt, secondary country of smelt, or country of most recent cast" is China, Russia, Belarus, or Iran.

USMCA Autos Report Issued

The Office of the U.S. Trade Representative (USTR) has published its biennial report to Congress on the automotive goods rules under the U.S.-Mexico-Canada Agreement (USMCA). The second "Report on the Operation of the United States-Mexico-Canada Agreement (USMCA) with Respect to Trade in Automotive Goods," released on July 1, 2024, analyzes the actions taken by auto producers to comply with the USMCA and evaluates the effectiveness and relevance of the USMCA's automotive rules of origin in the context of evolving vehicle and production technologies.

The rules of origin requirements under the USMCA have been controversial since the agreement's implementation. In January 2023, a USMCA dispute settlement panel ruled that the United States' interpretation of the deal's automotive rules of origin was inconsistent with its obligations under the agreement. The panel determined that the rules of origin do not include a "separate, self-standing" origination requirement for certain core auto parts and concluded that the U.S. had breached several commitments, including Article 3 of the Autos Appendix and Article 4.5, which specifies the rules for calculating regional value content. Additionally, the panel noted that the U.S. violated Article 8 by imposing requirements outside the scope of the Agreement for approving "alternative staging regimes" (ASRs), which allow automakers extra time to comply with the new USMCA requirements.

The report outlines some challenges faced by the North American auto sector in implementing USMCA provisions, such as "non-market excess capacity from the People's Republic of China (PRC) that has crowded out domestic suppliers across the autos supply chain." In May, the Trade Ministers of the three countries committed to addressing this issue and issued a statement agreeing to "jointly expand their collaboration on issues related to non-market policies and practices of other countries, which undermine the Agreement and harm U.S., Canadian, and Mexican workers, including in the automotive and other sectors."

The U.S. International Trade Commission (USITC) is conducting its own statutorily mandated investigation into the "economic impact and operation" of the USMCA's automotive rules of origin. The USITC report is expected to be finalized and submitted to the President, the House Committee on Ways and Means, and the Senate Committee on Finance by July 1, 2025.

Vietnam to Remain as "Non-Market Economy"

The Commerce Department announced on August 2, 2024, that Vietnam will continue to be classified as a "non-market economy" (NME) for the purposes of antidumping and countervailing duty (AD/CVD) cases. Vietnam, which has long sought to shed the NME designation, formally requested its removal in September 2023.

An NME is defined by the Commerce Department as a country that "does not operate on market principles of cost or pricing structures, so that sales of merchandise in such country do not reflect the fair value of merchandise." Alongside Vietnam, only 12 other economies, including China, Russia, and North Korea, are labeled as non-market by Washington.

Despite close U.S.-Vietnam partnerships on various regional security and economic issues, including membership in the Indo-Pacific Economic Framework for Prosperity (IPEF), some members of Congress opposed the change in status. In January, eight senators, including Elizabeth Warren and Bernie Sanders, sent a letter to Commerce Secretary Raimondo expressing concerns that granting Vietnam market economy status would "worsen ongoing trade distortions, erode the U.S. manufacturing base, threaten American workers and industries, and reinforce Vietnam's role as a conduit for goods produced in China with forced labor."

Commerce's decision highlighted that, despite significant reforms in Vietnam over the past two decades, the extensive government involvement in the economy distorts prices and costs, making them unsuitable for calculating U.S. antidumping duties.

Dr. Die Cast

PQ², Process and Simulation

Why simulation? Perhaps the most important reason for simulation is to produce higher quality castings "sooner" in the product development cycle. In the not too distant past, tool designers used their "best-guess" experience to create a gate design. Hopefully the first step of the design was based on the engineering principles taught in the NADCA Gating manual. Following the tooling design and build many tooling engineers "threw the tool over the cubical wall to production" and it was the responsibility of the die casting set up and process engineering team to develop a process using the existing gate and temperature control circuit design to achieve the required quality and productivity. Following was a period of "trial and error" process development that produced "process instructions" that was reproducible. On a good day, the development lasted less than a shift. On a bad day, a lot of people lost sleep and weekends while the tool made numerous trips to the tool room or back to the tool builder for gating design adjustments.

Most die casting producers, die casting tool shops and end users of die castings know that die casting simulation software exists. Many are not fully aware of the power and limitations of the software.

Who are some of the owners/users of simulation software's? Most are "larger foundry and die casting companies and tool shops. There is at least one smaller die casting company that recognizes the value of simulations and even contracts simulation time to other die casters and tool shops. Some are owned or leased by "independent die casting tooling designers" who design and simulate dies for a number of different companies.

Regardless of who performs the simulation, what are the most wasteful situations for a simulation customer?

1. Stopping after only one iteration. (Improvements can almost always be made.)

2. Limiting to a flow simulation only. (There are at least 2 other key simulations that should be part of the routine. Solidification and distortion).

3. Making decisions with no knowledge of the critical features of the casting. (Quality criteria).

4. Using outdated machine capabilities (PQ²).

How do you get the most out of the investment of time and money in a simulation project?

1. The die caster must provide the simulation engineer with current machine capabilities.

a. Maximum "Slow shot velocity" capability; (IPS or M/S).

b. Maximum "Fast shot velocity" capability; (IPS or M/S).

c. Maximum injection force: (Bars, Pounds, or Kilopascals).

d. Intensification rise time; (Bars, PSI, or Kilopascals per millisecond)

2. The process engineer should provide the theoretical process parameters for the specific casting.

3. The simulation should be run using the process parameters provided by the process engineer.

4. Once the simulation is completed it should be reviewed by the end users, particularly the die casting process engineer. Getting feedback from the end users provides insight that will often prove invaluable.

5. Review fill patterns (usually step one) for air pockets. Air pockets can be generated by cavitation in runners and at gate entries.

6. Look for "pre-fill" or blockages to overflows and vents. Metal that arrives "early" to a vent or overflow can block the vent and trap air in the casting.

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7. Review areas of high air pressure. These can be the result of the filling pattern but also can be due to closing vents or vacuum channels early in the filling process.

8. Vacuum and/or vent runners are often one size from end to end. Check the velocity and/or back pressure in them to insure you are not creating a bottleneck.

9. "Recirculation": This happens when metal flows into an overflow early and then is pulled back in to the casting. The resulting entrained cold metal serves to create cold shuts inside the casting. This can even happen when metal "back feeds" into an adjacent gate entry and potentially freezes off and blocks or at least restricts the 2nd gate entry.

10. Thermal simulations: Look at the solidification patterns. Are your gates freezing long before critical features (usually heavy bosses) where shrinkage porosity will be a major defect? Are there hot spots that will need additional cooling lines? Are there features that were identified in the thermal simulation that may require negotiation with the casting customer? Does the current casting design locate the "Neutral thermal axis" in the spot that will cause the greatest exposure when machined? Should the casting design include cores or "metal-savers" to remove material and reduce machining? Viewing the simulation with the casting customer will help them understand the physics behind the defect(s). It could help open discussions of product design changes, quality criteria or X-ray standards that reflect the true capability of the casting geometry.

a. Once a critical hot spot is identified, there are several options to apply that will greatly improve casting quality and in many cases allow for increased shots per hour.

i. Additive manufacturing inserts: i.e.; "Print core inserts" to create conformal cooling. This technique has already solved numerous hot spot issues and the cost, quality and deliveries of this technology are improving rapidly.

ii. Use a die or core material with a "high thermal coefficient." Materials such as Anviloy and "HTC" die steels can be beneficial in managing hot spots.

iii. If a "solid" area gets heavily machined or drilled, consider adding (a) core(s) to reduce machining.

iv. Jet cooling" is also becoming more widely used and can cool small features that have "always" ran without cooling.

v. "Heat tubes". This is a DME product that uses Freon in a closed tube to transfer heat from a small core or insert to a water line. There is a "High temperature" version of the Heat tube for die casting.

vi. Consider reducing cooling in the gate entry. If freezing the gate too soon is a problem, take steps to elevate the temperature or at least delay solidification in the gate while critical areas cool. (Most gates I have reviewed run too cold resulting in increased shrinkage porosity).

11. Comparative review: By saving key animations and screen shots of various iterations it is possible to measure significant improvements from gating and vent changes. It is possible to run animations side by side in PowerPoint. This helps demonstrate the difference between iterations.

NADCA NEWS

NADCA Scholarship Program Accepting Applications

Arlington Heights, IL - The North American Die Casting Association (NADCA) is now accepting applications for its David Laine Scholarship through October 1. David Laine was instrumental in developing safety standards in the die casting industry and was also a founder of the Die Casting Research Foundation. He provided vigorous representation for the die casting industry in Washington, D.C., speaking out for the programs and legislation that would best serve not only the die casting industry, but the numerous industries it serves. The scholarship was founded in 1975 as a tribute to David Laine and is supported entirely by both corporate and individual contributions from the die casting community.

To qualify for this scholarship, students must have worked or interned in a die casting company, or a supplier to the die casting industry. In 2023, NADCA awarded nearly $35,000 in scholarships to 14 full-time undergraduate students located across the North America.

Additional information about the scholarship and its eligibility requirements, are available on NADCA's website.

UPCOMING EVENTS

NADCA Congress West - October 25

Arlington Heights, IL - NADCA is excited to announce Die Casting Congress West!

Save the date for October 25, 2024 Anaheim, CA. The Congress will feature technology highlights from our Congress in Indianapolis, last fall. The event begin with a include a full day of presentations, networking and exhibits.

More information on topics and exhibitors coming soon.

Back to the East Coast – Marco Island Welcomes NADCA Execs

Arlington Heights, IL - NADCA is excited to announce that the 2025 Executive Conference will be held at the Hilton Marco Island on February 22-26, 2025 in Marco Island, Florida.

The tentative agenda, housing link and conference registration will be opened later this year. An announcement will be made via email and our newsletter when these items are opened.

Until then, pencil these dates into your calendar!

TOOLS & RESOURCES

12th Edition of Product Specification Standards for Die Casting Now Available

Arlington Heights, IL - The newest edition of Product Specification Standards for Die Castings is now available.

This manual covers specification, design and production guidance for both users and manufacturers of conventional high pressure die castings. The manual presents tooling and processes information, alloy properties, standard and precision tolerances, GD&T, design guidelines, quality assurance provisions and more.

Revisions for this edition include: rewrite of the first chapter to focus on an overview of the die casting process; additional information about die technology and sizing; new information about loose inserts; considerations for datum locations; moved around the order of alloy families to cover the more common alloys first; updated alloy reference tables; added P-20 as a possible option for miniature die casting die material; updated casting examples with more recent products; minor typographical errors have been corrected through.

The cost for this essential publication is $70 for Corporate Members, $100 for Individual Members and $140 for Non-Members.

You can order yours by visiting: www.diecasting.org/marketplace and search PUB-402.

Got Some News? We'd Love to Hear It!

Do you have some interesting industry news or promotions within your company that you would like to announce?

Send it over! Industry news and announcements are always welcome and encouraged.

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Send your news or announcements to
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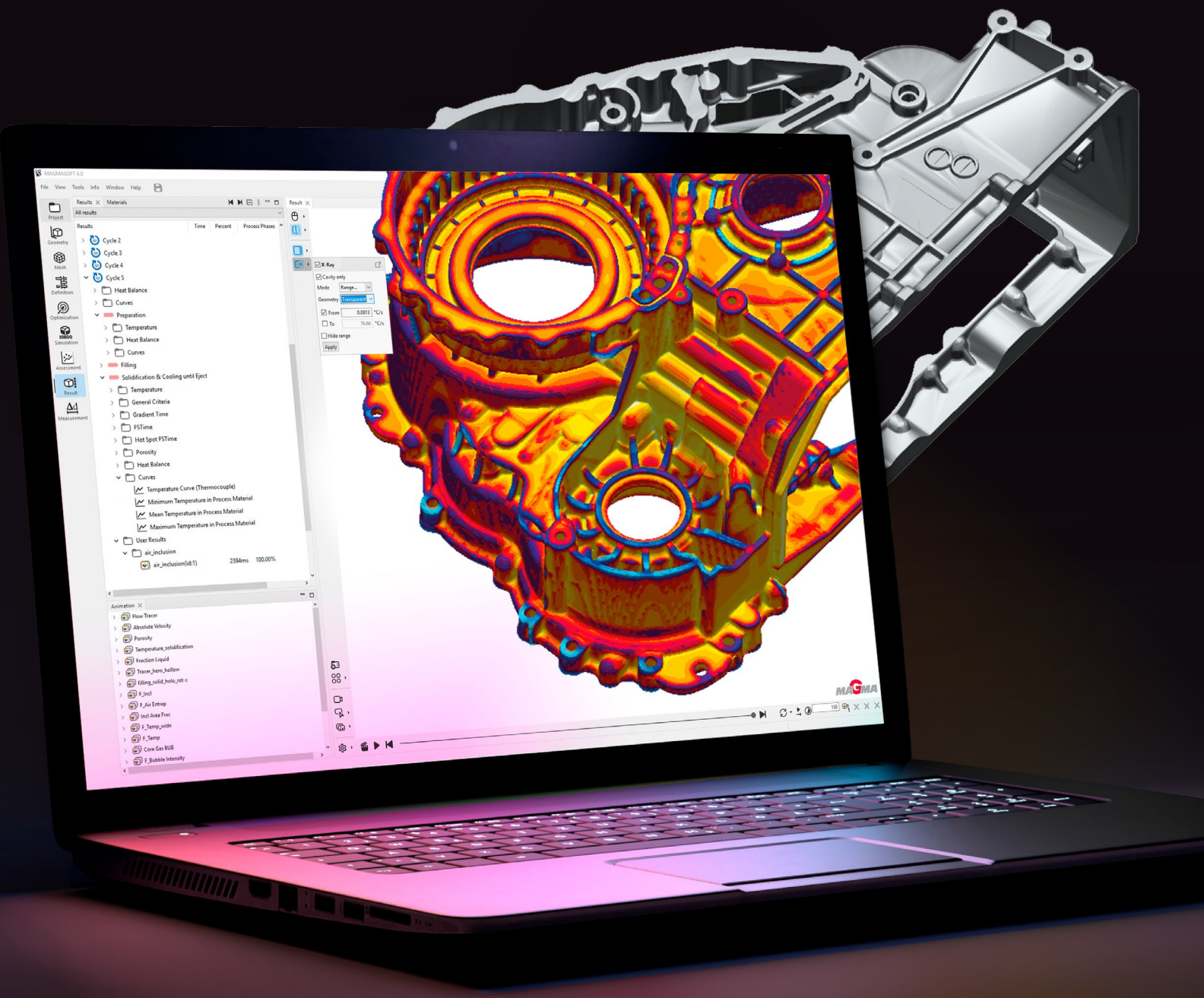

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Future Possibilities of CastView

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Abstract

This paper presents a research study on the application of the CastView approach to identify thick, thin, and die thin sections within 3D geometry models. The proposed methodology involves the computation of a distance field by Euclidean distance transformation. Through image morphological operations of erosion and dilation, the identified thick, thin, and die thin sections are achieved without relying on medial axis transform. The study was conducted using python code and libraries hosted on Google Colab, a cloud-based computing platform, and the resulting software code is open-source and accessible. By eliminating the need for a graphical user interface (GUI), the implementation relies on python based Jupyter Notebook to present a combination of markdown language text and python code blocks, offering a clear and transparent explanation of code steps and usage. Moreover, the presented approach adopts the generation of 3D geometry as STL files rather than using 3d dense arrays or voxel images as the result. This strategic choice enables further analysis and visualization using readily available software packages, significantly enhancing the practicality and usability of the results.

Introduction

CastView is a user-friendly and accessible tool specifically designed for die casting designers, enabling them to obtain results without the need for specialized expertise. Its emphasis on simplicity and efficiency makes it an attractive option for designers seeking quick analysis of their die casting designs. Unlike traditional methods that rely on physical modeling, CastView adopts a geometric approach, ensuring ease of use and rapid analysis.[1,2]

The key strengths of CastView lies in its ability to provide rapid analysis, empowering designers to efficiently evaluate multiple design iterations. This feature facilitates informed decision-making and expedites the overall design process. By detecting potential design flaws at an early stage, CastView significantly contributes to accelerating the design process. This early detection capability proves highly valuable in mitigating costly design errors and enables timely modifications prior to reaching the manufacturing stage, ultimately leading to notable time and cost savings.[3]

Background

CastView is a specialized design visualization tool utilized for the analysis of die castings, with a primary focus on detecting potential design flaws and manufacturing issues, including thermal distortion and casting defects. The tool employs both geometric reasoning and volume-based reasoning approaches to achieve its objectives.

A summary of CastView can be shown in 2006 when Miller and Rebello demonstrated it as a visualization tool dedicated to die casting part and die design. The core of CastView's functionality relies on qualitative analysis based on the geometry of the die casting parts, providing valuable insights into thermal and flow-related problems within the casting process. By facilitating the identification of thick and thin sections in the part and pinpointing potential fill problems, CastView proved instrumental in early detection and resolution of design flaws.[1]

In 2019, Warriner and Monroe contributed to the advancement of CastView by revitalizing and enhancing it through the integration of modern routines and the use of MATLAB. They emphasized the various advantages of employing MATLAB, including simplified code maintenance, the potential for further analysis and optimization, and enhanced platform independence. This enhancement paved the way for CastView to be more efficient and versatile in aiding die casting designers in their analysis and decision-making processes.[2]

The Update of CastView

The CastView project involves Python programming within the Google Colab environment, a web-based platform that enables collaborative coding and execution of Python scripts. Google Colab provides a notebook-style interface akin to Jupyter notebooks, facilitating code organization and documentation. It also allows real-time collaboration and easy sharing of Colab notebooks with others.[4] The update of CastView output consists of three data sets: thick result, thin result, and die thin result. Furthermore, the information is exported into numerous STL files, each of which is enveloped within glTF files. These glTF files work together to create an animated presentation, as depicted in Figure 1. glTF files employ a binary format to house models, materials, textures, and animations.[5] There are several advantages to using glTF over a dense array or individual STL files. As compared to a 3D dense array, the glTF file is smaller and easier to view.

Compared to individual stl file, the glTF format makes review of a series of results easier. The code for this project can be accessed through the following link: http://bit.ly/3JC3WUp. An overview of the code will be discussed below to explain the various code blocks that are given for the geometric analysis.

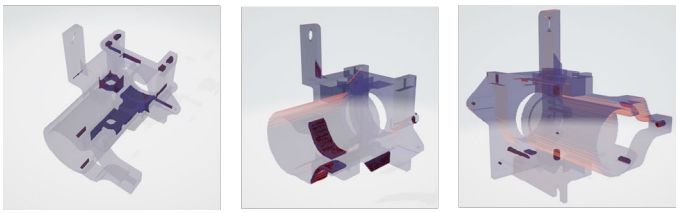

***Figure 1** – Visualized (a) thick sections of a steering column mount, (b) thin sections of a steering column mount, and (c) die thin sections of a steering column mount – from Google Colab.*

Preparing Section - Library and Voxel Resolution

The initial code block is provided to setup and install the various libraries necessary for the analysis. These can be summarized as Python script installs and imports multiple libraries to facilitate 3D data processing, medical image processing, 3D graphics, numerical computations, image processing, and operating system interactions. Specifically, it includes open3d for handling 3D data[6], SimpleITK for medical image processing[7], bpy for Blender interaction, NumPy and SciPy for numerical calculations[8] and skimage for image processing.[9]

Voxel resolution plays a crucial role in achieving accurate depiction and thorough analysis of spatial geometry. To establish the voxel resolution, the size of the geometry's outermost structure is initially ascertained by evaluating its maximum and minimum coordinates. Following this, the most significant dimension of this outer structure is divided by the element count (referring to the quantity of elements partitioned in this direction), thereby yielding the optimal voxel resolution for the analysis. The calls are standard for each library and voxel resolution will not be discussed here.

Analyzing Section - Geometry Voxelization

In Figure 2, the provided code presents an implementation of 3D image segmentation through a voxel-based approach. Initially, a large point cloud is generated and converted into a surface voxel grid representation. The occupied voxels are those that are identified with the surface and stored in a dense 3D NumPy array. Subsequently, a morphological closing operation is applied to the array to fill small gaps in the surface voxel grid. To create the filled 3D array from the surface array, several additional steps need to be completed. First, connected components are labeled in the resulting binary image, and the empty space within the components are filled to create a more robust segmentation. Finally, a new 3D surface mesh is generated from the filled binary image, facilitating visualization and further analysis of the segmented objects. This final 3D surface mesh should be functionally equal to the original STL file and can be used to estimate the appropriate amount of data compression for the final results.

```
pcd = geometry.sample_points_uniformly(number_of_points=100000000)
voxel_grid = o3d.geometry.VoxelGrid.create_from_point_cloud(pcd,voxel_size=voxel_resolution)
voxels = voxel_grid.get_voxels()
indices = np.stack(list(vx.grid_index for vx in voxels))
del voxels, voxel_grid, pcd
max_indices = np.max(indices, axis=0)+1
dense_array = np.zeros(max_indices, dtype=np.bool8)
for idx in indices:
    dense_array[tuple(idx)] = 1
del indices
array_pad = np.pad(dense_array.astype(bool),((2,2)),'constant')
del dense_array
array_closing = ndimage.binary_closing(array_pad, structure=ndimage.generate_binary_structure(3, 1),
iterations=1, mask=None,  border_value=0, origin=0, brute_force=False)
img = sitk.GetImageFromArray(array_closing.astype(int))
seg = sitk.ConnectedComponent(img != img[0,0,0])
img_filled = sitk.BinaryFillhole(seg!=0)
array_filled = sitk.GetArrayFromImage(img_filled)
verts, faces, _, _ = measure.marching_cubes(array_filled)
vertices_original = np.asarray(verts.tolist())
faces_original = np.asarray(faces.tolist())
del array_closing, img, seg, img_filled
```

***Figure 2** – Python code for voxelizing geometry in Google Colab.*

Analyzing Section - Morphological Operation

In Figure 3, the provided Python script demonstrates an image processing workflow using SciPy and SimpleITK libraries. Initially, the 3D binary array is subjected to a binary closing operation to smooth the jagged surface by one voxel element in the object representation. Voxel meshes tend to be noisy due to the stair-step appearance on the surface, by doing a closing operation for one layer this smooths the mesh eliminating small spurious hot spots near the surface. The resulting array is then converted to a SimpleITK image for further processing. The core function is defined to identify and mark regions within the array. Employing a set of rolling axis operations and iterative checks, the core function efficiently detects contiguous regions and labels them as potential core and die area.

```
array_initial = ndimage.binary_closing(array_filled, structure=ndimage.generate_binary_structure(3, 1),
iterations=1, mask=None,  border_value=0, origin=0, brute_force=False)
img_initial = sitk.GetImageFromArray(array_initial.astype(int))
def core(array):
    directions = [(0, 0, 0, 0), (2, 1, 2, 1), (0, 3, 2, 0)]
    new_array = np.copy(array)
    for direction in directions:
      array = np.rollaxis(array, direction[0], direction[1])
      array_temp = np.copy(array)
      ones_indices = np.argwhere(array == 1)
      for (i, j, start_index), (next_i, next_j, end_index) in zip(ones_indices[:-1], ones_indices[1:]):
          if i == next_i and j == next_j:
              array_temp[i, j, start_index+1:end_index] = 2
      array_temp = np.rollaxis(array_temp, direction[2], direction[3])
      array = np.rollaxis(array, direction[2], direction[3])
      new_array = np.where((array_temp == 2) | (new_array == 2), 2, array)
    return new_array
array_core = core(array_initial.astype(int))
array_core[array_core != 2] = 0
array_core[array_core == 2] = 1
```

***Figure 3** – Python code for morphological operation in Google Colab.*

Analyzing Section - Distance Field Calculation

In Figure 4, this code presents an image analysis technique for computing the signed Maurer distance map from a binary voxel data representation. Leveraging the powerful SignedMaurerDistanceMap function within the SimpleITK library, the code efficiently calculates the distance of each voxel to the nearest object boundary, considering both interior and exterior distances with positive and negative values, respectively. The resulting distance map is then transformed into a NumPy array, allowing for easy manipulation and analysis. Notably, the code also extracts valuable insights about the object's depth by identifying the negative minimum value from the distance map. Note that printing the value of the depth shows how many layers

of mesh need to be removed to get to the center of the deepest thicknesses of the geometry. This can be multiplied by the voxel resolution to convert from mesh layers to

```
img_dist = sitk.SignedMaurerDistanceMap(img_initial != 0, insideIsPositive=False, squaredDistance=False, useImageSpacing=False)
array_dist = sitk.GetArrayFromImage(img_dist)
depth = int(-array_dist.min())
del img_dist, img_initial
```

Figure 4 *– Python code for distance field calculation in Google Colab.*

Visualization Section – Thick

In Figure 5, the provided code exhibits a structured iterative approach for generating thick binary voxel representations at different distance depths. The process begins by iterating through a range of depth values. At each iteration, the code undertakes a sequence of essential operations on the voxel data. First, it thresholds the a distance map for depths greater than the requested depth. Then that resulting array is transformed using marching cubes and the resulting geometry is saved as an STL file. The STL file undergoes a decimation procedure with the objective of diminishing the polygon count and intricate geometric details by 10%. This procedure is conducted to preserve the core shape and visual portrayal of the geometry, while simultaneously enhancing its suitability for applications like animation, where a decreased polygon count leads to heightened efficiency and attractiveness. Ultimately, all the decimated STL file results are encapsulated within glTF files, facilitating the production of animations.

```
for i in range(2, depth+1):
  thick = np.where(array_dist > -i, 0, 1)
  verts, faces, _, _ = measure.marching_cubes(thick)
  vertices = np.asarray(verts.tolist())
  faces = np.asarray(faces.tolist())
  blender_mesh = bpy.data.meshes.new("Mesh")
  blender_mesh.from_pydata(vertices, [], faces)
  obj = bpy.data.objects.new(f"Object{i-1}", blender_mesh)
  bpy.context.collection.objects.link(obj)
  obj.select_set(True)
  bpy.context.view_layer.objects.active = obj
  bpy.ops.object.modifier_add(type="DECIMATE")
  bpy.context.object.modifiers["Decimate"].decimate_type = "COLLAPSE"
  bpy.context.object.modifiers["Decimate"].ratio = 0.1
  bpy.ops.object.modifier_apply(modifier="Decimate")
  obj.color = (0,0,1,1)
  mat = bpy.data.materials.new(f"{i-1}")
  mat.use_nodes = True
  principled = mat.node_tree.nodes["Principled BSDF"]
  principled.inputs["Base Color"].default_value = (1,0,0,1)
  obj.data.materials.append(mat)
  obj.keyframe_insert(data_path="scale", frame=0)
  obj.keyframe_insert(data_path="scale", frame=i-1)
  obj.scale = (0,0,0)
  obj.keyframe_insert(data_path="scale", frame=i)
bpy.ops.export_scene.gltf(filepath="//content//thick.gltf", export_format="GLTF_EMBEDDED", export_animation_mode="ACTIVE_ACTIONS")
```

Figure 5 *– Python code for analysis thick in Google Colab.*

Visualization Section – Thin

The approach employed to discern the thin section, as depicted in Figure 6, involves a gradual erosion of the geometry layer by layer. After a specific thickness threshold, certain regions may vanish, even upon applying an equal thickness dilation. These vanished areas are deemed indicative of thin sections, circumventing the need for dependence solely on the medial axis transformation technique.

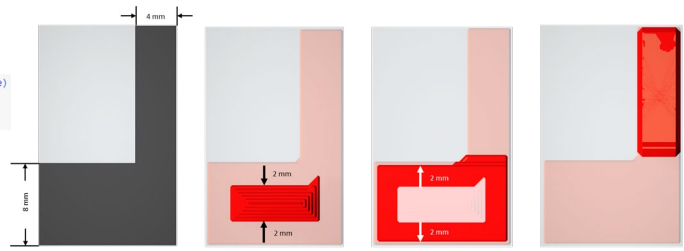

Figure 6 *– The thin area of L-shaped section identified by erosion and dilation method.*

The provided Python code involves an iterative process aimed at generating a thin result, as depicted in Figure 7. Based on the thin section result, the operation continues with thin analysis by applying binary dilation to the thicker array, effectively expanding specific regions within the voxel data. Following this step, the dilated regions are progressively removed to produce a refined thin section. Subsequent to obtaining the thin result, the marching cubes algorithm is applied to extract surface geometry is then stored in an STL file format. To manage computational complexity, the STL file undergoes a reduction process targeting a reduction of polygon count and decimation by 10%. This iterative process is repeated for each specified depth value within the defined range. This cumulative approach results in a comprehensive collection of thin representations. Ultimately, all the reduced STL file results are encapsulated within glTF files, simplifying the production of animated visualizations.

```
for i in range(2, depth+1):
  thick = np.where(array_dist > -(2+depth-i), 0, 1)
  array_thick_dilate = ndimage.binary_dilation(thick, structure=
  ndimage.generate_binary_structure(3, 3), iterations=2+depth-i+1, mask=None,
  border_value=0, origin=0, brute_force=False)
  thin = np.where(array_thick_dilate > 0, 0, array_initial)
  array_thin = ndimage.binary_opening(thin, structure=
  ndimage.generate_binary_structure(3, 1), iterations=1, mask=None,
  border_value=0, origin=0, brute_force=False)
  if(array_thin.max()>0):
    verts, faces, _, _ = measure.marching_cubes(array_thin)
    vertices = np.asarray(verts.tolist())
    faces = np.asarray(faces.tolist())
    blender_mesh = bpy.data.meshes.new("Mesh")
    blender_mesh.from_pydata(vertices, [], faces)
    obj = bpy.data.objects.new(f"Object{i-1}", blender_mesh)
    bpy.context.collection.objects.link(obj)
    obj.select_set(True)
    bpy.context.view_layer.objects.active = obj
    bpy.ops.object.modifier_add(type="DECIMATE")
    bpy.context.object.modifiers["Decimate"].decimate_type = "COLLAPSE"
    bpy.context.object.modifiers["Decimate"].ratio = 0.1
    bpy.ops.object.modifier_apply(modifier="Decimate")
    obj.color = (0,0,1,1)
    mat = bpy.data.materials.new(f"{i-1}")
    mat.use_nodes = True
    principled = mat.node_tree.nodes["Principled BSDF"]
    principled.inputs["Base Color"].default_value = (1,0,0,1)
    obj.data.materials.append(mat)
    obj.keyframe_insert(data_path="scale", frame=0)
    obj.keyframe_insert(data_path="scale", frame=i-1)
    obj.scale = (0,0,0)
    obj.keyframe_insert(data_path="scale", frame=i)
bpy.ops.export_scene.gltf(filepath="//content//thin.gltf", export_format="GLTF_EMBEDDED", export_animation_mode="ACTIVE_ACTIONS")
```

Figure 7 *– Python code for analysis thin in Google Colab.*

Visualization Section – Die Thin

In this extended code, which is shown in Figure 8, a range-based iterative loop is introduced to generate "die-thin" meshes from the voxel data representation. This approach is identical to the thin result described above, but the process is applied only to the geometry of the die or mold. In identifying thin sections of the die typically reveals cores, pins, or sharp internal corners. Each iteration involves a series of operations aimed at producing these specialized meshes. The distance map is the first thresholded to create a binary representation. Binary dilation and opening operations are then performed on the binary representation to refine the mesh. Utilizing the march-

ing cubes algorithm, a mesh is generated based on the thresholded distance map. The process is repeated across the specified range, resulting in multiple die-thin meshes, each capturing distinct structures within the die voxel data. These meshes effectively visualize thinner regions by utilizing the threshold information derived from the distance map. The final outputs are exported as STL files by 10% decimated, allowing for convenient visualization and analysis of glTF within the die object.

```
for i in range(2, depth+1):
  die_thick = np.where(array_dist < (2+depth-i), 0, 1)
  array_thick_dilate = ndimage.binary_dilation(die_thick, structure=
  ndimage.generate_binary_structure(3, 3),
  iterations=2+depth-i+1, mask=None,  border_value=0, origin=0, brute_force=False)
  die_thin = np.where(array_thick_dilate > 0, 0, array_core)
  array_thin = ndimage.binary_opening(die_thin, structure=
  ndimage.generate_binary_structure(3, 1), iterations=1, mask=None,
  border_value=0, origin=0, brute_force=False)
  if(array_thin.max()>0):
    verts, faces, _, _ = measure.marching_cubes(array_thin)
    vertices = np.asarray(verts.tolist())
    faces = np.asarray(faces.tolist())
    blender_mesh = bpy.data.meshes.new("Mesh")
    blender_mesh.from_pydata(vertices, [], faces)
    obj = bpy.data.objects.new(f"Object{i-1}", blender_mesh)
    bpy.context.collection.objects.link(obj)
    obj.select_set(True)
    bpy.context.view_layer.objects.active = obj
    bpy.ops.object.modifier_add(type="DECIMATE")
    bpy.context.object.modifiers["Decimate"].decimate_type = "COLLAPSE"
    bpy.context.object.modifiers["Decimate"].ratio = 0.1
    bpy.ops.object.modifier_apply(modifier="Decimate")
    obj.color = (0,0,1,1)
    mat = bpy.data.materials.new(f"{i-1}")
    mat.use_nodes = True
    principled = mat.node_tree.nodes["Principled BSDF"]
    principled.inputs["Base Color"].default_value = (1,0,0,1)
    obj.data.materials.append(mat)
    obj.keyframe_insert(data_path="scale", frame=0)
    obj.keyframe_insert(data_path="scale", frame=i-1)
    obj.scale = (0,0,0)
    obj.keyframe_insert(data_path="scale", frame=i)
bpy.ops.export_scene.gltf(filepath="//content//die_thin.gltf", export_format="GLTF_EMBEDDED", export_animation_mode="ACTIVE_ACTIONS")
```

***Figure 8** – Python code for analysis die thin in Google Colab.*

Output Result

Preceding the execution of the code, meticulous consideration of the element count is imperative. So, the steering column mount was analyzed with 200, 350 and 500 element count per side, which the parameters depicted in Table 1. Results from the analysis are shown below. As illustrated in Figure 8a, an escalation in the element counts corresponds to a proportional augmentation in peak memory utilization (RAM). This phenomenon is attributed to the increased instances of completed remeshing, distance transferring, and visualization processes. Regarding temporal consumption, the simulations involving remeshing and distance transferring exhibit brevity, generally concluding within a minute. Nevertheless, as depicted in Figure 9b, the visualization process experiences amplified time consumption in direct correlation with escalating element counts. This effect arises from the heightened element count, leading to augmented depth values and the generation of an increased number of geometrical meshes. Notably, within the visualization process, a significant portion of the time overhead originates from the defamation procedure. This step substantially contributes to the effective reduction of output file size, a phenomenon clearly illustrated in Figure 9c.

***Table 1** – Parameters for the steering column mount with element counts of 200, 350, and 500.*

Element counts	Number of elements	Voxel resolution (mm)	Depth value
200	8× 10^6	0.76	9
350	4.3× 10^7	0.43	16
500	1.25× 10^8	0.3	23

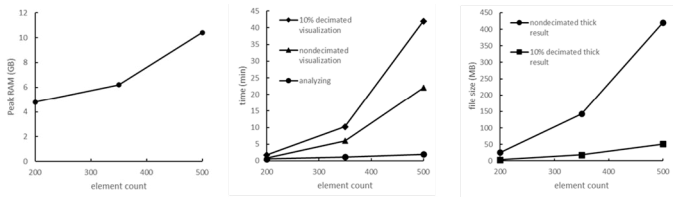

***Figure 9** – The a) peak RAM usage varies with the number of element counts, b) the time consumed varies with the number of element counts and c) the file size of thick result varies with the number of element counts – in Google Colab.*

In light of the constraints imposed by computational resources, particularly within the framework of Google Colab, which provisions a virtual machine equipped with 12.7 GB of RAM, surpassing this memory limit would lead to the virtual machine becoming unstable and eventually crashing. Consequently, an upper threshold of 500 element counts was enforced for the steering column mount, preventing an overextension of the available computational resources.

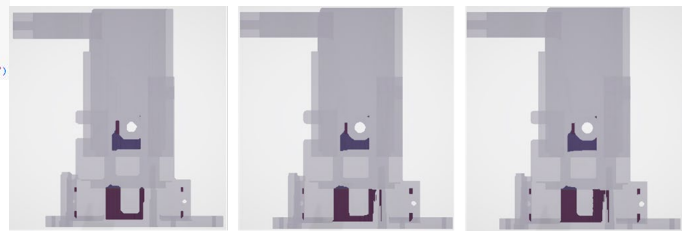

***Figure 10** – a) 200, b) 350 and c) 500 element count in thick selection at a depth of 3.8 mm along the Z-axis.*

The comprehensive analysis of the steering column mount encompassed simulations spanning distinct scenarios, including those involving thick, thin, and thin die variations, as visually represented in Figure 1. Remarkably, even with the deployment of 500 element counts, akin outcomes were observed as those resulting from the utilization of 200 elements, a substantiated observation as elucidated in Figure 10. Balancing effectiveness and the quality of results, the simulation efforts were carried out using a mesh consisting of 200 elements with a 10% decimation ratio, culminating in a cumulative element count of 8,000,000 for the steering column mount. The uniformity of voxel resolution, set at 0.76 mm, was diligently maintained, with the determination of depth informed by empirical insights gleaned from remote field observations. Notably, the variation in depth for the steering column mount ranged from 0.76 mm to 6.84 mm. To ensure structural integrity, the mount was discretized into 9 distinct layers, each upholding a consistent thickness of 0.76 mm.

In the thick selection result, as illustrated in Figure 11, a systematic layer-by-layer removal process was implemented on the steering column mount. The process initiated at a depth of 0.76 mm and progressed incrementally, increasing the depth up to 6.84 mm. Each layer, having a thickness of 0.76 mm, was successively removed to obtain the final outcome.

***Figure 11** – The thick selection in depth a) 0.76 mm, b) 3.04 mm and c) 6.08 mm.*

Conversely, in the thin selection result (Figure 12), the steering column mount was subjected to a dilation procedure. Commencing with a depth of 6.84 mm, the dilation process ensued with stepwise reductions, ultimately reaching a depth of 0.76 mm. The depth of iterations was adjusted accordingly throughout the process to ensure a comprehensive evaluation.

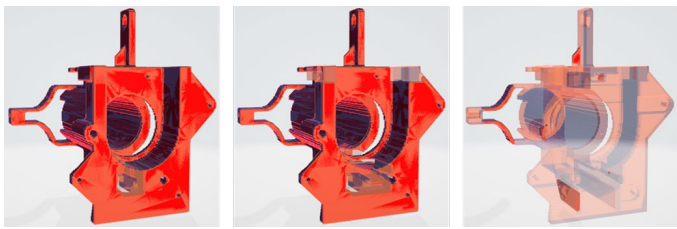

***Figure 12** – The thin selection in depth a) 6.08 mm, b) 3.04 mm and c) 0.76 mm*

For the thin die selection result (Figure 13), a similar dilation approach was adopted for the steering column mount, with the depth of dilation ranging from 6.84 mm to 0.76 mm. In this case, however, the depth of iterations spanned from 7.6 mm to 1.52 mm, with particular attention paid to preserving the area proximal to the boundary.

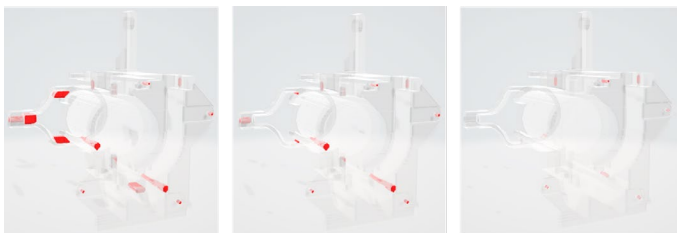

***Figure 13** – The thin die selection in depth a) 6.08 mm, b) 3.04 mm and c) 0.76 mm.*

Future Possibilities of CastView

In future research, a comprehensive approach can be developed for optimizing parting surfaces, which includes considering cores, machined holes, parting lines, and gating systems. This approach would be based on geometric methods and establish a logical framework that takes into account factors such as projected area, flatness, draw, draft angles, undercuts, and dimensional stability.[10,11] Core determination can be automated using techniques like object division and visibility maps, while also considering parting line complexity, draw depth, undercuts, and overall mold complexity.[12,13] Additionally, the gating system can be designed based on information from the parting line, core placement, and hotspots to ensure efficient casting processes.[14] To enhance the decision-making process, an interactive and visualized method could be employed, using 3D graphics tools to estimate the finishing process and cost of metal casting. By combining these advancements, the field of computer-aided design for manufacturing processes like casting, molding, and die-casting can achieve higher levels of automation, optimization, and cost-effectiveness.

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Process Awareness and the Application of Information for Continuous Improvement

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Abstract

Process awareness and the application of information for continuous improvement are crucial factors influencing foundry profitability and energy savings. Manual analysis struggles to manage the intricate interdependencies within the entire casting process.

This paper explores the benefits of adopting Industry 4.0 solutions and analyzing data metrics to identify areas of improvement in foundries. Key topics discussed encompass the limitations of manual optimization, IIoT-based data collection, energy and emissions monitoring, data synchronization and timestamping, as well as real-time optimization and process control.

The paper also features case studies of successful digital optimization implementations, along with scrap reduction results from an OEM and two foundries that illustrate the potential of Industry 4.0 in enhancing foundry operations.

Introduction

The casting process is many centuries old. Today, it can employ simple manual techniques, or can involve the use of sophisticated, fully automated lines or cells encompassing every production aspect. Each sub-process involves tens or even hundreds of machine, material and other variables, from melt temperature to injection speed.

This complexity makes it challenging to manually monitor production and find improvements. Troubleshooting relies on experience and is often little better than guesswork. As more experienced staff retire, a skills gap appears and it's even harder to control casting quality, cut costs and lower emissions.

After decades of manual management and optimization, digital is now the most effective – often the only – way to find the substantial gains required, whether it's lower scrap levels or higher productivity, sustainability and equipment utilization.

Foundries can apply digital tools to collect, visualize and analyze process and machine data. By applying what's learned from the analysis, the process can be optimized. Then the cycle begins again: results are evaluated, the analysis re-run and further changes made.

Foundry Digitalization – First Steps

The aim of the first stage of digitalization is to replace manual, paper-based data collection and storage with an automated digital system. For example, a critical measure like melting furnace fill levels might be checked at regular intervals with charging times recorded on paper and later typed into a spreadsheet. Adding a laser sensor to the shaft allows continuous measurement and monitoring to automate and optimize charging cycles, with this data then routed via the machine Programmable Logic Controller (PLC), monitored locally and stored for future reporting and analysis of melting sub-process.

Many foundries will already have digitally-enabled equipment like this: standalone systems on individual machines that make live data available locally during production. These individual machines may also store a limited amount of data to allow reporting.

A foundry may want to collect, combine and report on data from standalone systems to build a – partial or whole – view of its process that staff inside and outside the facility can access. But due to standalone system incompatibility, it is usually impossible to view data from different machines and sub-processes together in real time. The data is trapped in "silos" and is inaccessible. Any data integration must be carried out offline, using spreadsheets or similar tools to construct a more complete view of the process.

Manual integration is a slow, inefficient and error-prone process that takes days or even weeks. Merged data and derived variables are too old to be of use for day-to-day operations or spotting emerging problems. If sub-process data is hard to access and inconsistent, it is often not trusted by technical staff who prefer to retain traditional "rule of thumb" methods.

This makes fault-finding ineffective: finding root causes is slow and may never fully succeed. Process monitoring is restricted to single machines and individual operators. This results in more scrap, longer periods of unplanned downtime and, therefore, higher overall costs.

A single IIoT (Industrial Internet of Things) solution is a superior basis for foundry-wide digitalization. A secure in-house network connects standardized and compatible sensors, PLCs, gateways and edge devices to a central storage platform. Sensor data can then be forwarded to the central database where it is stored and combined with other data from across the whole process.

This approach enables a phased, step-by-step deployment but does not create incompatible data silos. As before, foundries can begin by digitalizing one or two

machines or individual sub-processes but are then able to build out their infrastructure in stages to eventually support their entire operation.

System Selection and Implementation: Key Challenges

Scalability

The initial systems and supplier(s) must be able to support continued growth as a foundry's ambitions increase. A modular approach is preferred, allowing foundries to "switch on" new functions as required.

Compatibility

A foundry typically contains equipment and systems from multiple vendors. The IIoT system should be able to gather data from any of these vendors' machines, new or old, by fitting sensors and an edge device or, if required, an upgraded PLC.

Standardization

Data from every source must be recorded, transmitted and stored in a standardized format. This allows real-time automatic integration in the central database so any data collected can be combined, correlated and analyzed in a unified view.

Timestamping

Each digital data sample collected must be timestamped with the time of collection, based on a central clock. Timestamping supports subsequent reporting and visualization, for example, to display a change in temperature over time. It also permits multiple variables to be merged and transformed to create derived variables.

Encryption and Security

Data should be encrypted by the edge device as it is forwarded to the central database. Data should only be able to flow one way, preventing any malicious access to foundry equipment. Foundries must check that the entire IIoT system and any supporting services such as cloud platforms have been properly accredited by reputable standards bodies.

Supplier Experience

Suppliers should be able to demonstrate experience in die casting equipment and process optimization as well as in implementing digitalization. This will greatly increase the probability of project success and the speed of implementation.

Prioritization

In a phased deployment, the digitalization project should prioritize data collection from the most important sub-processes and equipment to ensure to gain value from the data and investment to connect it.

The Role of IIoT Infrastructure

IIoT infrastructure employs a broad range of interconnected hardware and software that combines machine control systems, networking and cloud services with specialized interfaces, processors, sensors and many other elements. An example of an IIoT infrastructure platform is Monitizer.

IIoT networks facilitate internet-based data exchange in various applications. In this context, we are simply interested in a one-way stream of data to a central database. IIoT equipment for initial foundry digitalization includes (but is not limited to):

Edge Devices

An edge device (or, more specifically, an IIoT gateway) is hardware that controls data flow between two networks. A domestic broadband router is a simple edge device. Common IoT gateway functions include data processing, caching, routing, encryption and streaming. An example of an IIoT gateway device is NoriGate (pictured in Figure 1.).

Cloud Systems

On-demand cloud storage and computing services minimize on-premise hardware and system maintenance costs. They are the best way to handle vast data volumes, remote high- speed processing, data sharing, visualization, analysis and global connectivity requirements.

***Figure 1** – NoriGate IIoT edge device.*

Step 2 - The Central Data Platform

The central data platform should be instantly compatible – "plug and play" – with all other system components such as edge devices. The platform should be able to automatically fetch, validate and store all input data while computing any required derived variables in real time. It should display base data and derived/computed variables immediately and offer secure remote access via any desired devices – phones, tablets, laptops and so on.

It should have its own standardized Application Programming Interface (API) that allows secure, automated data export to, for example, other analytics applications. The platform should also store historical data for subsequent reporting (manual and automated). It should make that stored data available for comparison with live data to enable benchmarking and other functions, for example, to help determine the correct thresholds for automated alerts.

A web browser-compatible Hypertext Markup Language (HTML) interface will ensure the widest range of display device compatibility. Dashboards and Key Performance Indicators (KPIs) are vital. Both should be able to be created and edited easily without any knowledge of Structured Query Language (SQL) or the system's back-end coding or data configuration. This will allow every user to construct their own personalized view of the data available, enhancing system effectiveness and promoting rapid adoption across the foundry.

The platform should also include further visualization features such as charting, tabular reporting and color coding. Again, users should be able to customize these features without requiring IT support. Staff should be able to access and alter dashboards and KPIs using their own local language.

Notifications and alarms are essential features. They support automatic monitoring of large data sets with alerts if a variable value exceeds a defined threshold. In order to minimize false alarms, it should be possible to configure alarms based multiple conditions or thresholds.

The central platform can be in-house- or cloud-based. Using the latter solution makes it easier to link together multiple global sites to feed a single system, though this is also possible with an in-house system. In both cases, the performance of physically separate sites and equipment can be monitored and compared from a single remote location by management.

A reliable, integrated data platform that offers a real-time digital picture of the process transforms many aspects of casting operations. Accessible from any location, it supports, much more effective decision making and a faster response to any problems.

A merged view of the process reveals bottlenecks and allows data from multiple sources to be combined and compared to find the true root cause of casting defects. Digitization is proven to reduce scrap at many foundries

Energy Monitoring and Emissions Reduction

Sustainability reporting is no longer "nice to have" but an essential part of running a business. For example, from 2024 onwards, the EU's Corporate Sustainability Reporting Directive (CSRD) will make audited emissions reporting compulsory for large companies.

IIOT systems can automatically gather and present accurate data on energy consumption which, along with other inputs like material (sand, water, etc) consumption, can be translated into emissions. Access to this reliable process data makes scope 1 and 2 carbon reporting much more feasible, especially when multiple sites are involved. The data shows clearly which process improvements work and which don't, steering the foundry towards the most efficient and productive ways to operate.

Scrap reduction directly benefits sustainability. Less scrap means less electricity is consumed for remelting. For example, if a foundry melting 50,000 tons annually reduces their scrap rate from 5 to 3%, this equates to a saving of 604 CO2 tonnes a year.

Digitalization Case Study: Alupress

International aluminium die casting business, Alupress, is using digitalization to improve productivity at its Hildburghausen foundry site in Germany, by leveraging a process specific digital solution to optimize metal supply for its dosing furnaces .

The brand agnostic solution uses sensor data to continuously check fill levels for any connected dosing furnace against the metal consumption of the die casting process. It then presents the analyzed data as informative online dashboards which clearly show in real time when each furnace will need refilling, with which alloy and the amount of metal required. The dashboards are completely tailorable to show, at a glance, the information that is going to be most valuable. This includes setting colour codes – green, amber, red – to indicate priority actions required.

Alupress has these dashboards available in the melt shop and displayed on a dedicated monitor in the production hall. The forklift operators responsible for transferring the liquid metal from the melting furnace to the production hall also have securely authorised access to this real time data via a tablet in the vehicle to ensure optimal fill levels are maintained.

This solves a very practical challenge for Alupress, whose melting furnaces are located quite a distance from their die casting halls. Prior to implementing the solution, this involved regular manual fill level checks, taking time and resource. The logistics involved also meant there was always a risk of refilling and/or with the wrong alloy, overfilling or underfilling. As well as being unproductive, these factors can often result in undesirable stop/starts, for instance if melt is not ready, downtime and also problems further down the line with casting quality – in particular if fill levels have dropped too low.

Since the solution was installed, Alupress' dosing furnaces have been in continuous use because at any single point in time, the teams involved can see what's needed to optimize the dosing process.

Digitalization Case Study: MAT Foundry Group

MAT Foundry Group wanted to collect, monitor and analyse foundry data from two sites: Poole (UK) and Hradec (Czech Republic). The foundry can now view live KPIs within customized dashboards, letting it monitor and improve daily operations . The central platform is cloud-based with a central portal that gives a digital picture of foundry operations to any user in any location.

User-specific dashboards display the most relevant information: senior management can choose to view aggregated data such as casting tonnage or scrap levels per shift while production managers want site-specific productivity KPIs such as poured tons per hour, molds not poured and stop/wait times. The timestamped, consistent data shows any machine stops and starts (bottlenecks) and helps to pinpoint when problems occurred.

Staff on the factory floor monitor live machine data which is color-coded to help them quickly recognize and fix any small technical issues. The central maintenance team can plot trends, track live graphs and spot deviations from expected values in real time. For example, monitoring mold compressibility helped identify a weak seal. Changing it avoided possible unplanned downtime and associated production loss.

Cycle times, batch count and loading/unloading times for shot blasting are also captured and displayed via dashboards. Data on shotblasting vibration levels, which strongly influences blast wheel wear rate, supports MAT's predictive maintenance strategy.

Because of its urban location, the Poole facility must stop production if dust emissions are too high. Automatic monitoring was a key system requirement, removing the need for maintenance staff to manually check each dust collector several times daily. Now the system checks constantly for overly high differential pressures that indicate possible filter blockages and issues alerts via email if pressure exceeds a threshold value.

Digitalization Case Study: Draxton

Draxton, a global manufacturer of cast iron and aluminum components with a total annual casting capacity exceeding 620,000 tons, has reduced its downtime, energy use and resource consumption after deploying an IIoT solution at its foundry in Barcelona, Spain. The foundry produces complex components for brakes, powertrain and transmission systems, primarily for the automotive industry in North America, Europe and China.

Draxton's furnace and pouring unit, sand plant, two DISA moulding lines, the entire suction system and the shotblast machines, were all digitally connected, with data then securely collected from equipment and brought together within the IIoT solution's cloud database, presenting a single view of the process. Different dashboards were established to ensure that Draxton could view the most useful KPIs as needed, to monitor production and facility parameters. Authorised users have their own personalised dashboards to show information most relevant and useful to their role and requirements.

Alarm functionality has enabled Draxton to convert the expertise of employees into automatic monitoring (based on conditions and thresholds met) that identifies any upcoming problems – a capability which has dramatically transformed how they control production. The system supports monitoring, analysis and insight across all production areas and equipment.

If potential problems are flagged, the Draxton team uses their digital platform to analyse them by querying process data to find the root cause and the right course of preventative action. For example, Draxton is now able to digitally identify premature wear in the furnaces: when any parameters fall out of specification, the system automatically notifies both the maintenance and production teams.

Before implementing their digital solutions, Draxton struggled to remove a bottleneck caused by insufficient moulding sand for their two lines. By using data, it was possible to vary the sand plant's cycle time to match the amount of water added to the sand plant. This has removed the bottleneck and stabilised sand quality, while also cutting water and energy consumption.

By optimizing processes across its entire production set-up, casting quality has been improved, while energy and resource consumption has reduced, aiding Draxton in lowering its carbon emissions.

Next Steps: Optimization

Digitalization and analysis as described above is extremely effective in improving single sub-processes. It also helps to show the links between one sub-process and another. But the complexity and volume of the data needed to optimize the entire process overwhelms conventional analytics.

Artificial Intelligence (AI) is a solution , built on top of a mature data platform as described above. An AI-driven Expert Execution System (EES), Monitizer | PRESCRIBE is one example, can consider all the process parameters from an entire production line in order to maximize one target variable – casting quality.

The AI first examines historical data to learn how specific parameters influence each other – and affect final casting quality. It then calculates which combination of machine settings and material properties will produce the best results for each pattern.

Through advanced, unsupervised machine learning, the AI's neural network model calculates and establishes connection and interaction between hundreds of input process and machine variables (such as furnace pressure, die temperature, ON/OFF times of cooling channels in the die, metal temperature, metal fill-up temperature etc.) and final casting quality data. This produces an initial model used to automatically specify the optimal operating regime (control plan) for production that the data set relates to.

It is important to note that if a part fails any one of many quality tests, it is deemed to be a failed part. This way, the AI model tries to learn and create a generalized model to improve overall quality % (or decrease scrap %). Additionally, if a customer has detailed quality results of different types of tests, then specific AI models can also be created to find optimal production parameters to decrease defects of individual types. As it is possible that prescriptions created by considering only 1 defect type may increase chances of having higher another defect type, it is better approach to consider all defect types together and create AI models for overall quality improvement. Individual defect level prescriptions are used to understand the relation between production parameters and quality only.

During production, instead of simply reacting to quality issues, the EES updates its recommendations for the control plan every 30 minutes in response to AI predictions based on real-time data. That maintains stable, high-quality production, even as factors like air temperature vary. The EES's clear and simple real-time prescriptive instructions make it possible for the foundry to make complex changes correctly first-time round. Once the model is operational (during both testing and production), it updates its model with the new parameter and final quality data, so the optimization results continue to improve.

Results From AI-Driven Process Optimization

For commercial sensitivity, the following results do not specify starting-point scrap rates – instead, improvements are shown as % decreases. Note, uplift % is expected to be proportional to baseline scrap rate when utilizing prescriptive AI as outlined in this paper. For example, if baseline scrap rate is 10%, then achieving uplift of 50% is easier than starting from baseline scrap rate of 2%. That said, in real scenarios, we have seen that a high uplift is achievable even with a very low baseline scrap rate.

A global automotive OEM utilizing low pressure diecasting implemented an AI-driven Expert Execution System (EES) to reduce scrap produced during its light-alloy wheel manufacturing process. A scrap reduction of 29% was achieved. Extrapolating this result to all products and furnaces at the site, it was concluded that this scrap reduction would result in a gross annual saving for the plant of more than €0.5m and a production volume increase of 2.4%.

Japan's Morikawa foundry started to implement its digital platform in early 2021. It rapidly progressed to optimization by harnessing AI, with initial testing starting in 2022. The first tests on two different patterns cuts scrap rates by 66.6% and 86.9% respectively.

Huaxiang is China's fifth largest private foundry. Testing on four automotive castings in 2022 reduced scrap by 86.1%, 57.3%, 46.6% and 30.3% respectively.

Summary

Traditional manual techniques are insufficient for the needs of a modern foundry. Digitalization provides the data and tools required to manage and further improve casting production. An IIoT system that can collect and send data to a single, central database is the optimal solution. The central database must be easily accessed and be combined with tools that allow monitoring, visualization, reporting and analytics.

Any IIoT system and associated services must offer a pathway to future expansion if a foundry extends digitalization to its entire process or wishes to implement full process optimization. The supplier that the foundry partners should have substantial foundry experience and demonstrate success in foundry digitalization.

References

1. *Monitizer – more details can be viewed at https://www.monitizerdigital.com*
2. *NoriGate – more details can be viewed here https://www.monitizerdigital.com/en-gb/products/norigate*
3. *Calculation sourced from case study referenced at presentation by ItalPresseGauss during EUROGUSS 2022 – 'Monitizer: turn data into value'.*
4. *The specific solution deployed is Monitizer | Refill Monitor – https://www.monitizerdigital.com/en-gb/products/refill-monitor*
5. *The specific solution deployed is Monitizer | DISCOVER*
6. *The specific solution deployed is Monitizer | DISCOVER*
7. *Pr. S. Henry Juang, Yi-Ning Huang, David A. Kafando. Using Machine Learning to Establish the Relationship between Die Casting Parameters and the Casting Quality. 7th World Congress on Mechanical, Chemical, and Material Engineering. https://doi.org/10.11159/icmie21.107*
8. *Blondheim, D. Improving Manufacturing Applications of Machine Learning by Understanding Defect Classification and the Critical Error Threshold. Inter Metalcast 16, 502–520 (2022). https://doi.org/10.1007/s40962-021-00637-0*
9. *The examples provided in this section all utilise Monitizer | PRESCRIBE – more details can be viewed here https://www.monitizerdigital.com/en-gb/products/prescribe*

2024 DIE CASTING CONGRESS & EXPOSITION

SEPTEMBER 30-OCTOBER 2 | INDIANAPOLIS, IN

SHOW GUIDE

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WELCOME TO INDY

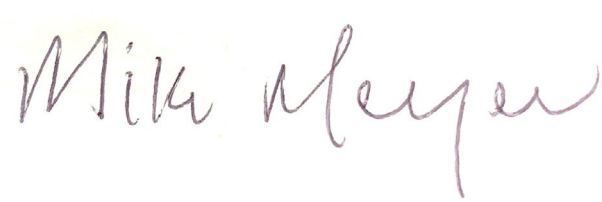
It is my pleasure to welcome you to the 2024 Die Casting Congress & Exposition on behalf of the NADCA Board of Governors and the NADCA headquarters staff. This one-of-a-kind die casting show provides a wealth of information to die casters, suppliers to the die casting industry, OEMs, designers, end users of die castings, and others seeking to gain die casting knowledge. It is an honor to have you with us this year and we encourage you to take advantage of all the technology transfer and networking opportunities being offered. I am also pleased to welcome you to Indianapolis, Indiana. There is much to see and do outside of the convention center, and I encourage you to go explore as you have time.

On the exhibit floor, you will find displays featuring over 160 suppliers that are highlighting their most recent product developments and information about their services. The multiple congress sessions are featuring presentations on the latest research and technologies covering topics such as additive manufacturing for tooling, computer modeling & simulation, advanced die casting alloys, mechanical properties of die castings, extending die life, data driven process control, secondary operations, and improved metal melting & handling. In addition, a presentation on NADCA's R&D projects, as well as a Washington D.C. update presentation, will be held. The Monday afternoon "Welcome Party" will provide for more networking opportunities and the "Industry Awards Luncheon" on Tuesday will recognize the outstanding achievements of this year's award winners. These various offerings during the event are ones you will not want to miss!

The Industry Awards Luncheon will recognize the winners of the 2023 Safety Awards, the Doehler Award, the Nyselius Award, International Die Casting Competition, Emphasis on Education Award, Committee Member of the Year Award, and Best Congress Paper Award. This Awards Luncheon is only $20, and the revenue helps to sponsor our National Scholarships.

Lastly, I wish to thank all the attendees, exhibitors, and presenters for your participation and support! Your contributions continue to keep this event a highly valuable one that NADCA is proud to host. I hope you enjoy this year's Die Casting Congress & Exposition and that it provides you with a beneficial and memorable experience.

Enjoy the show.



Mike Meyer
President
North American Die Casting Association

Greetings!

On behalf of the City of Indianapolis, it is my pleasure to welcome you to the 2024 Die Casting Congress & Exposition.

The die casting industry is significant to many services in our nation's economy and continues to support the spirit of American innovation. Because of industries like die casting, other services are well-equipped with a solid foundation for success.

Throughout the coming days, you will have opportunities to learn, grow, and connect with fellow die casters, as well as expand your knowledge on the future landscape and impact of the industry. The City of Indianapolis is proud to host such an innovative group of professionals.

Whether you are a first-time visitor to the Circle City, visiting again, or a resident, please enjoy the wonderful attractions our city has to offer.

I hope each attendee has a rewarding experience in Indianapolis filled with enriching professional development and meaningful connections.

Sincerely,

Joe Hogsett

Joseph H. Hogsett
Mayor
City of Indianapolis

GENERAL INFORMATION

Registration Hours -

INDIANA CONVENTION CENTER - ROOMS 126-127

Saturday, September 28: 3:00 pm – 5:00 pm
Sunday, September 29: 8:00 am – 5:00 pm
Monday, September 30: 8:00 am – 5:00 pm
Tuesday, October 1: 8:00 am – 5:00 pm
Wednesday, October 2: 8:00 am – 2:00 pm

Technical Sessions -

INDIANA CONVENTION CENTER - ROOMS 120-122

Monday, September 30: 8:00 am – 2:45 pm
Tuesday, October 1: 8:00 am – 5:15 pm
Wednesday, October 2: 8:00 am – 3:45 pm

Exhibit Hours -

INDIANA CONVENTION CENTER - HALLS A&B

Monday, September 30: 10:00 am – 5:00 pm
Tuesday, October 1: 10:00 am – 5:00 pm
Wednesday, October 2: 10:00 am – 5:00 pm

EXHIBITOR SERVICES: INDIANA CONVENTION CENTER

Global Experience Specialists (GES) will be available during move-in and move-out as well as during the show for exhibitors. They will be around to answer questions and resolve any exhibitor issues.

NADCA BOARD & COMMITTEE MEETING SCHEDULE: INDIANA CONVENTION CENTER - ROOM 125

Tuesday, October 1
Government Affairs Committee: 9:30 am - 11:30 am
Finance Committee: 2:00 pm - 3:30 pm

Wednesday, October 2
Board of Governors: 8:30 am - 11:00 am

SHOW OFFICE

The Show Office will be located at registration and will be open Monday, September 30 - Wednesday, October 2 from 8:00 am - 2:00 pm.

THE FINE PRINT

Policy on Audio and Video Recording: North American Die Casting Association reserves the right to any audio or video reproduction of any part of Die Casting Congress & Exposition Recordings (audio, video, still photography, etc.) intended for personal use, distribution, publication or copyright without the express written consent of the association and the individual authors or exhibitors is strictly prohibited.

Minimum Age Requirements: For the safety of our guests, children under the age of 16 are NOT permitted on the Show Floor without an adult.

Antitrust Policy: The Antitrust Policy statement of North American Die Casting Association is available to anyone attending Die Casting Congress & Exposition. Copies are available at registration.

AIRPORT

The Indiana Convention Center is conveniently located in the heart of Indianapolis. It is located 14 miles from Indianapolis International Airport.

TAXI

Approximately $45.00 one way to/from airport.

TRANSPORTATION

Traveling from Indianapolis International Airport to downtown Indianapolis is a breeze, with several convenient transportation options available. Visitors can opt for the IndyGo bus service, which offers direct routes from the airport to downtown, providing an affordable and reliable means of transportation.

Additionally, taxi services and rideshare companies operate at the airport, offering passengers the flexibility of door-to-door service. For those seeking a more personalized experience, rental car facilities are also available onsite, allowing travelers to explore the city at their own pace.

PARKING

Parking is available throughout the city. The closest parking garage to the Indiana Convention Center is the Capitol Commons Garage or Plaza Park Garage.

Plaza Park Garage
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A full map of parking locations can be found online here: www.visitindy.com/indianapolis-guides

SHOW APP

There is an official show app for the Die Casting Congress & Exposition! This app provides you with access to up-to-the-minute information about the show, congress sessions, exhibitors, special events and notifications.

You can search more information about our exhibitors, browse congress session topics and abstracts as well as create a personalized schedule for yourself. The app is absolutely free to download on your device!

Scan here for the show app!

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BOOTH 324

NADCA VIRTUAL REALITY PROJECT

Monday, September 30 - Tuesday, October 1
10:00 am - 5:00 pm
Wednesday, October 2
10:00 am - 3:00 pm

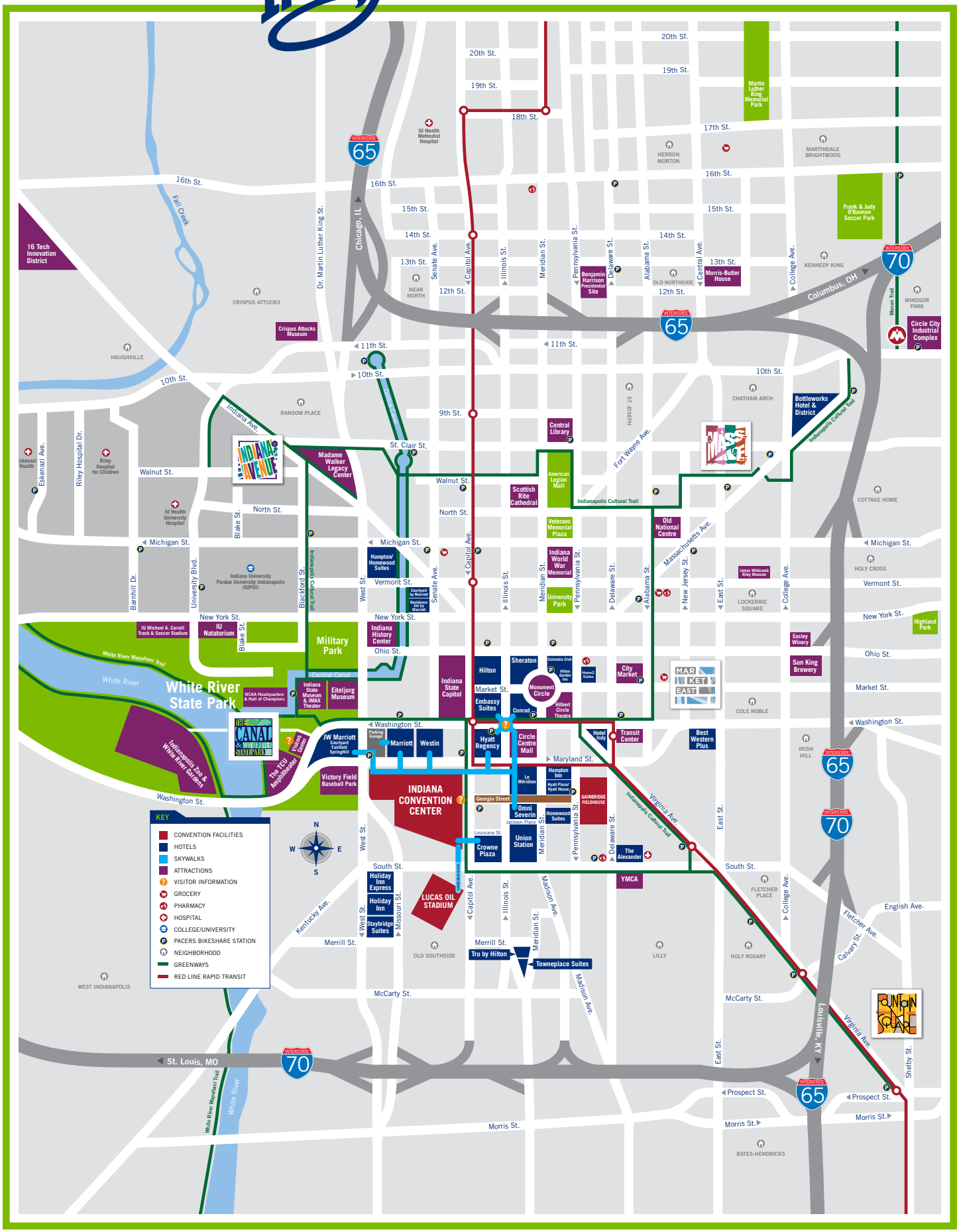
Experience the world of die casting from the comfort of an air conditioned office. Go between the die halves without worrying about injuring yourself. Learn about die casting in an immersive setting, without having to wear ear plugs. Virtual reality (VR) offers a new way to experience die casting. New hires now have a chance to virtually interact with a die casting machine; learning about the different components, how to start up the machine, and what happens when process settings are changed. Users can also explore a stack melt furnace and reverberatory furnace to learn more about charging and tapping the furnace and cleaning the metal.
In the Fire Safety app learn about how to handle a fire when molten metal is present. Find out how to put out a fire at the die casting machine, why you should never put water in molten metal, and the correct way to put out a magnesium fire.
Visit the NADCA VR Booth at the show and try out VR Die Casting developed by Purdue University Northwest Center for Innovation through Visualization and Simulation (CIVS).

NADCA CASTVIEW DEMONSTRATION

Monday, September 30 - Tuesday, October 1
10:00 am - 5:00 pm
Wednesday, October 2
10:00 am - 3:00 pm

Originally developed by Dr. Allen Miller and Alex Rebello at the Ohio State University, CastView provided a light-weight thermal and flow analysis software for the die casting industry. The software was able to quickly identify thick and thin sections on a geometry. Over time though the software was unable to run on newer operating systems.
Dr. Charles Monroe, at the University of Alabama, has revived CastView with help from his graduate students William Warner and Zhen Yang. Now, instead of needing to load a software onto your computer you can run a thick and thin section analysis on the cloud using Google Colab. Zhen Yang will provide a presentation on CastView at 2:15 pm on Wednesday in Room 120-122, but you are invited to come test out the latest version of CastView at the booth. Feel free to bring an STL of a geometry with you to test.

DOWNTOWN INDIANAPOLIS



For information about things to see and do in Indianapolis, go to VisitIndy.com.

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Fairfield Inn & Suites Indianapolis Downtown
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Rate: $179 plus tax

Hyatt Regency Indianapolis
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Crowne Plaza Indianapolis - Downtown Union Station
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Rate: $209 plus tax

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Hilton Garden Inn Indianapolis Downtown
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Rate: $183 plus tax

Staybridge Suites Indianapolis Downtown Convention Center
535 South West Street
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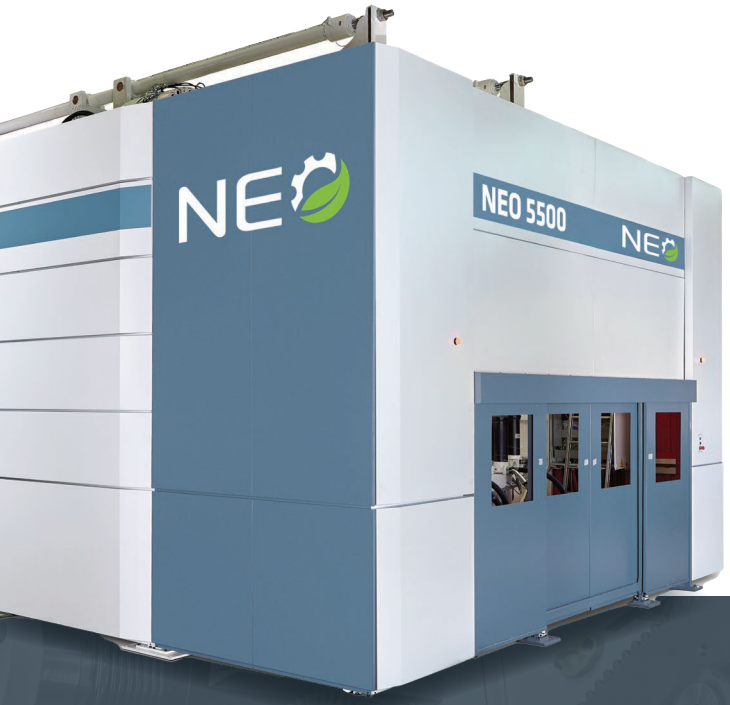
NEO introduces a new chapter in high end die casting technology.

NEO by Idra Group is the new paradigm in die-casting 'Giga' solutions (going from 340 to 9000 tons). NEO is anticipating the future requirements of diecasting, offering the perfect solution for the production of aluminum parts for Hybrid or full electric vehicles (Structural components, Battery box, Rotors) and Production of large aluminum parts made with full automated HPDC cells (Blocks, Auto Transmission, Multi-cavity structural). **Unparalleled Guaranteed LONG LIFE and Reliability.**



ENERGY SAVING 54%

Cell Controller Integration
Cell Controller is a brand new 4.0 architecture available in all the new machines that let you control the DCM and all the peripherals.

DCP Hydraulic System
The DCP has a new architecture, that can accomplish the same efficiency with smaller kW motors.

New Injection Series 5S©
New Award winning Injection Series 5S©.
Extended velocity control valve life by balance of hydraulic forces.
Fully regenerative hydraulic system.
High dynamic force necessary to fill difficult castings.
Maintaining same final pressure requirement for porosity in power train castings.

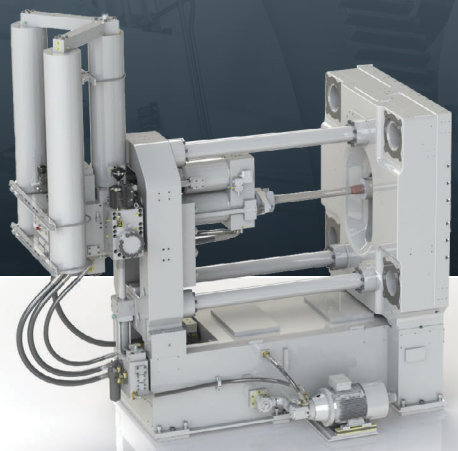
Award Winning 2024

Injection 5S© won the Industry category of the **European Inventor Award 2024**.

We listened.
We worked.
We researched.
We have found a solution for hydraulic innovation in die casting machines.

5S© INJECTION SYSTEM

5S© is a closed loop regenerative injection with aux servo pump for efficient recharge, that gives total control of pressure and velocity, with high dynamic force necessary to fill difficult castings, and an incredible amount of technological enhancements to **give superior results**.



EUROPEAN INVENTOR AWARD 2024

5S INJECTION SYSTEM

www.idragroup.com

UPCOMING EVENTS

2024

October 23	Die Materials Meeting *Anaheim, CA*
October 24	R&D Meeting *Anaheim, CA*
October 25	Congress West *Anaheim, CA*

2025

January 23	Committee Meetings *TBD*
January 24	Board of Governors Meeting *TBD*
February 5	Die Materials Meeting *West Lafayette, IN*
February 6	R&D Meeting *West Lafayette, IN*
February 23-26	Executive Conference *Marco Island, FL*
May 6-8	Plant Management Conference *Indianapolis, IN*
June 10-11	Government Affairs Briefing *Washington, D.C.*
June 10	Board of Governors Meeting *Washington, D.C.*
June 25	Die Materials Meeting *Arlington Heights, IL*
June 26	R&D Meeting *Arlington Heights, IL*
October 7-9	Die Casting Congress & Tabletop *Milwaukee, WI*
October 8	Committee Meetings *Milwaukee, WI*
October 9	Board of Governors Meeting *Milwaukee, WI*
October	Die Materials Meeting *TBD*
October	R&D Meeting *TBD*

2026

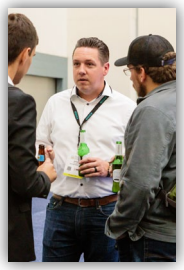
March 1-4	Executive Conference *Clearwater, FL*
September 29 - October 1	Die Casting Congress & Tabletop *Grand Rapids, MI*

SPECIAL EVENTS

After Hours with the Exhibitors

Monday, September 30
3:30 - 5:00 pm

Having such a good time meeting with exhibitors on the show floor that you wish you had more time? Now you do! Join us for After Hours with the Exhibitors. With more than 160 exhibitors we want to make sure that you have every opportunity to visit the show floor. Kick back and relax with a drink or two all while getting to spend a little extra time learning about all the new technologies and products that the exhibiting companies have to offer. No ticket required.



Die Casting Awards Luncheon*

Tuesday, October 1
12:15 - 2:00 pm

Take an afternoon break to converse and network with exhibitors and attendees alike. The following awards will be honored during this special event:

- Herman H. Doehler Award
  Patrick Greene, Cascade Die Casting
- Nyselius Award
  Alex Monroe, Space X
- Committee Member of the Year Award
  Patricia Miller, Uddeholm North America
- Best Congress Paper Award
  Preparation of a High-Performance Coating Using Cathodic Vacuum Arc Deposition for Die-Casting Molds and Its Characterization
  K. Kawata (Kawata PE Office); N. Inatsu, T. Tatsuno, R. Iijima (Castec)
- Industry Education Award
  Tesla, Inc.
- International Die Casting Design Competition
- 2023 Safety Awards

**Tickets available for purchase at the registration desk.*

NADCA THEATER BOOTH 442

Discover the latest in die casting technology at this year's tradeshow! The NADCA Theater on the exhibit floor will feature a dynamic lineup of technical and sales presentations designed to showcase cutting-edge innovations and industry trends. While the schedule is still being finalized, you'll be able to stay updated with real-time updates via our event app. Don't miss this exciting new addition to our tradeshow experience!

Scan here for the show app!

GET IT ON Google Play

Download on the App Store

2024 DIE CASTING AWARD WINNERS

For the last 50 years 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.

Die casters continue to improve the die casting process and quality. This in turn improves the customer's end product and expands the market potential for die castings. The 2024 International Die Casting Competition saw among the winning castings a magnesium die casting replace what is traditionally a cast iron part, aluminum die castings for structural applications (small and large), and the use of additively manufactured dies for conformal cooling. Winning castings utilized the advantages of the die casting process to provide a solution for their customer; often reducing the cost of the end product.

Categories in the competition are grouped by material and include aluminum, magnesium, zinc and other alloy families, including aluminum and magnesium structural die casting. Both custom and captive casters are eligible. For each category, there are four equally weighted criteria: ingenuity of casting and/or product design, overall quality, cost savings as compared to other manufacturing processes, and the part's contribution to expanding the market for die castings. A panel of independent judges, acknowledged experts, with no ties to eligible casters, choose the winners.

NADCA will honor this year's award winners at its 2024 Die Casting Industry Awards Luncheon on Tuesday, October 1 at 12:15 - 2:00 pm EDT during the Die Casting Congress & Exposition in Indianapolis, IN. The luncheon is an exceptional opportunity to meet this year's winners and learn more about their innovations.

TO COMPETE IN 2025

Innovative die casting design entries may be entered in the 2025 Die Casting Design Competition. All award-winning castings will be displayed next year at NADCA's Die Casting Congress & Tabletop, October 7-9 in Milwaukee, WI.

The competition is open to die castings from aluminum, magnesium, zinc, semi-solid & squeeze, and other alloy families. Within each category, there are more specific levels: aluminum under 1 pound; aluminum 1-to-10 pounds; aluminum over 10 pounds; aluminum structural; aluminum any size with decorative finish; zinc under 6 ounces/non-electroplated; zinc over 6 ounces/non-electroplated; zinc any size with decorative finish; magnesium over 0.5 pound; and magnesium under 0.5 pound.

Any number of die castings may be entered in the awards competition. Complete and submit a separate entry form for each casting or assembly of castings. As-cast entries are required (post trimming). 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.

Castings submitted for the competition MUST have approval in writing from the customer allowing NADCA to use the casting(s) in exhibitions and magazine articles. When possible, information and photographs describing the design process will be published in Die Casting Engineer magazine, but because of proprietary reasons, not all information can be shared. Such exceptions should be noted on your entry form.

More information and electronic entry form can be found at www.diecasting.org/castings/competition. All entries must be submitted by June 23, 2025. For more information, contact: Beau Glim at glim@diecasting.org.

Send sample casting(s) to:
NADCA - 2025 Casting Competition
3250 N. Arlington Heights Rd., Ste. 101
Arlington Heights, IL 60004

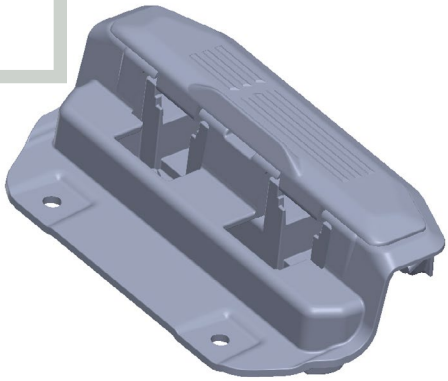
2024 Award Winner

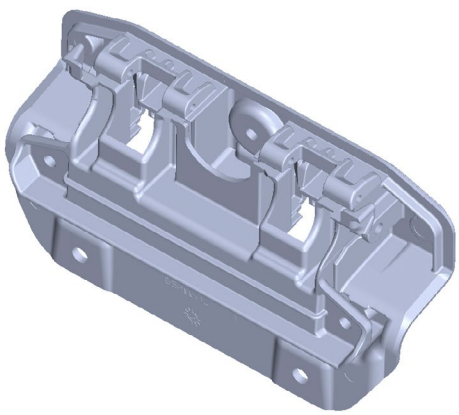
ALUMINUM – UNDER 1 LBS

GENERAL DIE CASTERS, INC.

PART: Glass Stow Latch Assembly
MATERIAL: 383
WEIGHT: 0.8 lbs (0.36 kg)
END MARKET: Automotive

CASTER AWARD NOMINEES:
John Quitter & Tim Tennant
CUSTOMER:
Flex N Gate





FUNCTION OF PART
Secures rear window glass on truck midgate to allow 5.9' bed to extend to 9 feet.

PREVIOUS PROCESS TO PRODUCE PART
Injection molding and investment castings.

ADVANTAGES GAINED
Injection molding failed to secure windows during crash testing. Investment castings used short term, but were not a cost effective alternative.

General Die Casters, Inc.
2150 Highland Rd.
Twinsburg, OH 44087
USA

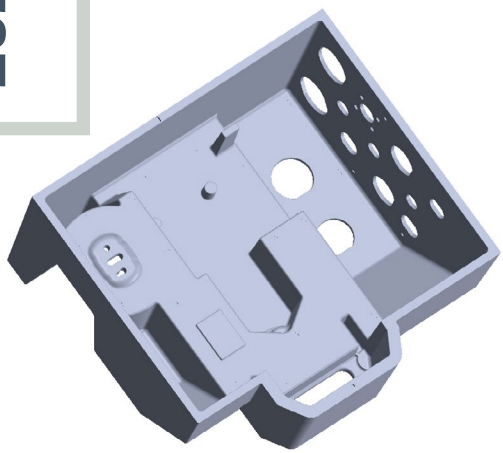
2024 Award Winner

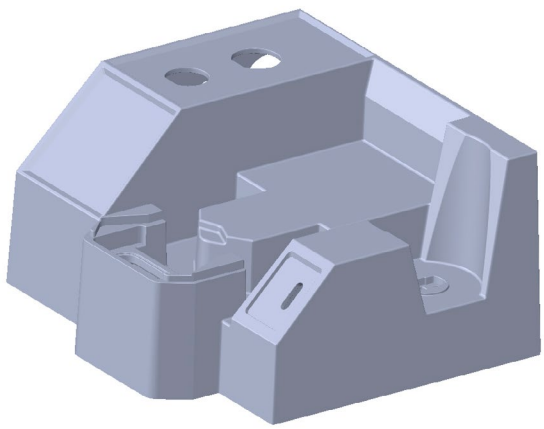
ALUMINUM – 1-10 LBS

BENDA TOOL & MODEL WORKS

PART: Enclosure MT3100
MATERIAL: 304
WEIGHT: 7.3 lbs (3.3 kg)
END MARKET:
Electronic Communication

CASTER AWARD NOMINEES:
Ryszard Urbaniak, Dan Jacks, & Ricardo Paniagua
CUSTOMER:
Datron World Communications, Inc





FUNCTION OF PART
Communication device housing.

PREVIOUS PROCESS TO PRODUCE PART
Sand casting.

ADVANTAGES GAINED
Able to produce consistent dimensional specifications on features and meet weight requirements without requiring extensive post-machine that was required in sand casting. Cost savings was nearly 50%.

Benda Tool & Model Works
900 Alfred Nobel Dr.
Hercules, CA 94547
USA

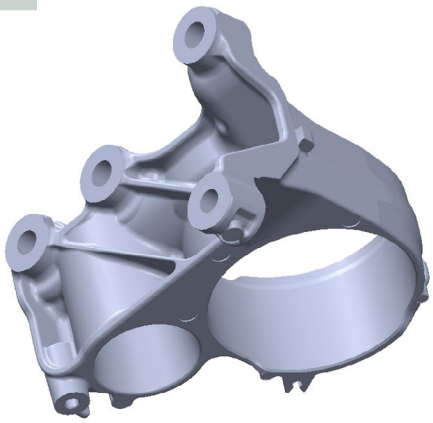
2024 Award Winner

ALUMINUM – STRUCTURAL UNDER 10 LBS

PARTNERSHIP BETWEEN IKD CO., DN AUTOMOTIVE, & GENERAL MOTORS

PART: Electric Drive Unit Mounting Bracket
MATERIAL: A356-T6 Swirled Enthalpy Equilibration Device (SEED)
WEIGHT: 2.15 lbs (1.0 kg)
END MARKET: Automotive

CASTER AWARD NOMINEES:
Xiaokang Liang (IKD), Hugh Leitch (DN Automotive), Sam Jomaa, Wojtek Suchta, & Frank Risko (General Motors)
CUSTOMER:
General Motors



FUNCTION OF PART
Locate and support rear electric drive unit.

PREVIOUS PROCESS TO PRODUCE PART
A356-T6 Permanent mold casting process.

ADVANTAGES GAINED
Significantly improved material mechanical and physical properties resulting in mass savings while meeting all functional requirements with tight tolerances.

IKD Co.
588 Jinshan Rd., Jiangbei District
Ningbo, Zhejiang 315033
China

DN Automotive
1807 E. Maple Rd.
Troy, MI 48083
USA

General Motors
29360 William Durant Boulevard
Warren, MI 48092
USA

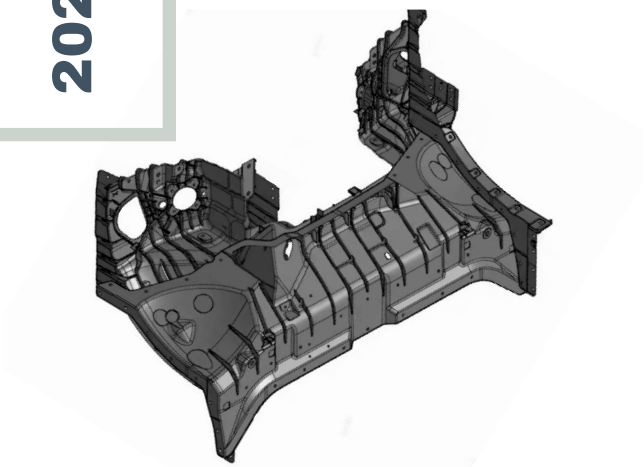
2024 Award Winner

ALUMINUM – STRUCTURAL OVER 10 LBS

PARTNERSHIP BETWEEN XPENG INC., ALCOA CORP. AND CSMET

PART: XPENG G6 Front Cabin Mega Casting
MATERIAL: Alcoa EZCAST-plus C611N
WEIGHT: 119 lbs (54 kg)
END MARKET: Automotive

CASTER AWARD NOMINEES:
Luo WenZhi (XPENG), Xinyan Yan (Alcoa), Zhang YueBo (CSMET)
CUSTOMER:
XPENG Inc.



FUNCTION OF PART

The front cabin megacasting combines safety, weight savings, and structural integrity, making it a key feature in this electric SUV.

PREVIOUS PROCESS TO PRODUCE PART

Traditional assembly methods were used to join more than 50 high strength steel stamping components by welding and riveting. The single-piece megacasting not only simplifies assembly, but also enhances the structural integrity and reduces the weight of the vehicles.

ADVANTAGES GAINED

1. Alcoa EZCAST-plus C611N alloy was used in this application. The alloy can achieve more than 10% elongation and >120MPa yield strength in as-casting condition. The alloy eliminates the dedicated heat treat, and thus prevents the distortion of the megacasting (significant cost saving).
2. The front cabin casting helps protect occupants and the battery in case of a crash by directing impacting forces away from the cabin and battery.
3. The front and rear mega castings and CIB battery integration technology produce body rigidity up to 41600N-m, 83% greater than traditional designs.
4. The front cabin megacasting allows XPENG to replace >50 separate components with a single cast piece. This not only eliminates complexity, but also lightens the vehicle by approximately 33 lbs (15 kg).

The efficiency in the production process directly translates into a lighter, more structurally sound vehicle.

XPENG Inc
No. 8 Songgong Rd, Changxing St.
Cencun, Tianhe District
Guangzhou, Guangdong 510640
China
Alcoa Corporation
201 Isabella Street Suite 500
Pittsburgh, PA 15212-5858
USA
CSMET New Materials Group Co., Ltd
699 Zhenyan Road, Zhangyan Town
Jinshan District, Shanghai 201514
China

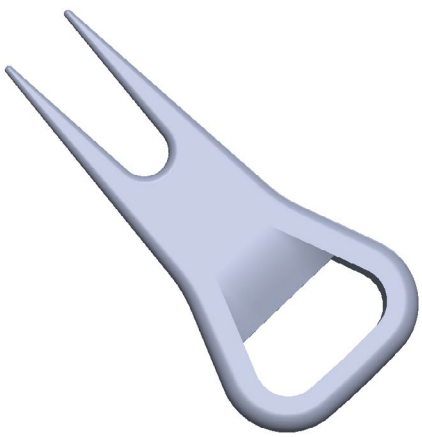
2024 Award Winner

ALUMINUM – INNOVATIVE TOOLING

BENDA TOOL & MODEL WORKS

PART: Divot Tool / Bottle Opener
MATERIAL: 383
WEIGHT: 0.1 lbs (45 g)
END MARKET: Sports and Leisure

CASTER AWARD NOMINEES:
Collin Elmer & Broderick Gillard
TOOL BUILDER: Mantle
CUSTOMER:
Benda Tool & Model Works / A&B Die Casting Division



FUNCTION OF PART
Repair golf divots and open beer bottles.

PREVIOUS PROCESS TO PRODUCE PART
Part is new to the die casting process. Chosen to prove the concept of using 3D printed H13 in the die casting industry.

ADVANTAGES GAINED
Research and development project to prove the concept of using 3D printed tooling. Worked with a San Francisco based company (Mantle) that traditionally builds 3D printed tooling for injection molding cavity inserts. Tooling company had no experience with high pressure die casting, but agreed to produce a small set of H13 steel inserts that could be run in exchange for tool life data. The divot tool was chosen for its size and shape and was designed to easily fit into the current working envelope of the supplier's equipment. 3D printing of the tool allows for rapid production of small die cavities. If the tool steel can acceptable withstand the high pressure die casting process more 3D printed tools will be produced in the future.

Benda Tool & Model Works
900 Alfred Nobel Dr.
Hercules, CA 94547
USA

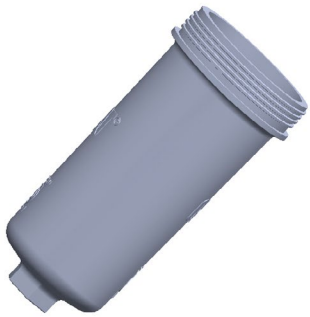
2024 Award Winner

MAGNESIUM – OVER .5 LBS

MERIDIAN LIGHTWEIGHT TECHNOLOGIES

PART: HPDC AZ91D Magnesium Oil Filter Housing
MATERIAL: AZ91D
WEIGHT: 1.04 lbs (0.47 kg)

END MARKET: Heavy Machinery
CUSTOMER:
Advanced Filtration Systems, Inc



FUNCTION OF PART

Leak proof shelter for oil filter.

PREVIOUS PROCESS TO PRODUCE PART

2.67 lb (1.21 kg) forged aluminum was previously used.

ADVANTAGES GAINED

Switching to a magnesium die casting resulted in a 61% weight savings, a 50% cost-saving. The die casting process was also able to incorporate machined threads for easy installation and removal. Part and process design supported thin-wall cylinder casting integrity and efficient two-cavity casting die with advanced venting design.

Meridian Lightweight Technologies
25 MacNab Ave.
Strathroy, ON N7G 4H6
Canada

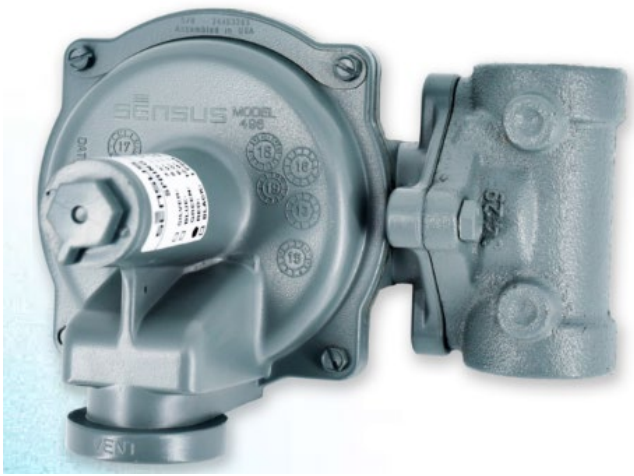
2024 Award Winner

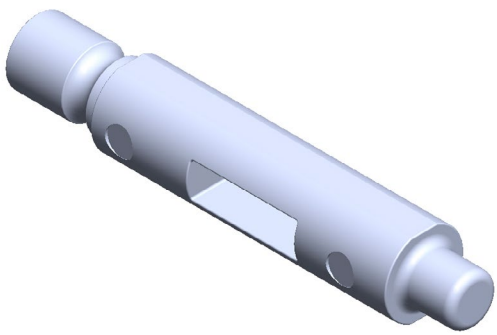
ZINC – UNDER 6 OZ

LAKESIDE CASTING SOLUTIONS

PART: 496 Regulator Valve Stem
MATERIAL: Zamak 3
WEIGHT: 0.325 oz (9.2 g)
END MARKET: Energy Equipment

CASTER AWARD NOMINEES:
Dennis Lehenbauer
CUSTOMER:
Utility Solutions Group





FUNCTION OF PART
The valve stem traverses in a linear motion actuating an inlet valve, regulating the flow of pressurized gas in the system.

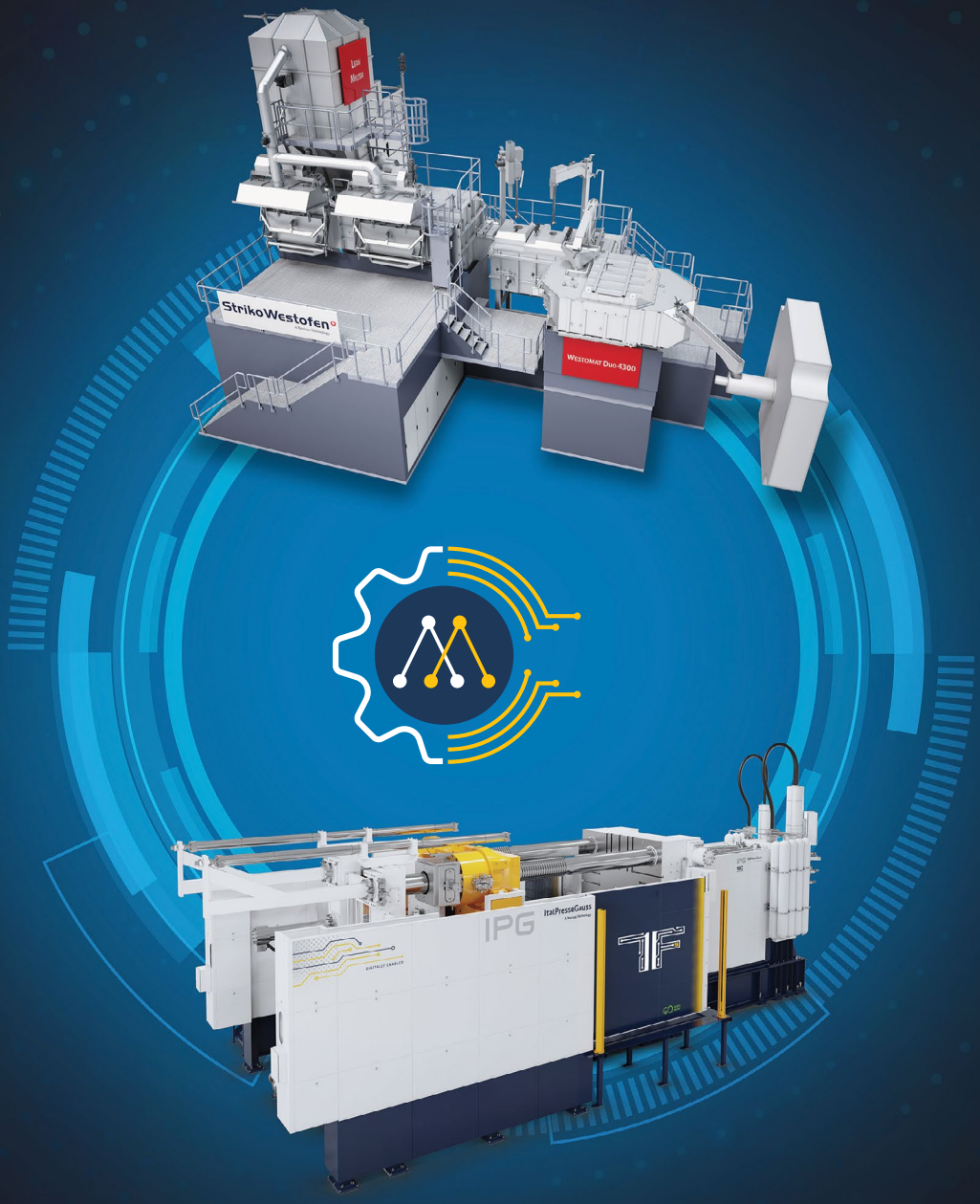
PREVIOUS PROCESS TO PRODUCE PART
Past part was machined from aluminum bar stock.

ADVANTAGES GAINED
Lakeside Casting Solutions (LCS) worked with Utility Solutions Group (USG) to develop a casting part print that met the need of the current part, plus add an additional feature for product safety. Once the geometry was agreed upon and a model was generated, LCS was allowed to complete a thermal / flow analysis that aided in assuring a sound casting. A die was built to fit into a multi slide Zinc press with a hydraulic shot end. The as cast part met dimensional and casting quality requirements. LCS was able to save USG over $4.25 per unit.

Lakeside Casting Solutions
2 Lakeside Dr.
Monroe City, MO 63456
USA

GIANT solutions for diecasting

Sustainable & innovative solutions to boost your foundry's productivity.



Increased e-mobility has given rise to giant casting, calling for die casting cells capable of producing larger, lighter structural components. Seamlessly.

Visit us at booths 740 & 839!

noricangroup.com

Norican Technologies

ItalPresseGauss Monitizer StrikoWestofen

2023 SAFETY AWARDS

The North American Die Casting Association is pleased to announce this year's Safety Award Winners. These Corporate Member Companies' safety records demonstrate their strong focus on employee safety and well-being. NADCA's Safety Award Program was developed to honor Corporate Members that both exceed and meet the average U.S. national safety standards for all manufacturing in a given year. Companies that have maintained a safety record during 2022 with 0 lost days/transfers/restrictions are awarded with a "Perfect" award. Companies with DART (days away, restricted or transferred) records equal to, or less than 2.1 (based on 2021's "All Manufacturing Industries" average of total recordable cases) are recognized with an "Outstanding" award. The DART for nonferrous metal die casting foundries in 2021 was 3.3, so any members who receive NADCA Safety Awards have safety records remarkably better than average! NADCA's Progress Award for Safety Improvements recognizes companies with a recorded safety DART improvement of 25% or more compared to the prior year. NADCA is proud to recognize these award-winning companies.

PERFECT AWARDS

Boyd Allenton
Allenton, Wisconsin

Fiat Chrysler Automobiles (FCA) Canada Inc. - Etobicoke Casting Plant
Etobicoke, Ontario

High Temperature Systems, Inc.
Chagrin Falls, Ohio

Metal Mechanics Inc.
Schoolcraft, Michigan

Norican Group
LaGrange, Georgia

Omni Die Casting, Inc.
Massillon, Ohio

Pace Industries Alloy Resources Corp.
Novi, Michigan

Pace Industries Fayetteville Corporate Office
Fayetteville, Arkansas

Pace Industries Harrison Zinc
Harrison, Arkansas

Pace Industries JEL
Chelmsford, Massachusetts

Pace Industries Maple Lake
Maple Lake, Minnesota

Pace Industries Novi
Novi, Michigan

Pace Industries Port City Casting Corp.
Muskegon, Michigan

Pace Industries Port City Die Casting
Muskegon, Michigan

Pace Industries Port City Metal Products
Muskegon, Michigan

Pyrotek - COL
Columbia City, Indiana

Twin City Die Castings Company - Monticello Division
Monticello, Minnesota

VERSEVO Inc.
Hartland, Wisconsin

OUTSTANDING AWARDS

Empire Die Casting Co.
Macedonia, Ohio

Cascade Die Casting Group, Inc./Great Lakes Division
Sparta, Michigan

Castool Tooling Systems
Uxbridge, Ontario

Finkl Steel
Chicago, Illinois

General Motors Bedford
Bedford, Indiana

Le Sueur Incorporated
Le Sueur, Minnesota

Nemak USA - Kentucky Plant 2
Glasgow, Kentucky

Nemak USA - Tennessee
Dickson, Alabama

Pace Industries Cambridge
North Billerica, Massachusetts

Pace Industries Chihuahua
Chihuahua, Mexico

Pace Industries Grafton
Grafton, Wisconsin

Pace Industries Harrison Aluminum
Harrison, Arkansas

Pace Industries Jackson
Jackson, Tennessee

Pace Industries Latrobe
Loyalhanna, Pennsylvania

Pace Industries Saltillo
Saltillo, Mexico

Patterson Mold and Tool
St. Charles, Missouri

Production Castings Inc.
Fenton, Missouri

Spartan Light Metal Products
Mexico, Missouri

Stellantis - Kokomo Casting Plant
Kokomo, Indiana

The Schaefer Group, Inc.
Beavercreek, Ohio

NADCA PROGRESS AWARD FOR SAFETY IMPROVEMENTS

Audubon Metals
Henderson, Kentucky

Audubon Metals Kentucky
Henderson, Kentucky

Audubon Metals Texas
Corsicana, Texas

Chicago White Metal Casting Inc.
Bensenville, Illinois

Dynacast
Lake Forest, California

Fort Recovery Industries
Fort Recovery, Ohio

General Die Casters, Inc.
Twinsburg, Ohio

Gibbs Die Casting
Henderson, Kentucky

Imperial Die Casting Co.
Liberty, South Carolina

Inland Die Casting
Wheeling, Illinois

Mercury Marine - Plant 17
Fond du Lac, Wisconsin

Nemak USA - Alabama
Sylacauga, Alabama

Nemak USA - Gateway
Sheboygan, Wisconsin

Nemak USA - Taylor
Sheboygan, Wisconsin

Pace Industries Maple Lake
Fayetteville, Arkansas

Pace Industries Port City Custom Plastics
Fayetteville, Arkansas

Production Castings Inc.
Fenton, Missouri

Twin City Die Castings Company - Minneapolis Division
Minneapolis, Minnesota

Twin City Die Castings Company - Monticello Division
Monticello, Minnesota

Walker Die Casting
Lewisburg, Tennessee

Whitehead Die Casting
Gainesville, GA

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Fort Recovery Industries, Ohio

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Mercury Castings - Division of Mercury Marine, Wisconsin

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LK Machinery Inc, Indiana

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SpaceX, Texas

ADDITIVE MANUFACTURING TASK FORCE

Corey Vian – Tool Engineering Manager
Stallantis - Kokomo Casting Plant, Indiana

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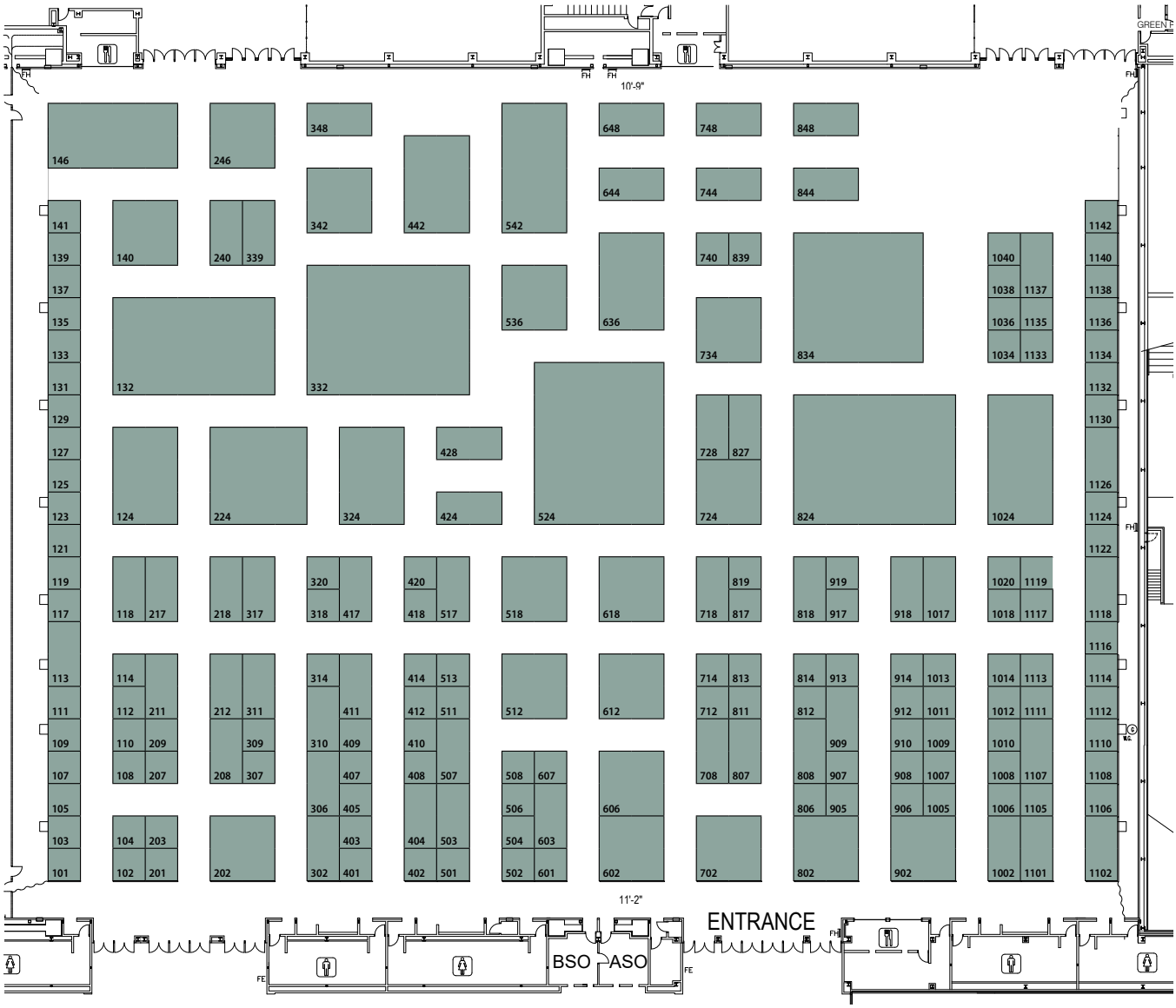

Registration Hours -

INDIANA CONVENTION CENTER - ROOMS 126-127

Saturday, September 28: 3:00 pm – 5:00 pm
Sunday, September 29: 8:00 am – 5:00 pm
Monday, September 30: 8:00 am – 5:00 pm
Tuesday, October 1: 8:00 am – 5:00 pm
Wednesday, October 2: 8:00 am – 2:00 pm

Technical Sessions -

INDIANA CONVENTION CENTER - ROOMS 120-122

Monday, September 30: 8:00 am – 2:45 pm
Tuesday, October 1: 8:00 am – 5:15 pm
Wednesday, October 2: 8:00 am – 3:45 pm

Exhibit Hours -

INDIANA CONVENTION CENTER - HALLS A&B

Monday, September 30: 10:00 am – 5:00 pm
Tuesday, October 1: 10:00 am – 5:00 pm
Wednesday, October 2: 10:00 am – 5:00 pm

EXHIBITOR LIST

Company	Booth
AarKel Tool & Die Inc.	1132
Absolent Inc.	135
Absolute Haitian Die Casting Systems	909
Advanced Foundry Specialists	207
Alcoa Corp.	339
Allied Metal Company	708
American Metalcasting Consortium (AMC)	320
AnyCasting Software Co	1009
Applied Material Solutions, Inc. (AMS)	405
Asiaway Automotive Technical Center, Inc.	342
ATD Engineering & Machine	208
Atherm/Cougar Electronics	1020
Auburn FilterSense a Nederman Company	108
Automation System & Design Inc.	724
B&L Information Systems, Inc.	806
Bedford Machine & Tool Inc.	1118
Bholster Tech	109
BOHLER	834
Brach Machine	402
Brondolin North America	918
BuhlerPrince, Inc.	524
Burkert Fluid Control Systems	314
Buttler Machinery LLC	1134
Carrier Vibrating Equipment	1006
Castec Corporation	905
Castool Tooling Systems/Exco Engineering	512
Chem-Trend, LP	602
COLOSIO SRL	418
Columbia Machine Works Inc	1130
Combined Technologies Group Inc	502
Comptech AB	107
Conticast Hormesa LLC	307
COSTAMP GROUP SPA	734
Daiichi Jitsugyo (America) Inc.	124
Delaware Dynamics	644
Die Therm Engineering LLC	201
Die-Pro LLC	1007
Diehl Tool Steel	1013
DME Company LLC	131
DMS	203
Dynamo Inc	1018
E-ANDE (H.K.) Limited	1137
Eastern Alloys Inc	311
EcoShot Inc.	1124
EKK, Inc.	513
Ellwood Specialty Metals – USA	506
ESI Group Inc	1114
EWT Foundry Products LLC	411
Ferrofacta Gmbh	212
FILL USA	211
Fisa North America Inc.	814
Flow Science	508
Fondarex USA	511
Foshan Enshi Automation Equipment Co., Ltd.	910
Frech USA Inc.	132

Gaming Engineering	127
General Kinematics Corporation	818
GH Tool & Mold LLC	808
GMH Industrial Group - Groditz Steel NA, ETE	906
Godfrey & Wing	1002
Goff Inc	306
Griffin Tool Inc.	101
Hanson International	401
Hellebusch Tool and Die Inc	507
Henkel Corporation	807
HERCO, LLC	518
High Temperature Systems Inc	309
Hildreth Manufacturing LLC	1126
Hill and Griffith Company	618
HTS International Corporation	606
Hypertherm, Inc.	1010
IDRA North America	542
IECI SRL	428
Inductotherm Corp.	913
Industrial Innovations Inc	536
Integrity Light Metals LLC	410
International Magnesium Association (IMA)	125
International Mold Steel	603
ItalPresseGauss	839
J&S Chemical Corp	802
JM Mold South, Inc.	1012
Kejia (Changxing) Mould Base Manufacturing Co., Ltd.	1005
Kimura Foundry Co., Ltd.	1102
Kind Special Alloys LLC	113
Laubinger + Rickmann GmbH & Co. KG	209
Lethiguel USA	517
Lindberg/MPH	105
Lioho Machine Works, LTD.	408
LK World	332
M & I Machine	1106
Magaldi Technologies LLC	1014
MAGMA Foundry Technologies Inc.	702
Master Finish Co	902
McDanel Advanced Ceramic Technologies	718
Meccanica Pi Erre Srl	412
Metropolitan Alloys Corp	121
Mo-Tech Corp	1111
MORESCO USA Inc.	1101
Mr. Pin Inc.	1122
NCC Die Casting LLC	424
Nexthermal Corporation	403
Ningbo Coway Surface Treatment Technology Co., Ltd.	912
Ningbo Dongen Precision Machinery Company	819
Ningbo Hansen Precision Machinery Co., Ltd.	302
Ningbo Haoli Metal Co., Ltd.	1140
Ningbo K&A Machinery Co., Ltd.	1117
Ningbo Moldie Mold Co Ltd	1108
Ningbo NRH Machine & Electrical Co	712
Ningbo Tianzheng Mould Co. Ltd.	908
Ningbo Zongchi Machinery Technology Co., Ltd.	1119
NovaCast USA Inc.	817
OEE Companies	318
Patterson Mold & Tool	117
Pegasus Ind	417
Pfeiffer Vacuum	118

Phygen Coatings Inc	601
Plansee USA LLC	917
Plasmatreat	1136
PMGUSA LLC	1113
Progressive Components	919
Prolong Surface Technologies	420
Proterial America	1011
Pyrotek Inc	224
QuakerHoughton	202
Race Mold Industria Co. Ltd.	504
Raffmetal SPA	1138
Regloplas Corp	503
Sandvik Additive Manufacturing	1142
SAPP Inc.	414
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Shanghai Yifeng Powder Metallurgy Co. Ltd.	1112
Shenzhen HongCasting Technology Co., Ltd.	1135
Shibaura Machine Company, America	902
SIC Marking	119
SINC Thermal	123
Sinto America	1133
SIR Robotics	844
SNP Precision Industry Co., Ltd.	714
Socitec US LLC	110
Spectro Alloys Corp	1107
State Metal Industries, Inc.	103
STOTEK, Inc.	1017
StrikoWestofen	740
Stucchi USA	813
Sun Metalon	111
Suzhou Yunjing Metal Technologies	404
Swiss Steel USA, Inc.	501
T-Sok Co., Ltd.	140
Techmire	317
The Schaefer Group Inc	728
Thermal-Tec Roofing	409
Tooling & Equipment International	218
Transmet Corp	811
Trebi North America Inc.	407
Trialco Aluminum LLC	129
Turn Key Tool & Die	112
Tvarit GmbH	137
Uddeholm USA	834
Valor Alloys, LLC	812
VERSEVO Inc	612
Viking Technologies	1116
Visi-Trak Worldwide LLC	827
voestalpine Additive Manufacturing Centers – North America	834
voestalpine eifeler Coatings LLC	834
Wollin USA	744
X-RIS	102
Yixing Jinzhen Casting Material Co., Ltd.	914
YIZUMI-HPM Corporation	824
Yushiro Manufacturing America, Inc.	310
ZEISS Industrial Quality Solutions	1008
Zhejiang Wanfeng Technology Development Co., Ltd.	636
Zitai USA - Die Casting Equipment Group	1024

EXHIBITOR PRODUCT CATEGORIES

Die Casting: Alloys

339	Alcoa Corp.
708	Allied Metal Company
108	Auburn FilterSense a Nederman Company
1134	Buttler Machinery LLC
1013	Diehl Tool Steel
311	Eastern Alloys Inc
1114	ESI Group Inc
127	Gaming Engineering
121	Metropolitan Alloys Corp
919	Progressive Components
1138	Raffmetal SPA
1107	Spectro Alloys Corp
103	State Metal Industries, Inc.
1017	STOTEK, Inc.
111	Sun Metalon
501	Swiss Steel USA
409	Thermal-Tec Roofing
129	Trialco Aluminum LLC
137	Tvarit GmbH
812	Valor Alloys, LLC
834	voestalpine High Performance Metals LLC
914	Yixing Jinzhen Casting Material Co., Ltd.
310	Yushiro Manufacturing America, Inc.

Die Casting: Dies

1132	AarKel Tool & Die Inc.
1118	Bedford Machine & Tool Inc.
1134	Buttler Machinery LLC
307	Conticast Hormesa LLC
734	COSTAMP GROUP SPA
644	Delaware Dynamics
1018	Dynamo Inc
506	Ellwood Specialty Metals - USA
1114	ESI Group Inc
212	Ferrofacta Gmbh
132	Frech USA Inc.
808	GH Tool & Mold
906	GMH Gruppe - Steel Div
401	Hanson International
507	Hellebusch Tool and Die Inc
603	International Mold Steel
1012	JM Mold South, Inc.
517	Lethiguel USA
412	Meccanica Pi.Erre SRL
302	Ningbo Hansen Precision Machinery Co., Ltd.
1117	Ningbo K&A Machinery Co., Ltd.
1108	Ningbo Moldie Mold Co.,Ltd
712	Ningbo NRH Machine & Electrical Co.Ltd.
908	Ningbo Tianzheng Mould Co. Ltd.
318	OEE Companies
117	Patterson Mold & Tool
417	Pegasus Industries
601	Phygen Coatings, Inc.
1113	PMGUSA LLC
919	Progressive Components
420	Prolong Surface Technologies
504	Race Mold Industria Co. Ltd.
414	SAPP Inc.
518	Schaufler Fischer Group
1133	Sinto America
714	SNP Precision Industry Co., Ltd.
1017	STOTEK, Inc.
317	Techmire
409	Thermal-Tec Roofing
140	T-Sok Co., Ltd.
112	Turn Key Tool & Die
137	Tvarit GmbH
612	VERSEVO Inc
834	voestalpine High Performance Metals LLC
914	Yixing Jinzhen Casting Material Co., Ltd.
310	Yushiro Manufacturing America, Inc.

Die Casting: Equipment

208	ATD Engineering & Machine
1020	Atherm/Cougar Electronics
108	Auburn FilterSense a Nederman Company
1118	Bedford Machine & Tool Inc.
109	Bholster Technologies
518	Boehmer
918	Brondolin North America
524	BuhlerPrince, Inc.
314	Burkert Fluid Control Systems
1134	Buttler Machinery LLC
512	Castool Tooling Systems/Exco Engineering
418	COLOSIO SRL
1130	Columbia Machine Works, Inc.
107	Comptech AB
307	Conticast Hormesa LLC
124	Daiichi Jitsugyo (America) Inc.
201	Die Therm Engineering LLC
1007	Die-Pro LLC
131	DME Company
1124	EcoShot Inc.
1114	ESI Group Inc
212	Ferrofacta Gmbh
211	Fill USA, Inc.
132	Frech USA Inc.
127	Gaming Engineering
818	General Kinematics Corporation
306	Goff Inc
518	HERCO, LLC
606	HTS International Corporation
542	IDRA North America
428	IECI SRL
913	Inductotherm Corp.
536	Industrial Innovations Inc
518	KMA
209	Laubinger + Rickmann GmbH & Co. KG
517	Lethiguel USA
105	Lindberg/MPH
1106	M & I Machine
1014	Magaldi Technologies LLC
412	Meccanica Pi.Erre SRL
424	NCC Die Casting LLC
318	OEE Companies
417	Pegasus Industries
1136	Plasmatreat
919	Progressive Components
420	Prolong Surface Technologies
224	Pyrotek Inc
503	Regloplas Corporation
1110	SECO/VACUUM
518	Schaufler Fischer Group
123	SINC Thermal
1133	Sinto America
844	SIR Robotics
740	StrikoWestofen
1017	STOTEK, Inc.
813	Stucchi USA
317	Techmire
728	The Schaefer Group Inc
407	Trebi North America Inc.
140	T-Sok Co., Ltd.
137	Tvarit GmbH
612	VERSEVO Inc
110	Vibro Dynamics
1116	Viking Technologies
827	Visi-Trak Worldwide LLC
744	Wollin USA
914	Yixing Jinzhen Casting Material Co., Ltd.
824	YIZUMI-HPM Corporation
310	Yushiro Manufacturing America, Inc.
1024	Zitai USA - Die Casting Equipment Group

Die Casting: Machines

1020	Atherm/Cougar Electronics
524	BuhlerPrince, Inc.
1134	Buttler Machinery LLC
418	COLOSIO SRL
1130	Columbia Machine Works, Inc.
307	Conticast Hormesa LLC
124	Daiichi Jitsugyo (America) Inc.
1114	ESI Group Inc
211	Fill USA, Inc.

132	Frech USA Inc.
306	Goff Inc
740	StrikoWestofen
1010	Hypertherm, Inc.
542	IDRA North America
913	Inductotherm Corp.
1014	Magaldi Technologies LLC
412	Meccanica Pi.Erre SRL
919	Progressive Components
420	Prolong Surface Technologies
1112	Shanghai Yifeng Powder Metallurgy Co. Ltd.
902	Shibaura Machine Company, America
123	SINC Thermal
1133	Sinto America
1017	STOTEK, Inc.
317	Techmire
407	Trebi North America Inc.
140	T-SOK Co., Ltd.
137	Tvarit GmbH
612	VERSEVO Inc
102	X-RIS
914	Yixing Jinzhen Casting Material Co., Ltd.
824	YIZUMI-HPM Corporation
310	Yushiro Manufacturing America, Inc.
636	ZHEJIANG WANFENG TECHNOLOGY DEVELOPMENT CO.,LTD.

Die Casting: Materials

339	Alcoa Corp.
108	Auburn FilterSense a Nederman Company
1134	Buttler Machinery LLC
905	Castec Corporation
1013	Diehl Tool Steel
1137	E-ANDE (H.K.) Limited
311	Eastern Alloys Inc
506	Ellwood Specialty Metals - USA
1114	ESI Group Inc
127	Gaming Engineering
906	GMH Industrial Group - Groditz Steel NA, ETE
603	International Mold Steel
802	J&S Chemical
424	NCC Die Casting LLC
1136	Plasmatreat
919	Progressive Components
1142	Sandvik Machining Solutions AB
844	SIR Robotics Inc
103	State Metal Industries, Inc.
1017	STOTEK, Inc.
501	Swiss Steel USA, Inc.
728	The Schaefer Group Inc
409	Thermal-Tec Roofing
137	Tvarit GmbH
812	Valor Alloys, LLC
834	voestalpine High Performance Metals LLC
914	Yixing Jinzhen Casting Material Co., Ltd.
310	Yushiro Manufacturing America, Inc.

Die Casting: Supplies

405	Applied Material Solutions, Inc. (AMS)
1118	Bedford Machine & Tool Inc.
518	Boehmer
402	Brach Machine
1134	Buttler Machinery LLC
905	Castec Corporation
512	Castool Tooling Systems/Exco Engineering
307	Conticast Hormesa LLC
1013	Diehl Tool Steel
1007	Die-Pro LLC
131	DME Company LLC
203	DMS
1114	ESI Group Inc
212	Ferrofacta Gmbh
511	Fondarex USA
127	Gaming Engineering
518	HERCO, LLC
1126	Hildreth Manufacturing LLC
618	Hill and Griffith Company
536	Industrial Innovations Inc

603	International Mold Steel
802	J&S Chemical Corp
518	KMA
517	Lethiguel USA
408	Lioho Machine Works, LTD.
1106	M & I Machine
1122	Mr. Pin Inc.
424	NCC Die Casting LLC
1140	Ningbo Haoli Metal Co., Ltd.
1117	Ningbo K&A Machinery Co., Ltd.
712	Ningbo NRH Machine & Electrical Co.Ltd.
318	OEE Companies
417	Pegasus Ind
417	Pegasus Industries
601	Phygen Coatings, Inc.
1113	PMGUSA LLC
919	Progressive Components
420	Prolong Surface Technologies
1011	Proterial America
224	Pyrotek Inc
202	Quaker Houghton
518	Schaufler Fischer Group
123	SINC Thermal
1017	STOTEK, Inc.
728	The Schaefer Group Inc
409	Thermal-Tec Roofing
811	Transmet Corp
140	T-SOK Co., Ltd.
137	Tvarit GmbH
914	Yixing Jinzhen Casting Material Co., Ltd.
310	Yushiro Manufacturing America, Inc.

ERP or Simulation Software

1009	AnyCasting Software Co., Ltd.
806	B&L Information Systems
109	Bholster Technologies
513	EKK, Inc.
1114	ESI Group Inc
212	Ferrofacta Gmbh
508	Flow Science, Inc.
511	Fondarex USA
306	Goff Inc
536	Industrial Innovations Inc
113	Kind Special Alloys LLC
517	Lethiguel USA
702	MAGMA Foundry Technologies Inc.
117	Patterson Mold & Tool
919	Progressive Components
844	SIR Robotics Inc
740	StrikoWestofen
1017	STOTEK, Inc.
137	Tvarit GmbH
914	Yixing Jinzhen Casting Material Co., Ltd.
310	Yushiro Manufacturing America, Inc.
1008	ZEISS Industrial Quality Solutions

Inspection

339	Alcoa Corp.
108	Auburn FilterSense a Nederman Company
518	Boehmer
1130	Columbia Machine Works, Inc.
124	Daiichi Jitsugyo (America) Inc.
1124	EcoShot
1114	ESI Group Inc
211	Fill USA, Inc.
401	Hanson International
518	HERCO, LLC
518	KMA
209	Laubinger + Rickmann GmbH & Co. KG
424	NCC Die Casting LLC
919	Progressive Components
518	Schaufler Fischer Group
844	SIR Robotics Inc
740	StrikoWestofen
1017	STOTEK, Inc.
728	The Schaefer Group Inc
137	Tvarit GmbH
102	X-RIS
914	Yixing Jinzhen Casting Material Co., Ltd.
824	YIZUMI-HPM Corporation
310	Yushiro Manufacturing America, Inc.

Other

1132	3D Printing, Trim Dies: AarKel Tool & Die Inc.
209	Adaptive Straightening: Laubinger + Rickmann GmbH & Co. KG
125	Association: International Magnesium Association (IMA)
124	Automation: Daiichi Jitsugyo (America) Inc.
536	Automation, FANUC ASI, work cell accessories: Industrial Innovations Inc
207	Automation, Finishing Solutions, Trim Press Systems, Trim Tooling: Advanced Foundry Specialists
306	Blast Cleaning Machines: Goff Inc
807	Casting Lubricants: Henkel Corporation
644	Casting Production: Delaware Dynamics
1117	CNC Machining, Prototype : Ningbo K&A Machinery Co., Ltd.
827	Data Acquisition, Monitoring, Control: Visi-Trak Worldwide LLC
410	Die Cast Prototypes: Integrity Light Metals LLC
1110	Die Casting Heat Treatment Furnaces: SECO/VACUUM Technologies
602	Die Casting Lubricants: Chem-Trend, LP
202	Die Casting Lubricants: QuakerHoughton
712	Die Casting Mold: Ningbo NRH Machine & Electrical Co
1112	Die Casting Mold: Shanghai Yifeng Powder Metallurgy Co. Ltd.
320	Die Casting R&D: American Metalcasting Consortium (AMC)
506	Die Steel: Ellwood Specialty Metals - USA
135	Filtration (Die Casting Smoke): Absolent Inc.
212	Hot Runner Dies: Ferrofacta Gmbh
913	Induction Melting Furnaces: Inductotherm Corp.
127	Joining of Die Castings to Steel or Aluminum body in white.: Gaming Engineering
1118	Leak Testers: Bedford Machine & Tool Inc.
802	Lubricants: J&S Chemical Corp
211	Machining Solutions: FILL USA
907	Other: Master Finish Co
107	Process development semi-solid casting (Rheocasting): Comptech AB
1102	Prototype Castings: Kimura Foundry Co., Ltd.
218	Prototype Aluminum Machined Castings: Tooling & Equipment International
812	Secondary Smelter: Valor Alloys, LLC
110	Shock & Vibration Isolation Mounting Systems: Socitec US LLC
409	Specialized Commercial Roofing: Thermal-Tec Roofing
109	Structural Casting Support, Scrap Management, De-Risking Programs: Bholster Tech
601	Surface Enhancement and Die Protection: Phygen Coatings, Inc.
1136	Surface Treatment Parts: Plasmatreat
518	TCUs, air filtration/hood, spray systems, and mold flushing: HERCO, LLC
420	Tool Coatings: Prolong Surface Technologies
603	Tool Steel: International Mold Steel
1013	Tool Steels: Diehl Tool Steel
1118	Trim Tooling: Bedford Machine & Tool Inc
101	Trim Tooling: Griffin Tool Inc.
1010	Trimming Machinery: Hypertherm, Inc.
412	Trimming Technology: Meccanica Pi Erre Srl
814	Ultrasonic Cleaning: Fisa North America Inc.
1002	Vacuum/Impregnantion: Godfrey & Wing

EXHIBITOR DIRECTORY

AarKel Tool & Die Inc. **1132**

17 Elm Drive South
Wallaceburg, ON N8A 5E8
Canada
(519) 360-7702
www.aarkel.com

Absolent Inc. **135**

6541 Meredien Drive
Suite 125
Raleigh, NC 27616
United States
(919) 488-5192

Absolute Haitian Die Casting Systems **909**

33 Southgate Street
Worcester, MA 01610
(508) 792-4305

Advanced Foundry Specialists **207**

1435 Midway Road
Menasha, WI 54952
United Sates
(920) 257-2189

Alcoa Corp. **339**

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American Metalcasting Consortium (AMC) **320**

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www.amc.ati.org

AnyCasting Software Co., Ltd. **1009**

B-16F Woolim B/D,
583 Yangchun-ro, Gangseo-gu,
Seoul 07547
Rebublic Of Korea
82236652493
www.anycastsoftware.com/en/

Applied Material Solutions, Inc. (AMS) **405**

1001 E Centralia St
Elkhorn, WI 53121
United States
(262) 723-6595

Asiaway Automotive Technical Center, Inc. **342**

38555 Hills Tech Dr.
Farmington, MI 48331
United States
52 444 165 9660

ATD Engineering & Machine 208

533 N. Court
Au Gres, MI 48703
United States
(989) 876-7161
www.atdemllc.com

Atherm/Cougar Electronics 1020

10 Lyhan St.
New Haven, CT 06511
United States
(203) 562-6545
www.cougarelectronics.com/manufacturer/atherm

Auburn FilterSense a Nederman Company 108

800 Cummings Center
Suite 355W
Beverly, MA 01915
United States
(978) 927-4304
www.auburnfiltersense.com

Auburn FilterSense is a global leader in advanced particulate monitoring and filter control solutions, specializing in technologies that enhance operational efficiency and environmental compliance. With a strong commitment to innovation, our products are designed to meet the demanding needs of the die casting industry, ensuring superior air quality and reliable process control. We empower companies to achieve optimal performance, minimize downtime, and stay ahead of regulatory requirements, all while contributing to a cleaner, safer environment.

Automation System & Design Inc. 724

3540 Vance Road
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www.asddayton.com

ASD provides in-house expertise in foundry robotics designing, building and programming specialty tools, controllers, finishing cells, one-off prototypes and built out of turn-key systems. We are minority and ISO-9001 certified. The focus of the business is to address the needs of the "Industrial Automation Market". We offer complete mechanical, electrical and software engineering and industry design expertise. We are dedicated to meeting the equipment and process needs of the growing manufacturing industry.

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Bedford Machine & Tool Inc. 1118

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Bedford, IN 47421-2447
United States
(812) 275-1948
www.bedfordmachine.com

Bholster Technologies 109

506-300 Eglinton Ave. E
Toronto, ON M4P 1L5
Canada
(416) 909-2027

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Schaumburg, IL 60173
United States
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www.us.bohler.com

When the job is tough, customers turn to BÖHLER Steels – exclusively represented by EDRO in the USA. Böhler prides itself on providing complete solutions with industry leading grades W360 (highest thermal stability and wear-resistance), W350 (large deep cavities), W403 (heat checking resistance), and W302 (premium H-13). Additionally, we offer full additive manufacturing services from design to part, and superior eifeler coatings that include Crosal-plus and Duplex-Tigral. No matter what the situation calls for, BÖHLER is here.

Brach Machine 402

367 Paul Road
Rochester, NY 14624
United States
(585) 343-9134
www.brachmachine.com

Brach Machine manufactures shot-end components for zinc and aluminum casting machines such as goosenecks, nozzles, gooseneck noses, plungers, plunger couplings, shot rods, and shot couplings. We also specialize in replacement parts for use in Techmire® and other miniature machines. Other services include refurbishing and re-sleeving goosenecks and deep hole gun drilling. Custom capabilities include machining prototypes, short run production parts, weldments, sub-assemblies, and obsolete parts.

Brondolin North America 918

1055 N Shore Drive
Benton Harbor, MI 49022
United States
(269) 208-3867
http:brondolin-na.com

Brondolin SRL , located near Milano, Italy is an industry leader in the manufacturing of Shot End Components for the Die Casting Industry and its products are distributed by Brondolin NA in North America. Established in 1968, Brondolin's state of the art machining factory also has its own Heat Treatment and Nitriding facility nearby, so they are able to produce the highest quality products by controlling the manufacturing process start to finish in house. Check us out for our latest technological advances at Brondolin.it.

BuhlerPrince, Inc. 524

670 Windcrest Dr
Holland, MI 49423-5410
United States
(616) 394-8248
www.buhlerprince.com

Die Casting Machines and systems made by BuhlerPrince are ideal for the most varied processes. Whether you are interested in aluminum, magnesium, zinc, vacuum, structural or engine block processes – BuhlerPrince has the right solution. BuhlerPrince supports customers throughout the life-cycle of their equipment with global services including process optimization, flow simulations, remanufacturing, retrofits and upgrades.

Burkert Fluid Control Systems 314

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Burkert Fluid Control Systems, your system solution specialist, offers the most reliable, precise and efficient process heating & cooling systems for your critical die casting and machining applications. From on/off and proportional solenoid valves to innovative flow controllers and meters, Burkert standard and custom solutions control and monitor your most complex processes with precision, reliability, repeatability and flexibility being the cornerstones of design from concept to production.

Buttler Machinery LLC 1134

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Marietta, GA 30064
United States
(678) 557-1131
www.atl-buttler.com

Carrier Vibrating Equipment 1006

3400 Fern Valley Rd
Louisville, KY 40213
United States
(502) 969-3171

Castec Corporation 905

7640 Moller Road
Indianapolis, IN 46268
United States
(317) 872-3882
www.castec-inc.com

Castool Tooling Systems/Exco Engineering 512

2 Parratt Road
Uxbridge, ON L9P 1R1
Canada
(905) 852-0121
WWW.CASTOOL.COM

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1445 McPherson Park Dr
Howell, MI 48843-3947
United States
(517) 302-2962
www.chemtrend.com

COLOSIO SRL 418

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25082 BOTTICINO (BS)
Italy
+390302692181
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Colosio Die Cast Machines & Automated Cells, Cold Chamber and Hot Chamber machines up to 4,400 Metric Tons. NEW…Colosio USA office in Minneapolis MN, fast service for all USA customers. NEW…"NEX Series" the most energy efficient and user friendly die casting machines in the world. Complete cells with linear loaders, custom engineered RELBO robotic spray systems and more. Quality first, efficiency, and state of the art HMI software make this a machine worth a closer look!

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United States
(937) 274-4866

Comptech AB 107

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Skillingayrd, Jonkoping 56831
Sweden
+46 (0)370-66 50 66
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Conticast Hormesa LLC 307

9340 Queens Blvd 2J
Flushing, NY 11374
United States
(954) 600-7379
hormesa.com

Hormesa specializes in providing advanced die casting furnaces and comprehensive solutions tailored for the non-ferrous metals industry. With decades of expertise, we offer high-efficiency melting and holding furnaces designed to optimize energy use and improve casting quality. Our innovative technologies ensure consistent performance, reduced operational costs, and enhanced productivity. Hormesa's commitment to sustainability and precision makes us a trusted partner in delivering reliable and customized solutions for the die casting industry worldwide.

COSTAMP GROUP SPA 734

Via Verdi 6
Sirone
Italy
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939 AEC Drive
Wood Dale, IL 60191
United States
(630) 875-0101
www.djausa.com

Delaware Dynamics 644

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Muncie, IN 47302-2356
United States
(765) 284-3335
www.delawaredynamics.com

Die Therm Engineering, LLC 201

7818 Silverthrone Dr SE
Ada, Michigan 49301
United States

Diehl Tool Steel **1013**

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Cincinnati, OH 45217
United States
(513) 242-8900
www.diehlsteel.com

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www.dmscomponents.com

DMS is a leading North American supplier of standard + special die cast components + related supply products such as Boride Polishing Products, Kaller Gas Springs, Koolflow, Water Manifolds, Custom Mold Cooling Components, Rochling Glastherm Insulator Boards, REDE Vault, NSK, TracyTec Micro TIG Welder, Thino Feet, ICS Full Color Mold Plaques + much more!

Blanchard Grinding + Flame Cutting, Ground Plates + related services can be provided by BordeSteel.net!

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www.die-pro.com

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29111 Stephenson Highway
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United States
(800) 626-6653
www.DME.net

Dynamo Inc **1018**

106 W Calendar Court #151
La Grange, IL 60525
United States
(708) 261-6492
www.dynamo.co.jp

We are a leading Japanese manufacturer of jet-cooled core pins and die components for high-pressure die-casting, with plants in Japan and Vietnam and sales offices worldwide.

Our products include jet-cooled core pins, cascades, inserts, bore cores, and water jackets. Partnering with Nihonseiki Co., LTD. and Tooling Innovation, Inc., we offer complete molds and advanced additive manufacturing with HTC45 die steel powder, providing high thermal conductivity and improved component life.

E-ANDE (H.K.) Limited **1137**

6th Floor, Luki Tower,
5 O'Brien Rd
Wanchai, Hong Kong
999077
China
852 27765029

Eastern Alloys Inc **311**

11 Henry Hennig Dr.
Maybrook, NY 12543-0316
United States
(845) 427-2151
www.eazall.com

Eastern Alloys manufactures world-class zinc alloys for the die casting industry using state-of-the-art processing technologies. Zinc alloys are manufactured in Eastern's 100,000-square-foot plant in Maybrook, New York, and as well as our Henderson, Kentucky plant. Eastern Alloys' competitive advantage is our combination of exceptional quality products and unique customer service programs (including defect analysis consultation, training and marketing) to ensure our customers have all the tools needed to manufacture high quality products.

EcoShot **1124**

5524 Fortune Circle S, Suite F
Indianapolis, IN 46241
United States
(317) 912-4498
www.ecoshotinc.com

EKK, Inc. **513**

29551 Greenfield Rd, Ste 209
Southfield, MI 48076
United States
(248) 624-9957
www.ekkinc.com

Ellwood Specialty Metals – USA **506**

499 Honey Bee Ln
New Castle, PA 16105
United States
(800) 932-2188
www.ess.elwd.com

ESI Group Inc **1114**

32605 W. 12 Mile Rd.
Suite 350
Farmington Hills, MI 48234
United States
(248) 381-8040
www.esi-group.com/

EWT Foundry Products LLC **411**

1900 N Bayshore Dr Ste 1A
United States
Miami, FL 33132
+34937572181
www.ewtsl.com/es/

Ferrofacta Gmbh **212**

Rennertehauser Weg 11
Allendorf 35108
Germany
+49 64528090845
www.ferrofacta.com

Ferrofacta is the world's leading supplier of hot runner tools for the die casting industry. Our innovative tooling solutions reduce metal and energy consumption as well increasing output and quality levels. Our patented hot runner solutions are suitable for all die casting machines and are already in use across Europe and the USA.

Fill USA, Inc. **814**

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(312) 973-9486
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As the innovation leader for machines and systems in the field of metal machining, Fill composes the best solutions internationally. Fill supports all your production processes – from the raw part to the machined, cleaned, tested, and assembled finished part.

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Fisa North America Inc. **814**

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United States
(847) 299-8400
fisa.com/

Flow Science 508

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Santa Fe, NM 87505
United States
(505) 982-0088
www.flow3d.com

Based in Santa Fe, New Mexico USA, Flow Science has been a pioneer in CFD software development for over 40 years. Our company mission is to provide our customers with best-in-class flow modeling software and exceptional technical training and support services. The ***FLOW-3D*** family of products offer highly accurate and versatile CFD solutions to meet the unique challenges of manufacturing in the 21st century.

Fondarex USA 511

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(269) 679-7164
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With the increasing demand of high quality diecast parts for E-mobility and MEGA / GIGA- Castings, Fondarex created a complete solution for an integrated system, consisting of; Vacuum unit, Squeeze Unit and Jet Cooling System to enhance the quality, reduce costs and expand the range of processable alloys.

The devices are controlled by a Central Periphery Management System to enhance energy efficiency, process optimization and simplifying maintenance and operation. Please come and visit Fondarex at the booth 511 during the Die Casting Congress & Exhibition in Indianapolis!

Foshan Enshi Automation Equipment Co., Ltd. 910

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Songxia Industrial Park
Foshan, Guangdong 528000
China

Frech USA Inc. 132

6000 Ohio St
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United States
(219) 874-2812
www.frechusa.com

Die casting systems by the Frech Group of companies offer customers improved productivity with the smart application of the die casting industry's leading technologies. Die casting cells are built to last and simple to operate with intuitive controls and flexible interfaces. Frech Group also includes important market brands like Robamat, Meltec, VDS, Spesima and FrechZPF.

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France
336 60 81 32 76
www.gaming-engineering.com/

General Kinematics 818

5050 Rickert Road
Crystal Lake, IL 60014
(815) 444-3514
United States
www.generalkinematics.com

General Kinematics is a leading manufacturer of vibratory foundry equipment and systems. GK's vibratory conveyors and feeders for gating and riser removal have improved die casting facilities' efficiency compared to fork trucks with tote boxes, rubber belts, and steel pan apron conveyors. GK's die casting solutions are scalable and allow for multiple configurations. Learn more about GK's diecasting equipment at booth #818 and discover why leading die casters are turning to GK's vibratory equipment solutions!

GH Tool & Mold **808**

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(636) 390-2424
toolingtechgroup.com/

GH Tool & Mold is a leading provider of high-pressure die cast dies, designing and building dies for machines with locking forces from 350 to 6,000 tons. We partner with customers to develop castings that are lightweight, manufacturing-friendly, and able to meet design intent.

GMH Industrial Group - Groditz Steel NA, ETE **906**

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Godfrey & Wing vacuum impregnation technology is engineered to overcome your porosity challenges. We enable you to meet OEM requirements, ensure the quality of your components, and the integrity of your bottom line. As a U.S. based company with industry leading equipment options for in-house impregnation, mil-standard approved sealants for any application, and a vast network of service centers, make or buy, we have you covered. Casting impregnation done, Simply Better.

Goff Inc **306**

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United States
(405) 278-6200
www.goff-inc.com

Griffin Tool Inc. **101**

2951 Johnson Rd.
Stevensville, MI 49127
United States
(269) 429-4077
www.griffintool.com

Hanson International **401**

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United States
(269) 429-5555
www.hansoninternational.com

Hanson International, founded in 1966, specializes in the design, build, sample, and inspection of precision molds and high pressure die cast dies. Hanson provides the industry with efficiently designed, high-quality, long-lasting tooling. Hanson International's in-house die cast machines offer sampling convenience and cost savings. Hanson's components are inspected using laser scanning and CMM's following ISO 9001:2015 standards. Hanson's single-point of contact approach guarantees outstanding service and support throughout the process.

Hellebusch Tool and Die Inc **507**

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United States
(636) 239-7543
htdinc.com

Henkel Corporation **807**

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United States
(866) 332-7024

HERCO, LLC **518**

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United States
(248) 656-5900

Founded in 2007, HERCO provides service and equipment to the aluminum/magnesium high-pressure die casting industry. HERCO is one of the leading providers for custom capital equipment and services in Tooling, Spray Systems, and Air Filtration. HERCO manufactures a multi-channel MoldFlush Unit, Die Release Mixing Unit, and performs maintenance service, repair, and rebuild to all major-brand TCUs (Temperature Control Units). Stop by booth #518.

High Temperature Systems Inc **309**

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United States
(440) 543-8271
www.hitemp.com

Hildreth Manufacturing LLC **1126**

1657 Cascade Drive
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United States
(740) 375-583
www.hildrethmfg.com

Hill and Griffith Company **618**

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United States
(800) 543-0425
www.hillandgriffith.com

HTS International Corporation **606**

123 Center Park Dr
Ste 233
Knoxville, TN 37922
United States
(865) 382-5601

Hypertherm, Inc. **1010**

PO Box 14
Hooksett, NH 03106
United States
(603) 643-3441

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IDRA is an Italian company with the longest tradition among the manufacturers of High pressure die casting machines for non-ferrous alloys.

IDRA die casting machines are well known all over the world for sturdiness, long duration and high advanced technical characteristics.

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United States
00390306850370
www.iecionline.com

Inductotherm Corp. **913**

10 Indel Ave
Po Box 157
Rancocas, NJ 08073
United States
(609) 267-9000
www.inductotherm.com/

Industrial Innovations Inc **536**

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(616) 249-1525
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Integrity Light Metals LLC **410**

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Elgin, IL 60120-5502
United States
(931) 561-2161
www.integritylightmetals.com

International Magnesium Association 125

1601 Utica Ave
Suite 213
Minneapolis, MN 55416
United States
(651) 379-7305

International Mold Steel 603

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United States
(859) 342-6000
www.imsteel.com

Backed by the quality and innovation of Daido Steel in Japan, International Mold Steel (IMS) offers more than raw materials – we provide solutions to all your die cast challenges. When you need toughness through the core, count on DH31EX™, DHA-World™ and AMDAP™ powder to deliver.

A host of Fortune 500 companies, including Toyota, Ford, Honda and Stellantis, have relied on IMS solutions featuring premium Daido tool steels. Are you ready to solve your diecasting challenges?

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www.italpressegauss.com

ItalPresseGauss partners with and supplies the global light metal casting industry with high pressure, low pressure, and gravity die casting solutions. We tailor to customer needs as standard, offering consistent high-quality casting solutions that are tightly integrated, highly automated, and ultra-precise–for demanding applications. Our machines, in-house automation solutions, parts and services, and range of IIoT digital technologies for process optimization, are all designed around our customer needs today and well into the future.

J&S Chemical 802

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United States
(770) 720-8100
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USA-based J&S Chemical is a leading manufacturer of specialty lubricants for the die casting industry. J&S Chemical's business philosophy is to create value for their customers by developing high quality, high performing, value added products. Substantial investment in R&D as well as their Technical Service Team, working on-site with their customers, is driving new product developments. Many of their brands are product leaders in the industry such as, Turbo-Cast® (die release agents and liquid plunger lubricants), ShotBeads® (solid plunger lubricants) and TurboTrim™ (trimming fluids).

JM Mold South, Inc. 1012

807 Sheffield Rd
Easley, SC 29642
United States
(864) 855-0450

Kejia (Changxing) Mould Base Manufacturing Co., Ltd. 1005

No. 301, Xiangfu Road
Eco & Tech Zone
Changxing, Huzhou 313100
China

Kimura Foundry Co., Ltd. 1102

1157 Nagasawa
Shimizu-cho, Shizuoka 4110905
Japan
81559757050

Kind Special Alloys LLC 113

1221 Velma Court
Youngstown, OH 44512
United States
(330) 788-2437

Laubinger + Rickmann GmbH & Co. KG 209

Gildestr. 20
Norwalde, North Rhine-Westphalia 48356
Germany
+49 2573 9388 – 0
www.laubinger-rickmann.de

Lethiguel USA 105

14800 James Rd
Rogers, MN 55374-9361
United States
(763) 428-4229
lethiguelusa.com/

Lindberg/MPH 105

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Lioho Machine Works, LTD. 408

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Taoyuan 32056
Taiwan
886 3 4870688
www.lioho.com/zh-tw/

LK World 332

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Located in Edinburgh Indiana USA LK Machinery produces high pressure die casting machines ranging from 30T to 20,000T. Choose from cold or hot chamber DCM systems, expertly integrated with full cell solutions. Local Refurbishing services, and local engineering support. LK Also offers CNC machining centers for your post-process integration needs. Contact us for superior reliability and tailored solutions that drive efficiency and success.

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United States
(269) 849-3624
ShotEndTooling.com

Magaldi Technologies LLC 1014

30000 Millcreek Ave
Unit 385
Alpharetta, GA 30022
United States
(678) 705-9219
www.magaldi.com/en

MAGMA Foundry Technologies Inc. 702

10 N Martingale Rd
Suite 425
Schaumburg, IL 60173
United States
(847) 252-1668
www.magmasoft.com

Mangas-AarKel Tool and Engineering Inc

2721 Avalon Ave
Muscle Shoals, AL 35661
United States
(256) 383-7300

Mangas-AarKel Tool and Engineering Inc. are designers and manufactures of medium and large diecast dies which includes structural and GIGA dies serving a variety of industries including automotive, lighting, appliance, lawn and garden and many others. We offer additional services through our sister companies such as trim dies, 3D Printing and die sampling on our 4000MT DCM.

Master Finish Company 907

2100 Nelson SE
Grand Rapids, MI 49507
United States
(616) 245-1228
www.masterfinishco.com

McDanel Advanced Ceramic Technologies 718

510 9th Ave.
Beaver Falls, PA 15010
United States
(724) 843-8300
www.mcdanelceramics.com

Meccanica Pi.Erre SRL 412

Borello 6 Street
Bedizzole, BS 25081
+390306875411
meccanica-pierre.it

Meccanica Pi.Erre, known as MPR on American Market and present with a US office in Texas since June 2022, has been offering high-quality solutions for trimming and mechanical machining of castings and high-pressure parts in aluminum and magnesium for almost 40 years.

Our product portfolio consists in trim dies, trimming presses (from 20 tons up to 300 tons) and special and customized machining machines. 100% in-house from design to product manufacture. All products always tested internally. MPR is able to provide to customer sampling and on specific request, even the preproduction series. Finally, yet importantly, this company offers a post-sales support to better match customer's needs.

Metropolitan Alloys Corp 121

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Detroit, MI 48212-1115
United States
(313) 826-3212
metroalloys.com

MORESCO USA Inc. 1101

PO BOX 446
Fountain Inn, SC 29644
United States
(864) 770-0430
www.morescousa.com

Mo-Tech Corp 1111

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Oakdale, MN 55128
United States
(651) 770-1515
www.mo-tech.com

Mr. Pin Inc. 1122

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Minneapolis, MN 55428
United States
(763) 432-9739
www.mr-pin.com

NADCA Casting Winners 324

3250 N. Arlington Heights Rd
Ste 101
Arlington Heights, Illinois
60004
United States
(847) 279-0001
www.nadcaawards.com

NADCA Theater 1044

3250 N. Arlington Heights Rd
Ste 101
Arlington Heights, Illinois
60004
United States
(847) 279-0001
www.diecasting.org

NCC Die Casting LLC **424**

2301 Solona St
Haltom City, TX 76117
United States
(682) 703-1058
www.ncc-diecasting.com

In the aluminum and magnesium high pressure die casting market, NCC offers innovative injection systems solutions, operating on cold chamber high pressure die casting machines. The main goals achieved by our customers, using the NCC's plunger-rod systems, is the optimization of the production process, which comes from the reduction of the maintenance costs, improvements of casting quality, extension of components lifetime, reduction of machine downtimes, and cycle time.

Nexthermal Corporation **403**

1045 Harts Lake Road
Battle Creek, MI 49015
United States
(269) 964-0271

Ningbo Coway Surface Treatment Technology Co., Ltd. **912**

No. 18Nanhai Road, Xingi Street
Beilun District
Ningbo, Zhejiang 310000
China
0574 86556929

Ningbo Dongen Precision Machinery Company **819**

No 181, Qinge Rd., Chunxiao
Industrial
Beilun, Ningbo 315800
China
(373) 882-9261
www.dongenprecision.com

Ningbo Hansen Precision Machinery Co., Ltd. **302**

No 68 Oulanqiao Rd. West
Ningbo, Zhejiang 315010
China
+86 13957473218
www.nb-hansen.com

Ningbo Haoli Metal Co., Ltd. **1140**

15# Longtanshan 3rd Road
Daqi, Bei Lun District
Ningbo, Zhejiang 315800
China
86 574 86103889
www.haolimetal.cn

Ningbo K&A Machinery Co., Ltd. **1117**

No. 128 Huizhom Road,
Yinzhon Area
Ningbo City, Zhejiang 315040
China
8615958270291
www.bestdealgr.com

Best Deal Group (Ningbo K&A Machinery Co., Ltd) was founded in 1995 and has since evolved from a small mold shop to a professional manufacturer specializing in Engineering and Design, Rapid (Prototype) Tooling, Aluminum Zinc Magnesium Die Casting, low pressure casting and gravity casting. With nearly 30 years of experience, we offer customizable and cost-effective manufacturing solutions to help our customers save costs. Our one-stop service delivers goods directly to your door.

Ningbo Moldie Mold Co.,Ltd **1108**

No 1 Lane 1000 Yunshan Road
Meixu Street
315048 Ningbo Zhejiang
China
86-574-55861678
moldiecasting.com/

Ningbo NRH Machine & Electrical Co.Ltd. **712**

No. 8-2 Hailing Road Daqi Strett
Beilun District
Ningbo, Zhejiang
China
86-13023755750
www.nrh-china.com

Ningbo TianZheng Mould Co. Ltd. 908

Daxie Development Area
Ningbo, Zhejiang 315812
China
(920) 266-6990
www.tzmc.com

Ningbo Tian Zheng Mould Co., LTD(TZMC) is located in Ningbo city, Zhejiang province, China and established in 2000. Our company design and manufacture of die casting mold.For auto parts, medical devices, lighting systems, communication products and other fields. Especially for big Magnesium die casting mould. Our products are exported to North America and Europe and also Asia.

Ningbo Zongchi Machinery Technology Co., Ltd. 1119

88 Da Ta Road
Beilun District, Ningbo City
Zhejiang 315000
China
(365) 134-4068

NovaCast USA Inc. 817

1952 McDowell RD
Naperville, IL 60563
United States
(630) 450-1647
www.novacastusa.com

OEE Companies 318

855 Village Center Drive #336
Saint Paul, MN 55127
United States
(612) 440-5714
www.oeecompanies.com

OEE Companies supplies tooling, tooling components and peripheral equipment for high pressure die casters. - Chill vents - Unit dies - Conformally cooled inserts - Custom shot end components - Standard ejector pins, die springs and consumables - Jet cool pins - Small diameter cooling machines - Vacuum systems

Patterson Mold & Tool 117

1005 Portwest Dr
Saint Charles, MO 63303
United States
(636) 940-9988

Patterson Mold and Tool is a full-service tool and die facility, serving the casting industry for 45 years. Our team of experienced and skilled craftsmen, array of CNC equipment, and quality system, (meeting both AS9100 and ISO 9001 standards), combine to make us a competitive and trusted supplier to our customers. Our products range from unit dies to dies for 3,000-ton machines, trim dies, and machining fixtures to complement our casting dies.

Pegasus Industries 417

12380 Beech Daly Rd
Redford, MI 48239-2433
United States
(313) 937-0770
www.pegasustcs.com

Pfeiffer Vacuum 118

24 Trafalgar Square
Nashua, NH 03063
United States
(800) 248-8254

Phygen Coatings Inc 601

1400 Marshall St NE
Minneapolis, MN 55413-1040
United States
(612) 331-4224

Phygen's XVD surface enhancement reduces soldering, erosive die wear and minimizes heat checking on core pins and dies with a one-of-kind improved PVD process. Phygen solutions offer extended die life and improved "as cast" part quality for your most demanding needs and has been a leader in innovation and research advances in the die casting industry. Phygen offers tailored solutions and personal customer service.

For more information, please visit www.phygen.com or reach out to us at quote@phygen.com

Plansee USA LLC 917

115 Constitution Blvd.
Franklin, MA 02038
United States
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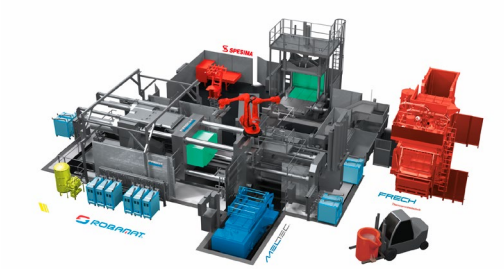

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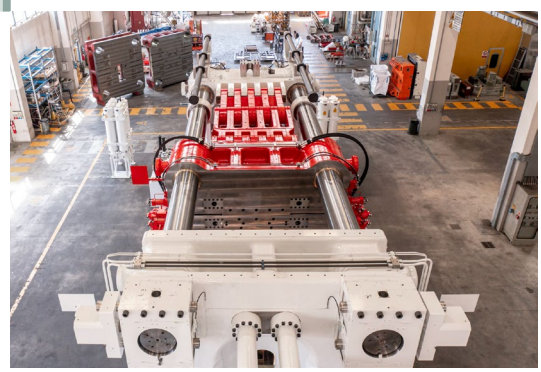

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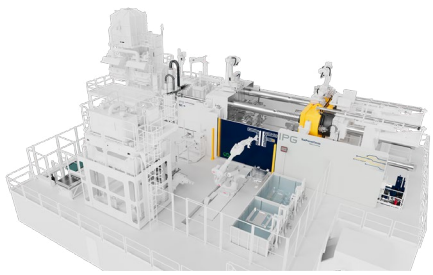

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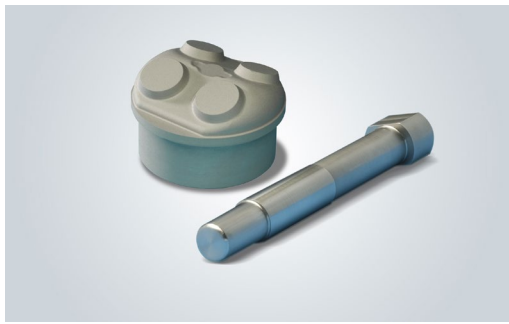

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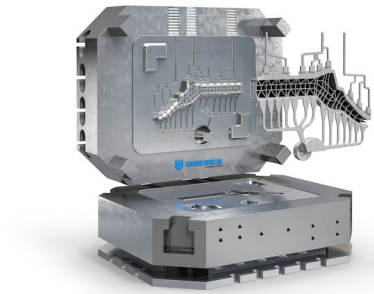

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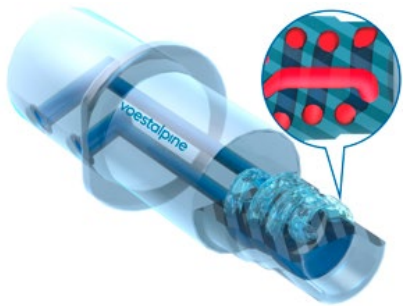

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CONGRESS SESSIONS

MONDAY SEPTEMBER 30		TUESDAY OCTOBER 1		WEDNESDAY OCTOBER 2
ROOM 120	**ROOM 124**	**ROOM 120**	**ROOM 124**	**ROOM 120**
Additive Manufacturing Uses in Die Casting (8:00 - 9:30 am)	Improving Aluminum Die Casting Alloys (8:00 - 9:30 am)	Process Controls Through Simulation (8:00 - 9:30 am)	Update on US Government Affairs (8:00 - 9:00 am)	Post Die Casting: Technologies & Techniques (8:00 - 9:30 am)
Failure & Quality Analysis of Additively ManufacturedTooling (9:45 - 11:15 am)	Die Casting Sustainability (9:45 - 11:15 am)	Innovative Die Casting Materials (9:45 - 11:15 am)	North American On-Shoring and Near-Shoring (9:45 - 11:15 am)	Thermally Controlling the Die (9:45 - 11:15 am)
BREAK		BREAK		BREAK
Advanced Tooling Materials and Processes (1:00 - 2:30 pm)		Die Casting with Artificial Intellegence (2:00 - 3:30 pm)	Protecting the Die from Molten Aluminum (2:00 - 3:30 pm)	Structural Die Casting Challenges (12:30 pm - 1:00 pm)
		Metal Melting, Treatment, & Transportation (3:45 - 5:15 pm)		Optimizing Die Casting with Computer Modeling (2:15 - 3:45 pm)

Schedule as of 8/7/24. Subject to change.

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MONDAY, SEPTEMBER 30

ADDITIVE MANUFACTURING USES IN DIE CASTING

8:00 - 9:30 am
Session Chair: Ante Lausic
Room 120

Case Study of A Serviced AM 3D Printed Maraging Insert in HPDC

Q. Zhang, J. Tutterrow, J. Harmeyer, N. Norvell, J. Hewitt, D. Sachs, T. Tsuwano (Ryobi Die Casting); W. Shen, H. Hu (University of Windsor); J. Wang, J. Zhang (Indiana University - Purdue University Indianapolis)

The application of additive manufacturing (AM) 3D printed die inserts with conformal cooling channels has been increasingly used in high pressure die casting (HPDC) in recent years. This is because the 3D printed die steel with conformal cooling lines demonstrated many advantages, such as improving the surface finish, allowing a higher and more uniform cooling rate, reducing cycle time and shrinkage porosity, and so on. Among various types of 3D printed die steels applied to HPDC, the AM 3D printed maraging steel as one of die insert applications becomes popular in the high pressure die casting industry recently. Today the most of AM inserts in production for HPDC tooling is AM 3D printed maraging steel. To understand its characteristics of application. In this case study, a serviced 3D printed maraging steel insert which was out of service from production line was selected for investigation. The chemical composition of the AM 3D printed maraging steels was analyzed by inductively coupled plasma-optical emission spectrometry (ICP-OES). The microstructure was evaluated by optical microscopy, and the Rockwell hardness was measured. The corrosion resistance of the 3D printed maraging steel in parallel to the H13 counterpart was determined by the electrochemical method. It was found that it varied significantly with the concentration of salt solutions at room temperature. Finally, the serviced AM 3D maraging steel die insert was examined by SEM analysis. The energy dispersive X-ray spectroscopy (EDS) analysis revealed the effect of the alloy elements and segregation, such as Ni, C, and formation of intermetallic, which played key roles in causing corrosive behavior of AM 3D maraging steel, and additional washout by melt filling led to more mass losses. Consequently, they caused the failure of the AM 3D maraging steel insert during HPDC production.

Printing Hot - Carbon Steels from the Metal 3D Printer - A Great Solution for Die Casting!

C. Dörr (TRUMPF Laser); M. Dinter (Innoteque Solutions)

There are now Metal-3D printers on the market that can be used to print carbon tool steels with a very high process reliability. A solution that the die casting industry had to wait a long time for. Carbon steels such as H13, Uddeholm DIEVAR® or Böhler W360 from the Metal-3D printer are entering now massive the die casting industry and the printed inserts no longer only offer the many advantages of conformal cooling, but now also ensure a very long and safe tool lifetime in die casting.

In addition, they offer die casters and toolmakers the safety of using these steels, which they have been using and trusting in conventional production for decades. With this paper we will talk about a short description why these tool steels can now be printed additively with the so-called 500°C printers, but also we will show real practical examples, how the new possibilities are establishing themselves in the die casting industry and what great advantages they offer.

An Empirical Study of Friction Factors in Laser Powder Bed Produced Tubes

C. Vian (Purdue University)

Laser powder bed additive manufacturing is now being used regularly to produced die casting die inserts with conformal cooling, however this process leads to rough and irregular cooling channels. This roughness leads to increased pressure loss, meaning more water supply pressure is required to achieve a desired flow rate of cooling water. To engineer for this pressure loss the friction factors present in the system must be known. This study provides initial work in measuring these friction factors and provides easy to use charts for predicting the minimum expected pressure required to attain certain flow rates through conformal cooling lines.

IMPROVING ALUMINUM DIE CASTING ALLOYS

8:00 - 9:30 am
Session Chair: Alex Monroe
Room 124

Roadmap for Automotive Aluminum

C. Devadas (Hydro Aluminum Metal); J Fourmann (Rio Tinto)

The Aluminum Transportation Group (ATG) of the Aluminum Association published a Technology Roadmap for Automotive in late 2021. The Roadmap was compiled with input from over 120 stakeholders and lays a foundation for the industry to continue its growth and differentiation in the automotive sector. The Roadmap provides new directions for

optimizing the use of aluminum in the automotive sector through a number of pathways, including: design and product innovation with targeted efforts to create alloys and components that meet OEM specifications for BEVs and other propulsion systems, increased sustainability and recyclability in all aspects of aluminum production, including a focus on closed-loop recycling and lower energy and carbon footprint. The members of the ATG conduct research and provide educational material to support the automaker design engineering functions based on teams defined by product form such as Castings, Sheet, and Extrusions. A Recycling and Sustainability team, which underpins the product-focused teams, has also been established. This paper will provide an overview of the Technology Roadmap and also describe the work of the teams to demonstrate progress towards the goals and illustrate the technology development being undertaken by the aluminum industry in support of the automotive sector as it moves through transformational changes in their manufacturing processes to deliver the engineering vehicle solutions that meet or surpass consumer demands and sustainability priorities.

Controlling of Primary Alpha-Al for Super Ductile and High Strength Diecasting Al-Mg Alloys

L. Wan, B. Hu, B. Zheng, S. Cheng (CSMET New Materials Group); X. Yan (Alcoa Technical Center)

Effect of primary alpha-Al on the microstructure and mechanical properties of Al-Mg-Mn-Si alloy was studied under high pressure die casting process. The results showed that the shot sleeve temperature is critical to control the volume fraction of primary alpha-Al phase, and the casting quality and mechanical properties are strongly affected by the primary alpha-Al phase. The high efficiency grain refiner can dramatically modify the morphology of dendritic primary alpha-Al phase, then reduce the micro-segregation and benefit the quality of the die casting coupons made by Al-Mg alloys. By process and microstructure control, the Al-Mg die casting alloy can achieve superior mechanical property: yield strength at 179.9Mpa, elongation at 16.36%, and ultimate tensile strength at 311.70Mpa, without strength/ductility tradeoff for high integrity die casting components.

Influence of Subsurface Microstructure Variations on Bending Ductility of Aural™-2 HPVDC Thin-Walled Components

X. Trembley (University of Quebec at Chicoutimi), A. Gariépy, M. Javidani (National Research Council of Canada / University of Quebec at Chicoutimi)

High pressure die casting is widely employed in the automobile industry for its ability to mass produce intricate aluminium parts, including sizable structural components made of specialized alloys. However, the size and complexity of the castings, combined with the current understanding of the rapid solidification process, can limit our control over the microstructure. More specifically, the fast turbulent flow of material during filling leads to the formation of distinct subsurface microstructure variants, often visible within one casting. Given that bending ductility is generally a key performance indicator for high-integrity castings, and is expected to be largely influenced by near-surface microstructure, this paper aims to characterize the observed microstructure variations in die cast aluminum specimens and assess their impact on local bending behaviour. The microstructure variations were characterized using optical microscopy on representative specimens, revealing distinct types of subsurface microstructure variants. Samples from region expected to present different types of subsurface microstructure variants underwent VDA bending tests. Mechanical testing demonstrated that these subsurface variants influence the bending behaviour. Considering these results, a deeper understanding of the mechanisms involved in the filling process could improve die design practices. Furthermore, this knowledge could facilitate the control of microstructure formation and enhance the overall homogeneity of mechanical performances throughout HPVDC components.

FAILURE AND QUALITY ANALYSIS OF ADDITIVELY MANUFACTURED TOOLING

9:45 - 11:15 am
Session Chair: Corey Vian
Room 120

Modeling Pore Formation in Additively Manufactured High Pressure Die Casting Dies

X. He, X.M. Wang, W. Vian (Purdue University); C. Vian (Stellantis)

The presence of pores in additively manufactured high pressure die casting (HPDC) dies has emerged as a critical challenge due to its pronounced effect on both functionality and reliability. A numerical model was developed to depict the pore formation induced by molten pool instability in 18Ni300 steel. The present study employs the Laminar flow model to treat fluid dynamics, and also utilizes the volume of fluid (VOF) algorithm to track vapor-liquid water interaction. Computational fluid dynamic (CFD) simulation revealed that as the laser traversed, the keyhole within the molten pool experienced inward flow towards the center, subsequently enveloped by the liquid interface. This led to the formation and separation of gas bubbles along the laser path. These dispersed bubbles originated from ambient gas and vapor and give rise to pores due to declining temperatures and reduced fluidity of the molten metal. Upon solidification, these pores are distributed along the melt pool boundaries (MPBs).

The Study of 3D Conformal Cooling Line Leakage Mechanism

J. Zhang, Y. Pang, A. Luo (The Ohio State University); D. Eblen, W.P. Liao, P. Wang, R. Ingle (LK Machinery); Y.L. Chu (Consultant)

The application of additive manufactured conformal cooling line provides a more effective and controlled cooling condition in die casting parts, which can reduce the defects formation in the parts, reduce surface damage from soldering and reduce the cycle time. However, it also brings the water leakage issue due to the cracking formation of these conformal cooling channels. Therefore, the life of a 3D conformal cooling line insert should be considered, and the crack and leakage mechanism are of vital importance. In this paper we are focusing on the physical examination of the 3D insert outside surface and inner cooling line surface change. A robotic dipping test stand has been established to simulate the real die casting process. Various 3D conformal cooling lines with different design and channel width have been tested to investigate the internal cooling line surface change during dipping test. After more than 30K dipping cycles, we checked the 3D conformal cooling line surface changes, and sectioned the test inserts and studied the cooling line crack mechanism. The morphology of the formed cracking and the possible reasons of the cracking formation were investigated. This study may help the industry to have a better understanding of 3D conformal cooling line design strategies and reduce the failure of 3D conformal cooling lines.

Metallurgical Analysis of Failed 3D-Printed Inserts for HPDC Dies

P. Cheng (Retired); J. Brevick (Otterbein University); J. Zhang (The Ohio State University); P. Zhu, J. Huang (Tesla); Y.L. Chu (Consultant)

To create favorable conformal cooling for high pressure die casting dies, especially for the local thermal concerned die inserts, 3D printing (AM) manufacturing technology has been applied increasingly in the die casting industries. In the recent years, with the extensive applications of 3D printed die inserts, many successful examples were reported. On the other hand, some unexpected failed cases were also found in die casting production. For those failed 3D printed inserts, however, due to various reasons, few of them were detailed analyzed and limited reports published in public. In this paper, several 3D printed die inserts which were used/tested in die casting production and found failed after thousands of shots, were detailed metallurgically and mechanically analyzed. Examinations and analysis revealed that improper internal cooling/water line design, abnormal printed microstructures, improper printing powder material and post heat treatment, and improper die casting die maintenance procedure could be the leading causes of the failure of these inserts. To improve and ensure successful applications of the 3D printed inserts for die casting industry in the future, some recommendations and suggestions were presented.

DIE CASTING SUSTAINABILITY

9:45 - 11:15 am
Session Chair: Rob DeNeff
Room 124

Structural Die Casting Alloys with High Recycling Content and Low Carbon Footprint

J. Armstrong (Trialco Aluminum); M. Hartlieb (Viami International)

Structural castings have been the biggest growth sector in our die casting industry in recent years. With the continued trend of electrification of vehicles (and need for lightweighting that goes with it) as well as the new wave of Mega-/ Giga-castings, this trend seems to continue for many years. Traditional die castings were mostly found in powertrain applications using secondary alloys, especially A380 - made typically from all post-consumer scrap. Since the 2000s, aluminum and especially structural die castings have been increasingly used in light vehicles, and they were almost exclusively made from primary aluminum alloys to guarantee the high purity and consistency needed for those safety critical castings, requiring high mechanical properties, weldability, etc. Today not only post-consumer, but also an increasing amount of pre-consumer/industrial aluminum scrap is coming to the market and needs to find new homes. Know-how in terms of scrap recycling, segregation and sorting, as well as melt treatment/cleaning practices have been improving a lot. This allows us today to produce structural die casting alloys with high recycling rates and therefore low carbon footprint, without negatively impacting their quality and performance. Some of the existing alloys can tolerate higher scrap rates than others, and some newer ones offer significant potential, while others are very difficult to make from scrap. This paper describes latest trends and developments on this topic and describes which alloys can be made with which types of scrap and what are the limiting factors.

Achieving 100% Recycled Aluminum in Die Casting Applications

A. Luo, M. Moodispaw, G. Garcia, J. Zhang (The Ohio State University); X. Yan (Alcoa Technical Center); M. Gavin, J. Garren (Audubon Metals); C. Zhang, Fan Zhang (CompuTherm); P. Brancaleon (NADCA)

Recycling aluminum uses only about 5% of the energy needed for primary aluminum production. Current aluminum die castings for structural applications in the transportation industries are

made of primary alloys with strict control on impurity elements such as iron. Increasing the use of aluminum scrap in die casting applications (structural and non-structural) will lead to significant savings of energy and reduction of CO2 emissions. This paper provides an overview of a project sponsored by The REMADE (Reducing EMbodied-Energy And Decreasing Emissions) Institute. The goal of this project is to achieve 100% use of recycled aluminum in die casting applications by realizing the following two objectives: 1) substitute 100% secondary materials for primary alloys (e.g., EZCast and Aural-2) in structural die castings with no degradation in properties; and 2) improve the mechanical properties of the current secondary alloys (e.g., A380 and A383) for non-structural applications. Based on an integrated computational materials engineering (ICME) approach, the project scope includes: 1) thermodynamic assessment of impurity neutralization modeling; 2) CALPHAD (CALculation of PHAse Diagrams)-based alloy design using secondary aluminum; 3) ICME tool development for high pressure die casting and heat treatment; 4) Experimental validation of new alloys (microstructure and mechanical properties) and simulation tools; and 5) technology transition and training in the domestic die casting industry to strive for 100% use of recycled aluminum in die casting.

Sustainable Materials in Automotive Body Engineering – The Role of (Giga-) Casting Technology to meet Net Zero Targets

V. Rohwer, S. Krinke, D. Lehmhus, C. Pille, D. Fendt (Fraunhofer Institute)

For battery electric vehicles, the sustainability focus has shifted from use to production phase, and while battery packs account for the majority of CO2eq, the body in white is closely following, with raw material production a crucial factor. At the same time, foundries supplying the automotive industry are confronted with a massive change in demand, as engine blocks, cylinder heads and gearboxes can only partly be replaced by electric motor, power electronics or battery housings. Hence there is an industry-wide move towards structural applications. An outstanding example of this kind is Gigacasting, established by Tesla introducing a single-piece casting as rear underbody in their Model Y. Common problem of such aluminum-rich automotive designs is the carbon footprint associated with primary aluminum production. Meeting sustainability targets thus either affords sourcing low CO2eq production primary aluminum, or switching to secondary aluminum. This, however, is hampered by limited availability. Against this background, the Fraunhofer Society has initiated a large-scale project, FutureCarProduction, focusing on concepts and tools to facilitate consideration of sustainability besides performance and cost in early stages of automotive product development. From a casting technology perspective, the evaluation focus is on Gigacasting, and alternatives to this approach like compound casting, or overcasting, facilitating the use of conventional HPDC equipment while still relinquishing subsequent joining processes. The present work outlines the sustainability challenge, provides an overview of the issue of secondary aluminum alloys for structural automotive applications, and outlines the FutureCarProduction project with respect to approaches and initial results.

ADVANCED TOOLING MATERIALS AND PROCESSES

1:00 - 2:30 pm
Session Chair: Steve Midson
Room 120

High Thermal Conductivity Steel – Thermodur® 2383 Supercool – in the HPDC Injection System

A. Magistrelli (B.A Bonomi Acciai); D. Frie, L. Henke, L. Schlund (Deutsche Edelstahlwerke Specialty Steel)

The Die Casting Industry is more and more often looking for the possibility of increasing the productivity of its production processes, without neglecting the aspect of the durability of the equipment.

HPDC molds increasingly present very complex geometric conditions. At the same time, increasingly stringent mechanical properties and quality requirements are needed from die casting parts in order to guarantee high performance.

It is therefore clear that the management of temperatures inside the mold is of fundamental importance to guarantee the quality of the casting, on the one hand, and the performance of the mold, on the other hand. Thus, the thermal management of the mold should be improved without neglecting the lifetime of the mold components.

Special, high-performance hot work tool steels, which allow the cycle time of the die casting process to be significantly reduced, help to guarantee improved lifetime to the entire injection system. Based on the excellent thermal shock resistance of the die material, the lifetime of the entire injection system is increased.

In order to offer advantages to die casters we present our new high thermal conductivity steel – Thermodur® 2383 Supercool – in terms of mechanical properties, physical properties and enhanced tempering and thermal shock resistance in this technical paper. Additionally, we include successful case studies, related to the HPDC injection system.

Heat Check Resistance Hot Work Tool Steel – Thermodur E 40 K Superclean

J. Stocker, L. Henke, D. Frie (Swiss Steel Group)

Die casting applications require high-quality hot work tool steels that have the best property profile for the part to be produced. For steel producers, the requirements of the market are the most important starting point for further developments. The most critical parameter in die casting applications is

heat checking resistance. To meet this requirement, Swiss Steel Group had developed Thermodur E 40 K Superclean that has been tested and approved by NADCA's die material committee.

Over the last several years, numerous field trials were completed and the feedback from the die casters confirmed our expectation of heat checking performance. In this paper we present a few of the most important field studies for Thermodur E 40 K Superclean showing the benefit for the die casters.

High Toughness Steel Grades for Huge Molds of Die Casting

T. Masuda, M. Kawano, M. Hobo (Daido Steel); D. Mitchell (International Mold Steel)

The integral casting to make car bodies is one of the trends of die casting1. The process to create these integral castings is often referred to as giga casting. The gigantic molds have a higher risk of gross cracking due to low toughness at the core. The low toughness comes from coarse microstructure caused by slow quenching rate. So far, Daido Steel has been developed high hardenability grades, DHA-WORLD and DH31-EX to produce a clean microstructure in large castings. Building on this work, new grades with higher toughness for giga molds are being developed.

This study shows the various properties of developed grades compared with conventional grades. Additionally, the heat treatment trial results for a very large block are shown.

1. The gross cracking on the large mold is initiated from coarse primary carbide due to slow solidification at making the large ingot, and rough microstructure due to slow cooling at quenching.
2. We are developing two new grades, HT Type (Hardened and Tempered), and PH Type (Pre-hardened). These two grades exhibit excellent hardenability from alloy design. Its bainitic transformation start temperature is lower than H13 which suppress to be a rough microstructure under slow cooling.
3. A 600mm thick block (approximately 2.5MT) of the HT Type was heat treated by vacuum furnace. The toughness at the core was good. And hardness was evenly distributed on the cross section near the 1/4 position. Machinability of gun drilling with 43 HRC block was better than the H13 modified grade.

TUESDAY, OCTOBER 1

PROCESS CONTROL THROUGH SIMULATION

8:00 - 9:30 am
Session Chair: Carl Soderhjelm
Room 120

Simulation of Die Filling for Steel in High-Pressure Die Casting Process

D. Portillo (University of Alabama)

This paper discusses the ongoing interest in High-Pressure Die Casting (HPDC) for manufacturing steel and other high-temperature alloys. While established practices exist for die casting low melting point alloys, their suitability for high melting point alloys remains uncertain. To address this gap, the HPDC process is deconstructed into sections to investigate individual variables. Key parameters such as gate velocity, filling time, and area are examined. This study reviews existing literature on these parameters and their impact on high melting point alloys such as steel. Three simulations, conducted using different software, analyze steel flow during die filling, based on geometries and parameters outlined by Wallace and Belov. These simulations leverage steel's physical properties to validate previous findings. The results provide valuable insights into recommended process parameters for producing high-quality steel parts via HPDC.

A Formation Mechanism of Externally Solidified Crystals in Aluminum Die Casting Process

J. Zhang, N. Trometer, A. Luo (The Ohio State University)

Die casting of aluminum is used for lightweighting in the automotive and other industries. These castings have good mechanical properties, but the presence of externally solidified crystals (ESCs) can considerably reduce the mechanical performance, especially the elongation of the cast components. ESCs can be categorized into two groups: Type I with large aplha-Al dendrites and Type II with large crystals of fine dendrites and a clear boundary with the matrix. In this study, the formation of these two types of ESCs and their motion during the casting process were investigated. The effect of process parameters on the formation and of these two ESCs was studied by die casting trials, computer simulations and water analog experiments. The results showed that both types of ESCs were formed in a shot sleeve. Type I ESCs form in the shot sleeve, floating in the melt. Type II ESCs were found to form along the shot sleeve wall and plunger tip after pouring and can be reduced by increasing the melt temperature. Both types of ESCs were carried into the die cavity during filling process and their distributions were closely related to the fast shot speed and the turbulence of the molten aluminum. A reduced fast shot speed can greatly reduce the number of ESCs transported into the die cavity, especially Type II, which greatly improved the related mechanical performance.

Accelerating the Scalability of PrintCast structures using High Pressure Die Casting

H. Hyer, A. Ziabari, S. Dryepondt, D. Splitter (Oak Ridge National Laboratory); F. Sant (Falcon Lakeside Manufacturing)

PrintCast composites are fabricated by infiltrating a metal mesh or preform (e.g., a additively-manufactured 316L lattices) with molten metal of a lower melting temperature (e.g., A380 aluminum). The resulting PrintCast composite has been shown in the literature to produce diverse and unique mechanical properties that are controllable at the local or global level by adjusting volume-fraction and/or topology of the preform's geometry. Although promising mechanical and thermal properties have been achieved at the laboratory scale level, the scalability from laboratory to full scale components has been limited using conventional casting infiltration. This work highlights how using high pressure die casting can significantly advance the development and eventual deployment of PrintCast approaches at large scales. We have successfully produced 227 mm x 152 mm x 25 mm thick PrintCast 316L stainless steel/A380 aluminum "panels" via high pressure die casting. Initial findings show excellent infiltration and production capability. The resulting approach demonstrates the scalability and manufacturability of hybrid cost effective metal-metal matrix composites at larger length scales with high quality infiltration results.

UPDATE ON US GOVERNMENT AFFAIRS

8:00 am - 9:00 am
Presenter: Omar Nashashibi
Room 124

Politics is thrust into the spotlight in Presidential election years. Omar S. Nashashibi of the Franklin Partnership, NADCA's lobbyist in Washington D.C., will provide insight for the upcoming election and what it could mean for the die casting industry.

INNOVATIVE DIE CASTING MATERIALS

9:45 - 11:15 am
Session Chair: Alan Luo
Room 120

Characterization of the Microstructures and Properties of Steel Die Castings Produced During Plant Trials

D. Portillo, C. Monroe (University of Alabama); S. Midson (Colorado School of Mines)

A five-year research project, funded by the Defense Logistics Agency and focusing on extending the high pressure die casting process to produce steel die castings, has just been completed. During the project, five steel die casting trials were performed at Mercury Marine and more than 100 die castings were produced from nine separate steel alloys. The alloys ranged in scope from stainless steels, tool steels, low carbon steels, and low alloy steel compositions. The production of these castings have been documented in papers published at previous years' congresses. The objective of this paper is to characterize the microstructure, properties, and performance of the steel die castings. The microstructures of castings produced from the steel alloys will be documented in this paper. To characterize porosity content and distribution, the internal quality of the castings has been documented, using both conventional 2-dimensional x-rays, and via CT scanning. Properties of the steel die castings have been measured using both hardness, together with mechanical properties of selected alloys. In addition, the aging response of the precipitation-grade stainless alloy has been measured, and is compared to that of material produced using conventional wrought approaches.

Solder Resistant Alloys Through Tresca Friction Criteria Optimization

J. Belke (Mercury Marine); P. Sanders (Michigan Technological University)

For almost 100 years, aluminum die casters have been battling die solder using coatings, lubricants, and high iron contents to no avail. Die casters have started moving away from the traditional notion that solder is Al-Fe intermetallics and towards the Tresca friction criteria. A solder-prone production HPDC alloy was compared with a Tresca-criteria optimized alloy where a minimum of 0.6 wt% magnesium was predicted to mitigate solder in cored holes. The results of the trial showed that the higher Mg alloy reduced the soldering behavior of the casting. Microscopy and SEM-EDS revealed a microstructural dependency on solder formation as areas that had a skin, and no porosity were less likely to solder. Mg was found to increase the number of fine precipitates near the surface instead of forming a skin. The microstructure morphology and subsequent solder formation was cooling rate dependent.

The Effect of Secondary Material on the Properties of Aluminum HP-DC Alloys for Structural Components

S. Wiesner, K. Wandrekar (Aluminium Rheinfelden Alloys)

The increasing demand for reduced carbon footprint and geopolitical autonomy underscores the necessity for high content of secondary material in cast aluminum alloy production.

This study investigates the production of AlSi-alloys, including AlSi10MnMg (Silafont-36), AlSi7MnMg (Silafont-33), AlSi9MnMoZr (Castasil-37) and AlSi9Cu3 (380), utilizing different scrap sourced such as wheels or cans. Various heat treatments (status F, T5, T7) and quenching methods were explored to optimize alloy properties.

Furthermore, the development delves into the AlMgFe alloy family variations, such as AlMg4Fe2 (Castaduct-42), AlMg4Fe1Si (Castaduct-42 Eco), and AlMg4Fe1Mn1Si (Castaduct-51), produced from secondary aluminum sourced from extrusions and cans. Mechanical property results in the as cast status are presented, alongside discussions on their impact on castability, corrosion resistance, machining, and joining capabilities.

Additionally, the study calculates the carbon footprint of the alloys and presents a project aimed at disseminating information about alloy properties through a chatbot interface. Through comprehensive

exploration and analysis, this research aims to contribute to the development of environmentally sustainable and technologically advanced cast aluminum alloys for diverse applications in the automotive and manufacturing industries.

NORTH AMERICAN ON-SHORING AND NEAR-SHORING

9:45 - 11:15 am
Presenter: Paul Brancaleon
Room 124

The pandemic, in 2020, followed by supply chain issues, have exposed the dangers of producing parts far from where they are assembled. Additionally, tariffs on foriegn made parts and the USMCA trade agreement have caused U.S. original equipment manufacturers (OEMs) to look at sourcing components closer to home. Paul Brancaleon, NADCA Executive Director of Research, Education, and Marketing, will provide an update on manufacturing business coming back to the United States (on-shoring) and to Mexico (near-shoring).

DIE CASTING WITH ARTIFICIAL INTELLIGENCE

2:00 - 3:30 pm
Session Chair: Adam Kopper
Room 120

Study on the Use of Sensor-Derived Parameters on the Injection and on other Components of an HPDC Machine for the Purpose of Predictive Maintenance

T. Tronci, L. Metelli (Gefond); P. Catterina (Visi-Trak Worldwide)

The production of constant quality castings on a HPDC machine is strongly determined by the state of efficiency of many components directly dependent from the full control of the injection parameters. The maintenance activities that contribute to the repeatability of the injection parameters are crucial for this goal.

Among others, the state of the accumulator cylinders and of the injection cylinder, the tightness of the nitrogen pressure and the temperature of the hydraulic fluid are important indicators of the perfect hydraulic and mechanical efficiency of the injection system.

The presence of sensors on all these components allow to perform precise data collection, data that are used to feed special machine learning algorithms that are thus able to predict system drifts. The research started from this assumption and allowed to structure algorithms that maintain real-time monitoring of some of these predefined parameters: 2nd-phase oil pressures, 3rd-phase oil pressures, 2nd-phase nitrogen pressure, 3rd-phase nitrogen pressure, hydraulic circuit oil pressure, hydraulic fluid temperature.

Using Artificial Intelligence models to identify abnormal behavior, through the Perpetuo system developed by Gefond, data collected from sensors installed on the equipment or from machine PLCs were transformed into meaningful information used for predictive maintenance of mechanical, electrical, hydraulic and pneumatic parts subject to wear and tear or failure. The same system, also feeded by parameters acquired from Visi-trak's monitoring software, provided additional and more accurate information with the purpose of ensuring repeatability and predictive control of machinery and process.

The analysis procedure was done directly on the field over a technically complex production. This was useful to identify suitable sensors in terms of resolution and acquisition speed. The project also led to the definition of a network architecture for data collection and to the construction of the most suitable tools for the pre-analysis. The collected data were used for training the analysis algorithms and detecting the false positives in the starting phase of the project. At the end of the training, the predictive maintenance algorithms identified anomalies in the integrity of the hydraulic systems, which affected the injection parameters.

Industry 4.0: Accelerating Your Foundry's Performance Through Digitization

J. House (Sinto America); J. Wenson, D. McClure (Sinto America, BEET Analytics Technology)

Imagine a foundry environment where operational data arrives in real time as it is generated. Instead of reacting retroactively to failures, picture using this data to prevent and preempt such issues. How much effort is currently expended daily to manage these complexities? How much more could be accomplished if these challenges did not occur every day? This scenario exemplifies just one of the numerous advantages of a smart foundry system. Empowered by real-time analytics and data, smart foundries can leverage this information to derive actionable insights, ensuring equipment consistently operates at peak performance.

Capturing this data and deriving insight remains exceptionally challenging. It necessitates integrating operational technology (OT) with information technology (IT), tying together various original equipment manufacturers (OEM), synchronizing events and variables, and ensuring data veracity for a variety of stakeholders. By implementing a unified, vendor-agnostic, cloud-based data analytics system, many of these obstacles can be overcome. Foundries adopting such systems have reported up to a 15% reduction in downtime, 25% increase in efficiency, and 10% decrease in scrap. Harnessing data to pinpoint bottlenecks, establish operator benchmarks, schedule maintenance, automate production reporting, and manage process parameters represents just a fraction of what is achievable with a smart foundry system.

Optimal Data Strategies and Augmentation Techniques for Enhanced Anomaly Detection in Industrial Applications

B. Zhang, X. Wang, B. Yang (Purdue University); C. Vian (Stellantis)

Die casting is pivotal in various industries for creating intricate, precise, and smooth objects. However, surface defects significantly impact quality control. Recent studies have explored computer vision to automate defect detection. Models are trained solely on defect-free samples to identify defects at both the image and pixel levels during inference. However, the success of these deep neural networks largely depends on access to high-quality data, which is frequently limited, expensive, or slow to gather. In this study, we aim to determine the minimal dataset size required for effective anomaly detection using models trained exclusively on defect-free samples, without the need for pixel-level labeling. Additionally, we will explore which data augmentation techniques are most beneficial when data availability is limited. This work bridges the critical gaps in current methodologies and application and lays the groundwork for future advancements in anomaly detection with limited datasets.

PROTECTING THE DIE FROM MOLTEN ALUMINUM

2:00 - 3:30 pm
Session Chair: Peter Ried
Room 124

The Evaluation of Deformations in High Pressure Die Casting Molds: a Comparative Study using FEM and FEEA Method

T.S. Ribeiro, C.A. Costa (University of Caxias do Sul); C.M. Sacchelli (Federal University of Santa Catarina)

In the aluminum High Pressure Die Casting (HPDC) molds process design, filling simulation is carried out often, however structural analysis is not very common. Knowledge about the loads placed upon the mold is important for the safety of the operation, for the quality of the part casting and for possible material savings. Among some analysis methods, there are the Finite Element Method (FEM) and the Finite Element External Approximation Method (FEEA), however both have particularities. The aim of this work is to evaluate the two methods by analyzing the results in terms of outputs and practicality. In order to develop this study, an actual HPDC mold was simulated under mechanical, thermal, and combined loads, to understand the contribution of each type of loading to the deformation of the components. It was observed that on the fixed side of the mold, thermal loads had a greater effect, while on the moving side, mechanical stresses are the main source of deformations. Further work is being performed on varying the bottom thickness of the mold components to check how these computational tools can support material savings during the design process. Finally, comparing the two methods in the experiments shows that it has potential for implementation in tool shops, with relatively accurate results, ease of use, and quick solving. Although the FEM is more accurate in terms of the defined mesh and importing the temperature profile from others software, FEEA method has some advantages in terms of processing time and learning curve for final users.

Preparation of a High-Performance Coating Using Cathodic Vacuum Arc Deposition for Die-Casting Molds and Its Characterization

K. Kawata (Kawata PE Office); N. Inatsu, T. Tatsuno, R. Iijima (Castec)

Aluminum die-casting molds must have exceptional soldering and erosion resistance to enhance productivity and maintain product quality. Therefore, various surface treatments have been applied to meet these requirements. The cathodic vacuum arc deposition (CVAD) method has emerged as a promising technique for creating ceramic coatings at low temperatures. Ceramic coatings produced by CVAD are widely used owing to their superior soldering and erosion resistance compared to those achieved through nitriding treatments.

A newly developed AlCrSiN/CrN/TiN multilayer coating for aluminum die-casting molds via CVAD has shown higher wear and heat resistance than traditional ceramic coatings produced using CVAD. Additionally, these coatings demonstrated remarkable properties that make reactions with molten aluminum alloy challenging. Evaluations included aluminum soldering tests with and without mold-release agents, corrosion resistance tests in molten aluminum alloys, friction and wear tests at room and elevated temperatures, and micro-slurry-jet erosion tests. Furthermore, this paper discusses the practical results of applying the AlCrSiN/CrN/TiN multilayer coating to actual aluminum die-casting molds.

Resistance of several Tungsten Heavy Alloys in Aluminum Die Casting Application

R. Cury (Plansee Tungsten Alloys); R. Stahl, C. Glofelty (Mi-Tech Tungsten Metals); P. Rudnik (Plansee USA); P. Hofer, Patrick Genewein (ÖGI)

Foundry industry permanent components (such as cast molds, pins, cores and die inserts) in contact with molten materials demand a combination of properties to resist liquid metal embrittlement, wear, and solidification stresses. Tungsten heavy alloys are specifically suitable for the casting of aluminum since they show primarily higher tool life than any other usual die material such as hot working steels. Hence, several different alloys were tested in a crucible with Al melt at 750°C at different times of exposition. The weight loss and general microstructure was evaluated after the test showing

the differences between the materials tested, indicating that the resistivity against liquid Aluminum of all materials is undoubtedly higher than that of iron-based materials.

METAL MELTING, TREATMENT, AND TRANSPORTATION

3:45 - 5:15 pm
Session Chair: Charles Monroe
Room 120

"Isomelting" Technology by Lethiguel: Melting and Holding Aluminum using Conductive Electrical Immersion Heaters

G. Levacher (Lethiguel Group)

A sizable portion of the energy used for an aluminum die-casting operation goes into the melting process of the solid metal, and into its holding process in liquid form, thus it is understood that the total cost of furnace ownership is greatly impacted by the energy consumption, and the loss of metal generated by the melting and holding processes themselves. It is estimated that Melting furnaces use up to 77% of all energy consumed by aluminum die casting facilities. As die-casting operations are under pressure to decrease their CO2 emissions, emerging alternative technologies offer technical solutions to operate that transition, while also enabling to optimize productivity and decrease the metal losses.

The principal of isothermal melting (melting solid aluminum by immersing it into liquid aluminum) has been known and used for years in different niche applications. Building on existing practical experiences from cast houses and recycling industries, Lethiguel has developed a modular and scalable technology allowing to melt solid aluminum in capacities ranging from several hundred up to several tons per hour.

This technical paper shall present and explain the melting of solid aluminum into an existing bath of liquid aluminum, using electric energy provided by conduction. Taking advantage of the high thermal conductivity of aluminum, this 100% electric melting technique provides extreme efficiency with 99% of the energy being transferred to the metal itself. Past practical applications have shown that measured energy consumptions range from 300 to 350kW/hour/Ton for melting, and only 10 to 15kW/hour/Ton for holding at a given temperature setpoint.

The isothermal electric melting technology can either replace central melting furnaces, as well as offering a solution to optimize the complete die-casting process: because both melting and holding can be performed at the die-casting machine directly, this offers more flexibility in the manufacturing and operation process (multiple alloys can be handled as each die-casting cell can have its own alloy), as well as cutting down energy costs incurred by the conveying of molten metal.

This paper will first offer a "state of the Art" outlook, and a comparative analysis of the different existing melting technologies and their technical characteristics. While looking more closely at the technical alternative offered by isothermal melting with electric conductive immersion heating, we shall present field data and recorded performances as well as measurements collected in a variety of different tests performed in different applications in the recent years.

We will explain how our isothermal melting furnaces are operated and how they work in a die-casting operation. We will also present the results gathered thanks to our P.O.C (proof of concept) and demonstration melting furnace that is installed and used in our plant in France.

The paper brings forward precise records of temperatures, energy consumption, material input, timeframes, as well as images and views of our existing and operating melting furnace.

Chemical Products and Rotary Degassing for Structural Die Cast Aluminum Components – Results from a Field Study

K. Berndt, P. Schuetten (Foseco Europe); R.M. Simon (Foseco NAFTA)

This paper proves in detail and with the participation of industry (Magna Cosma Soest, Germany) and science that under today's technological conditions the use of granulates in die casting of aluminum structural parts is not only harmless but also economically and ecologically important.

Beyond Boundaries – Unveiling Breakthroughs in Vacuum Dosing Technology for Mega & Giga Foundries

A. Harrison, R. Burgstaller (Meltec Industrieofenbau)

Since Tesla started setting new standards for casting applications, the terms Mega & Giga Casting have dominated and accelerated the technical developments within the die casting industry. Linked to this magnified size is naturally the increased need for energy. To promote resource preservation during the melt dosing process as part of the casting cell, MELTEC Industrieofenbau GmbH more than meets this challenge with its fully automated vacuum dosing technology. In addition, MELTEC has pushed the existing limitations to an outstanding set of performance data, which for 150 kg of aluminium include an intake time of 15 seconds, a dosing speed of up to 20 kg/s and a dosing accuracy of less than ± 350 g.

MELTEC has been producing high-end furnace and dosing technology for the die casting industry for over 20 years. The main challenge lies in the highly efficient transfer of the aluminium melt from the furnace to the shot sleeve. From the process perspective the focus is on high dosing accuracy, temperature stability as well as minimized oxide formation during the intake, transfer, and pouring. In line with these quality-based properties, MELTEC also delivers on the environmental aspects: Significant energy savings due to a closed dosing system with a low thermal conductivity, hence resulting in a lower

necessary melt temperature in the furnace.

As an essential part of any Mega & Giga foundry, MELTEC's vacuum dosing technology does not only ensure a stable process, but also contributes to the much-needed environmental compatibility of future green foundries.

WEDNESDAY, OCTOBER 2

POST DIE CASTING TECHNOLOGIES AND TECHNIQUES

8:00 - 9:30 am
Session Chair: Yeou-Li Chu
Room 120

Plasma Arc Cutting to Enable High Volume, Large HPDC Parts Manufacturing

S. Mitra, J. Lindsay, M. Wittmann (Hypertherm Associates)

The rise of mega-casting, propelled by the adoption of large high-pressure die-casting (HPDC) systems, has created a pressing need for efficient alternatives for trimming castings. Traditional methods, such as trim presses, have significant drawbacks like high investment, long lead times, costly design changes, and limited effectiveness with large cast parts. Mechanical saws and shears, while used in some assembly processes, face limitations in scalability for high-volume production.

Enter plasma-cutting robotic cells—a flexible, adaptive, and scalable solution. These systems utilize plasma arc-cutting (PAC) technology to trim gates, runners, and flash from castings. Mounted on industrial robots, plasma torches efficiently handle various casting designs within a single cell. Plasma cutting is relatively insensitive to standoff height, making it an ideal choice for complex parts and large-scale production.

High-pressure cast aluminum alloys are designed to have mechanical properties that are largely insensitive to cooling rate1, making them well suited for thermal cutting processes like PAC. This study examines the effects of cutting speed on the edge appearance and metallurgy of Aural 2S and A380 aluminum alloys.

Enabling Aluminum-Aluminum Compound Casting in HPDC: Material Joints for Structural Applications via Cold Spray Coating

D. Lehmhus, C. Pille, J. Clausen (Fraunhofer Institute); A. List, F. Gärtner, T. Klassen (Helmut-Schmidt-University)

The interest in hybrid and compound casting, or overcasting, for automotive structural applications is based on the promise of realizing multi-material, lightweight structures without separate joining operations. The present study is focused on Al-Al compound casting, which is hampered by the natural oxide layer of aluminum substrates. To overcome this obstacle in high pressure die casting (HPDC), cold spray coating is applied to establish a material joint between casting and insert via formation of transient liquid phases during casting and solidification. The advantage of this process is the kinetic energy of the coating particles, which enables breaking the oxide layer and prevents its renewal by immediately covering the exposed bare aluminum. Initial experiments following this approach have been performed using Cu, CuZn14, CuZn37 and ZnMg2.7 powders for coating of AA 5754, AA 6061 and AA 7075 substrates. As casting alloy, AlSi10MnMg was chosen. First test series focused on identifying promising material combinations, deriving mechanical characteristics and evaluating the possibility of further property enhancment via heat treatment. Additional investigations considered the thermal impact of the casting process on AA7075-T6 substrate properties. Casting relied on IFAM's Bühler SC N/66 HPDC machine and an experimental die providing lap shear test samples. All samples in as cast and heat treated state exceeded the standard benchmark in in shear strength of 20 MPA, as given by structural adhesives employed in the automotive industry. According to metallographic studies, the high strengths were attributed to reaction layers at the interfaces between cast material and insert.

ERWin®, a Robust Welding Insert Solution to Join Low & High Ductility High Pressure Die Casting Parts to Steel Structures on Standard Body-In-White Spot-Welding Assembly Lines, Stellantis Application

M. Grojean, A. Grojean, R. Alain, S. Farrell (Gaming Engineering); M. Tedesco (Stellantis)

Structural body Aluminium high pressure die castings, like shock towers, are usually assembled with self-piercing rivets (SPR) to the Body in White (BiW). Apart from the high costs and investments required, this joining technology also requires high ductility parts to ensure crack free riveting. In many cases, such levels of ductility are not required for the function of the part on the vehicle. These high elongations are achieved using primary alloys, vacuum die casting and full heat treatments, at a time when the HPDC industry is searching to reduce CO2 emissions by suppressing heat treatments and moving towards recycled alloys that will tend to be more brittle.

In this context, Gaming Engineering has developed a specific Resistance Welding Insert, named ERWin®, that can be punched into low ductility die casting alloys, allowing afterwards the lightweight part to subsequently be welded to the BiW using the existing standard spot-welding equipment of the car makers.

The specificity of this insert lies in its very specific design, which ensures a strong connection to the BiW, no damage induced to the lightweight material both at the insertion stage and at the welding stage, and high tolerance to casting wall thickness variations and electrodes offsets. Moreover, the ERWin® joints can be disassembled for repair or end-of-life recycling.

The solution allows cost and CO2 savings, by the suppression of the heat treatments and the

integration of recycled materials, opening new opportunities for structural die-casting applications and alloys. The ERWin® is now used by Stellantis on the new Maserati GranCabrio.

THERMALLY CONTROLLING THE DIE

9:45 - 11:15 am
Session Chair: William DiBacco
Room 120

Exploring Die Lubricants as Thermal Buffering Agents in High-Pressure Die Casting

T. Cowell (The Hill and Griffith Company); D. Milligan, C. Monroe (University of Alabama)

Die casting lubricants (DLs) are substances used in the die casting industry to cool, release, and lubricate dies. However, they also play a crucial role in protecting die steel from thermal and chemical stresses during high-pressure die casting (HPDC) cycles. Despite their importance, the inherent benefits of DLs have been poorly understood, including their ability to protect dies from excessive heat, slow cycle rates, and thermal shock. To address this knowledge gap, we developed a novel experimental setup called the Die Lubricant Splash Test (DLST), which simulates real-world operating conditions and evaluates the thermal performance of various die lubricants. The DLST consists of a heated H13 steel plate at an incline, a lubricant spray nozzle, and an electronically controlled pouring system. During the test, the H13 plate is heated to a desired temperature, followed by the application of lubricant and the splashing of 1 kg of aluminum onto the plate. Thermocouples embedded in the plate capture the temperature curve during the cycle, allowing us to analyze both the cooling/heat extraction properties of lubricants and their insulating properties compared to water. Simulations were conducted to better understand the sensitivity and mechanisms at play within the DLST. By analyzing the thermal behavior of different DLs in the DLST, we identify opportunities for process improvement and/or formulation changes to optimize system performance. Our goal is to develop a predictive model that links chemical composition to thermal performance, enabling tooling engineers and lubricant manufacturers to optimize their processes and enhance product quality.

Merging HPDC Injection Process Parameters with Process Temperatures

P. Catterina (Visi-Trak Worldwide); F. Magri (Imago); A.Camossi (La Cibek)

It is well known that the quality of die-cast components is largely determined by the process parameters and particularly by the metal injection phase into the die cavity. Still little attention is paid, however, to the measurement of the die surface temperature and other process temperatures which are also critical and determining factors in the entire process, for the purposes of quality, repeatability and traceability of the product.

The research, through the mean of monitoring systems, aimed at measuring injection parameters together with temperature values with reference to part surface, mold surface, molten metal and hydraulic fluid.

The research has been carried on focusing the HPDC production in a foundry through real parameter measurement and statistical control tools both in real time and out of ex post analysis. This has provided a significant contribution to improving the quality of die-cast products and process.
The data analysis was completed on using statistical techniques of multivariate analysis offering as an outcome, in addition to obvious and well-known correlation phenomena between parameters, a tool for understanding the process from a much more complete profile than traditional monitoring.
The work presented prefigures a procedure and tools useful for quality control in accordance with the ""Foundry 4.0"" models.

The Impact of Corrosive Water on OEE, Repair Costs and Tool Life

J. Beck, S. Heinrich (Schaufler Fischer Group / Laichingen)

Highly efficient tool cooling in combination with microspray is a decisive factor in achieving short cycle times, low scrap rates and a longer tool life. Due to its high heat capacity, water is the medium of choice in most cases. However, the use of water as a coolant in HPDC molds can have a negative impact on OEE, repair costs and mold life if it is not adequately treated. Therefore, many die casting foundries have developed solutions to minimize lime scale and biofilm in the cooling lines.

Another important aspect is the corrosiveness of the water, which affects cooling lines, installed cooling elements such as baffles or pipes, as well as fittings, pipes, pumps, TCUs, etc.

In order to understand the effects of typical plant water on die casting steel, the Schaufler Fischer Group has started a research and development project in which the corrosiveness of cooling water from different HPDC foundries was tested and compared with solutions from other industries.

In our presentation, we will introduce and explain the different test setups, the test execution and the evaluation of the results with hints on possible solutions for the mentioned problem.

STRUCTURAL DIE CASTING CHALLENGES

12:30 - 2:00 pm
Session Chair: Paul Boone
Room 120

Vacuum for Mega/Giga Castings

M. Hartlieb (Viami International); A. Würz (Pfeiffer Vacuum)

High vacuum has been applied in the production of structural die castings since the 1990s and many innovations and improvements have led to very efficient and robust technologies. Many of those are readily commercially available on the market. However, scaling them up to the size of Mega/Giga castings is posing significant challenges. The sheer size of the vacuum tank(s) can pose more than just a floorspace problem. Evacuating the huge amount of air in a very short time and achieving best leak tightness in such large dies and shot sleeves/plunger tips can be a huge challenge. Chill blocks are the predominant technology in dies now, but the traditional ones are not very efficient and use up locking force in already huge DCMs. Newer technologies can improve the situation a lot but are not capable of providing best vacuum alone. The airflow through the thin gaps of chill blocks is hard to calculate precisely but is significantly lower than airflow through unobstructed round holes/tubes that are typically used in the shot sleeve. With the amount of air to be evacuated in a very limited time it is vital to combine efficient shot sleeve evacuation with optimum die evacuation. For the shot sleeve evacuation typically one second is targeted but even in very large DCMs/system this is not always easy to achieve and requires advanced technologies and engineering. Control of the vacuum efficiency before production start (flow and leak rates of die and shot sleeve/plunger tip) and during production is key to making high integrity castings. In this paper latest developments of the various technologies related to achieving the required vacuum in Mega/Giga dies are described and it is explained how they can help die casters produce economically ultra-large high integrity die castings.

Challenges in the Machining of Large Castings

M. Gamisch (Fill USA)

The mass production of HPDC structural components for vehicles has become increasingly important due to the need for weight reduction in electric vehicles. However, the concept of ""Gigacasting"" has increased the challenges for foundries and downstream processes. Increasing added value by machining large castings requires more than just larger machining centers.

To maintain high added value throughout the equipment lifetime it is crucial to find the right combination of HPDC machine and machining center. Consequently, this applies not only to the clamping forces, but also to the cubature and complexity of the castings that need to be machined efficiently. Particularly as product life cycles tend to become shorter, choosing the right combination ensures greater investment security thanks to the flexibility that is not only linked to the topology of parts like ""Gigacastings"". The first part of this paper discusses machine concepts and their automation capability.

Due to the casting complexity of large castings, the added value of machining is only completed with a quality inspection. AI-based optical inspection systems showed a great way to keep the large number of possible casting defects under control. In the second part, this paper discusses findings from the inspection of castings and derives the requirements for robust future inspection systems.

Challenges of a New Dimension - Development of Large Structural Castings without Compromise

P. Hettich (Laubinger + Rickmann / LR Q-Systems); M. Hartlieb (Viami International)

Large structural die castings (up to Mega/Giga castings) are increasingly used in car body components and battery enclosures of vehicles. Mechanical properties are key for their performance and to achieve goals like crash energy absorption, weight reduction and economical part integration. Unfortunately, there are already inverse correlations between just these 3 goals. Part integration leads to larger castings (longer flow length); weight reduction requires thinner walls; crash energy absorption requires high ductility (ideally T6/7). Ideally one would use different alloys to achieve each of those goals. If tight tolerance goals for economical assembly into the larger structure are added, significant compromises seem almost inevitable. Until now, most structural castings are therefore made from near-eutectic alloys in T7 - allowing best flow, thinnest walls and high elongation/crash performance. However, to reduce costs and complexity, most Mega/Giga castings are made of AlSi7MnMg type alloys in F (+Paint-Bake). Even without solution heat treatment in most cases it is impossible to meet tolerance requirements without major compromises in the casting design. These often lead to increased weight, and sometimes reduced properties and crash energy absorption. Then there is the 4th dimension: Hoping that an acceptable compromise can be found leads in the end to high costs and impossible lead times for automated straightening systems, and large castings end up missing their goals of weight reduction, economical production, etc. This can be avoided by investing early into intelligent straightening systems but keeping them flexible as long as possible - without compromising the ultimate goals of the casting development project.

OPTIMIZING DIE CASTING WITH COMPUTER MODELING

2:15 - 3:45 pm
Session Chair: Joe Campbell
Room 120

Utilizing Geometric-Based Modeling for Predictive Die Casting Gating

Z. Yang (University of Alabama)

This study adopts a geometric approach for thick identification and utilizes this data to inform gate generation, with the goal of extracting valuable insights from geometry and generating gates for casting geometries. The Python script, accessible via Google Colab, conducts thorough geometric analysis on STL files to generate gate data for casting geometries, employing voxel meshing and 3D image processing techniques. Leveraging libraries such

as trimesh, SimpleITK, scipy, and numpy, the script facilitates voxelization, distance field calculations, watershed segmentation, parting line analysis, and gate analysis. By implementing predictive die casting gating, engineers can optimize processing parameters to improve casting quality and reduce defects.

Assessing the Predictive Accuracy of Tresca Friction Criteria for Solder Formation in High Pressure Die Casting

J. Belke (Mercury Marine); P. Sanders (Michigan Technological University)

The Tresca friction criteria shows promise to predict the soldering behavior of high pressure die castings, but previously has used theoretical data as the hot shear strength of aluminum was not available. The Tresca criteria is the ratio of the shear strength of the aluminum:die interface and the shear strength of the aluminum as a function of temperature. The Tresca criteria was calculated for a gravity die casting designed to solder using hot shear strength data for A356, A362, and A380 with various magnesium contents. Ejection force and solder observations were recorded for each alloy at casting ejection temperatures of 300, 400, and 500°C. The Tresca friction criteria was found to accurately predicted the formation of solder. The ejection force was statistically significant between ejection temperatures, but not alloys.

Digital Twin Integrating Cell Data for HPDC Process Modelling

A. Gariépy, F. Pineau (National Research Council Canada)

A single process cycle in high-pressure die casting involves a series of operations with complex flow, thermal, and metallurgical phenomena. Most commercial simulation software includes the mathematical framework to handle those. However, the user still needs to define a large number of coefficients to reproduce the magnitude of the physics and may also have to program functions to better replicate reality. This calibration effort can be an enabler for higher-fidelity simulations to efficiently develop new high-quality products, especially in the high-integrity field. This paper presents a data collection effort on a connected high-pressure vacuum die casting research and development cell that is fed into a process simulation. First, data was collected from the ladling robot, the die casting machine, and the spray actuator to provide an accurate representation of a typical cycle. Secondly, heat transfer behaviour was estimated for the cold chamber during pouring as well as for die spray to capture the heat exchanges in the system, as a complement to previously-acquired data for melt-to-die heat transfer. User functions were then programmed in ProCAST® to add the required features. Using this data, simplified cyclic simulations were run to calculate the expected steady-state die temperature regime and compare it to experimental data. Finally, a single-cycle flow and thermal simulation was run including the ladle pouring into the cold chamber. This works highlights some of the challenges and opportunities associated with a functional, off-line digital twin for high-pressure vacuum die casting, used as a tool to design new products and processes.

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Drummondville, QC, Canada

Cascade Die Casting Group - Atlantic
High Point, NC

Cascade Die Casting Group - Great Lakes
Sparta, MI

Cascade Die Casting Group - Group Services/ Corp. HQ
Grand Rapids, MI

Cascade Die Casting Group Inc. - Mid-State
Grand Rapids, MI

Cast Products Inc.
Norridge, IL

Cast Specialties Inc.
Warrensville Heights, OH

Centracore de Mexico
Guanjuato, Mexico

Centrifugal Castings*
Milwaukee, WI

Chicago White Metal Casting Inc.
Bensenville, IL

CMP Group Ltd.
Delta, BC, Canada

CompX Security Products
Grayslake, IL

Consolidated Metco Inc.
Clackamas, OR

Cosma Casting Michigan, Cosma International, Magna International
Battle Creek, MI

D

Dalite*
Troy, MI

Dart Casting, Inc.
Alsip, IL

DeCardy Diecasting Co.
Chicago, IL

Deco Products Co.
Decorah, IA

DyCast Specialties Corp.
Starbuck, MN

Dyersville Die Cast
Dyersville, IA

Dynacast International, LLC - Elgin Plant
Elgin, IL

Dynacast International, LLC - Germantown Plant
Germantown, WI

Dynacast International, LLC - Global Headquarters
Charlotte, NC

Dynacast International, LLC - Lake Forest Plant
Lake Forest, CA

Dynacast Limited
Peterborough, ON, Canada

Dynacast Mexico SA De CV
Obispo, Cuautitlan, Mexico

E

Empire Die Casting
Macedonia, OH

F

FabCast Solutions SRL De CV*
San Luis Potosí Mexico

Falcon Lakeside Manufacturing
Eau Claire, MI

FCA Canada, Inc. - Etobicoke Casting Plant
Toronto, ON, Canada

Fielding Mfg.-Zinc Diecasting Inc.
Cranston, RI

Fort Recovery Industries Inc.
Fort Recovery, OH

FT Precision
Fredericktown, OH

G

G & M Die Casting Co. Inc.
Wood Dale, IL

General Die Casters Inc.
Twinsburg, OH

General Motors Corporation - Bedford Casting Operations
Bedford, IN

General Motors Corporation - R&D Technical Center
Warren, MI

Gibbs Die Casting Corporation
Henderson, KY

Gnutti Carlo Canada Ltd. - Light Metals Div.
Ljunghall, Canada

Greenfield Industries Inc.
Freeport, NY

H

Heritage Die Casting Co.
Denver, CO

Honda De Mexico - Celaya Engine Plant
Celaya, Mexico

Honda De Mexico - Transmissions
Celaya, Mexico

Honda Development Manufacturing of America - Alabama Auto Plant - ALDC
Lincoln, AL

Honda Development Manufacturing of America - Anna Engine Plant: ALDC
Anna, OH

Honda Development Manufacturing of America - Auto Development Center: Aluminum Division
Raymond, OH

Honda Development Manufacturing of America - Production Engineering
Anna, OH

Honda Development Manufacturing of America - TMPG: ALDC
Tallapoosa, GA

Honda Development Manufacturing of America - TMPO: ALDC
Russells Point, OH

Honda North America - Purchasing
Marysville, OH

Honda of Canada Mfg. Inc. - Engine Plant: ALDC
Alliston, ON, Canada

Honda Power Equipment - Aluminum Die Cast
Swepsonville, NC

Hyatt Die Cast & Engineering Corporation
Cypress, CA

J

J&M Precision Die Casting
Elyria, OH

K

Kamtek Casting, Inc. - a Division of Magna International
Birmingham, AL

Kason Industries Inc.
Shenandoah, GA

Kobelt Manufacturing Company Limited
Surrey, BC, Canada

Kwikset Corporation
Denison, TX

L

Lakeside Casting Solutions
Monroe City, MO

Le Sueur Incorporated
Le Sueur, MN

Linamar Light Metals - Mills River (LLM-MR)
Arden, NC

M

Madison Precision Products
Madison, IN

Madison-Kipp Corp.
Madison, WI

Madison-Kipp Corp. - Richmond
Richmond, IN

Mag-Tec Casting Corp.
Jackson, MI

Marchesi Light Alloy
Jalisco, Mexico

Mercury Castings - Div. of Mercury Marine, WI
Fond Du Lac, WI

Meridian Lightweight Technologies Corporate Head Office
Plymouth, MI

Meridian Lightweight Technologies Inc. - GTC
Strathroy, ON, Canada

Meridian Technologies Inc. - Magnesium Products of America
Eaton Rapids, MI

Meridian Technologies Mexico
Ramos Arizpe, Coahuila, Mexico

Michigan Automotive Compressor, Inc.
Parma, MI

Michigan Die Casting LLC
Dowagiac, MI

Midwest Die Casting Corp.
Milwaukee, WI

Miniature Casting Corp.
Cranston, RI

Mumford Companies - Metal Casting Division
Chicago, IL

N

Nebraska Aluminum Castings Inc.
Hastings, NE

Nemak Alabama
Sylacauga, AL

Nemak Kentucky*
Glasgow, KY

Nemak Wisconsin
Sheboygan, WI

New GLDC LLC
Muskegon, MI

Northern Iowa Die Casting Inc.
Lake Park, IA

O

Omni Die Casting Inc.
Massillon, OH

Ozark Die Casting Co.
Saint Clair, MO

P

Pace Industries, Cambridge
North Billerica, MA

Pace Industries, Chihuahua
Chihuahua, Mexico

Pace Industries, Corporate Headquarters
Rochester, MI

Pace Industries, Grafton
Grafton, WI

Pace Industries, Harrison Aluminum
Harrison, AR

Pace Industries, Harrison Zinc
Harrison, AR

Pace Industries, Jackson
Jackson, TN

Pace Industries, Latrobe
Loyalhanna, PA

Pace Industries, Maple Lake
Maple Lake, MN

Pace Industries, Port City
Muskegon, MI

Pace Industries, Saltillo
Saltillo, Mexico

Pacific Die Casting Corporation
Vancouver, WA

PHB - Die Casting Div.
Fairview, PA

Polaris Inc.*
Monticello, MN

Prestige Casting Inc.
Englewood, CO

Production Castings Inc.
Fenton, MO

Promatek Research Center - a Division of Cosma Part of Magna Intl.
Brampton, ON Canada

R

RCM Industries Inc. - Aallied Die Casting Co. of Franklin Park
Franklin Park, IL

RCM Industries Inc. - Aallied Die Casting Co. of NC
Rutherfordton, NC

RCM Industries Inc. -Corporate Headquarters
Franklin Park, IL

RCM Industries Inc. - Imperial Die Casting Co.
Liberty, SC

RCM Industries Inc. - Inland Die Casting Co.
Wheeling, IL

Rheocast Company, A Division of The Fall River Group, Inc.
Germantown, WI

Ryobi Die Casting Mexico
Irapuato, Guanajuato, Mexico

Ryobi Die Casting USA Inc.
Shelbyville, IN

S

Schlage De Mexico
Baja California, Mexico

SDC Incorporated
Sullivan, MO

Shawnee Specialties Incorporated
Eau Claire, MI

Simalex Manufacturing Company Ltd.
Langley, BC, Canada

SKS Die Casting & Machining Inc.
Alameda, CA

Soldy Manufacturing Company
Schiller Park, IL

SpaceX
Hawthorne, CA

Spartan Light Metal Products Inc.
Sparta, IL

Spartan Light Metal Products LLC
Hannibal, MO

Spartan Light Metal Products -Corporate Office
Hannibal, MO

Spartan Light Metal Products LLC
Mexico, MO

Spartan Light Metal Products - LMP Plant
Mexico, MO

Stellantis - Kokomo Casting Plant
Yorktown, IN

STRATTEC Component Solutions
Milwaukee, WI

Sundaram - Clayton Limited
Deerfield, IN

T

TAC Manufacturing Incorporated
Jackson, MI

Team Industries - Detroit Lakes
Detroit Lakes, MN

Technical Die-Casting Inc.
Winona, MN

TESLA Motors
Lathrop, CA

Top Die Casting Company
South Beloit, IL

Troy Design & Manufacturing*
Plymouth, MI

TRU Die Cast Corp.
New Troy, MI

TVT Die Casting Die Casting & Manufacturing
Portland, OR

Twin City Die Castings Co.
Minneapolis, MN

Twin City Die Castings Co.
Monticello, MN

Twin City Die Castings Co.
Watertown, SD

Twinsburg Manufacturing Facility, a Division of AAM
Twinsburg, OH

W

Walker Die Casting
Lewisburg, TN

Whitehead Die Casting Inc.
Gainesville, GA

Wilkast, Inc.
Grand Rapids, MI

Y

Yamada North America
South Charleston, OH

CORPORATE SUPPLIERS

A

AarKel Tool & Die Inc.
Wallaceburg, ON, Canada

Absolute Machinery Corporation
Worcester, MA

Alcoa USA Corp.
Alcoa, TN

Allied Metal Co.
Chicago, IL

Anviloy By Astaras Inc.
Largo, FL

Audubon Metals LLC
Henderson, KY

Automation Systems & Design
Dayton, OH

B

B & L Information Systems Inc.
Bridgman, MI

Badger Metal Tech Inc.
Jackson, WI

Bedford Machine & Tool Inc.
Bedford, IN

BGH Specialty Steel*
Macedonia, OH

Bholster Tech*
Toronto, ON, Canada

Blue Ridge Community College
Flat Rock, NC

Bodycote Thermal Processing Inc.
Sturtevant, WI

BOHLER
Walnut, CA

Brach Machine
Batavia, NY

Brondolin North America
Benton Harbor, MI

BuhlerPrince Inc.
Holland, MI

C

Cal-Miser Aluminum Systems Inc.
Rock Island, IL

Canmet MATERIALS - Natural Resources Canada
Hamilton, ON, Canada

Castec Corporation
Indianapolis, IN

Castool Heat Treat
Newmarket, ON, Canada

Castool Tooling Systems
Uxbridge, ON, Canada

Chem-Trend Ltd. Partnership
Howell, MI

Colosio Die-Casting Machines & Accessories
Minneapolis, MN

Conticast Hormesa LLC
Weston, FL

Cottingham & Butler
Dubuque, IA

Custom Alloy Sales, Inc.
City of Industry, CA

D

Daido Steel Co. Ltd.
Hebron, KY

Daiichi Jitsugyo (America) Inc.
Wood Dale, IL

Die Cast Press Manufacturing Co.
Paw Paw, MI

Diehl Tool Steel
Cincinnati, OH

Die-Pro LLC
Sheboygan Falls, WI

DieTech & Engineering Inc.
Grand Rapids, MI

DISA Group
LaGrange, GA

DME Company
Madison Heights, MI

DTP Diecast Solutions LLC
Florence, AL

Dynamo Inc.
LaGrange, IL

E

Eastern Alloys Inc.
Maybrook, NY

EcoShot, Inc.
Indianapolis, IN

EKK, Inc.
Farmington Hills, MI

Ellwood Specialty Steel
New Castle, PA

Exco Engineering
Newmarket, ON, Canada

F

Finkl Steel*
Chicago, IL

Finkl Steel - Sorel*
St-Joseph-De-Sorel, QC, Canada

Fisa North America Inc.
Elk Grove Village, IL

Flow Science
Santa Fe, NM

FONDAREX USA
Schoolcraft, MI

Frech USA Inc.
Michigan City, IN

Fremar Industries
Brunswick, OH

G

Godfrey & Wing Inc.
Aurora, OH

H

HA International, LLC
Westmont, IL

Hanson International *
Saint Joseph, MI

H Gerber Consulting
Evanston, IL

Henkel Corporation
Madison Heights, MI

Herco, LLC
Auburn Hills, MI

High Temperature Systems Inc.
Chagrin Falls, OH

Hildreth Mfg LLC
Marion, OH

Hill & Griffith Co.
Cincinnati, OH

HTS International Corporation
Knoxville, TN

I

IDRA North America
Kokomo, IN

IECI Srl
Pine Brook, NJ

Imperial Zinc Corp. & Imperial Aluminum Corp.
Chicago, IL

Inductotherm Corp.
Rancocas, NJ

Industrial Innovations
Grandville, MI

Italpresse Gauss
Lagrange, GA

J

J&S Chemical Corp.
Canton, GA

K

Kind Specialty Alloys LLC
Youngstown, OH

Kirby Metal Recycling
Clinton, MD

L

LaFrance Manufacturing Co.
Maryland Heights, MO

LK World
Edinburgh, IN

Lethiguel USA
Rogers, MN

LiCON Mt LP
Dexter, MI

LIFT - American Lightweight Materials Manufacturing Innovation Institute*
Detroit, MI

Lincoln Electric Automation
Columbus, OH

Lindberg MPH
Riverside, MI

Luke Engineering & Manufacturing Co.
Wadsworth, OH

M

M & I Machine
Benton Harbor, MI

MAGMA Foundry Technologies Inc.
Schaumburg, IL

Mangas-AarKel Tool and Engineering Inc.
Muscle Shoals, AL

Meitler Consulting Inc.
Tonganoxie, KS

Metal Conversions Ltd.
Mansfield, OH

Metal Mechanics Inc.
Schoolcraft, MI

Metalworks Recycle-Reload, LLC
Bowling Green, KY

Mokon
Buffalo, NY

MORESCO USA Inc.
Fountain Inn, SC

N

New Brunswick Plating Inc.
New Brunswick, NJ

Nexthermal Corporation
Battle Creek, MI

Norican Group
LaGrange, GA

Novacast Solutions USA Inc.
Naperville, IL

O

OEE Companies
North Oaks, MN

Oerlikon Balzers Coating USA
Rock Hill, SC

P

Pascal Engineering
Arlington Heights, IL

Patterson Mold & Tool
Saint Charles, MO

Paulo
Saint Louis, MO

PCS Company
Fraser, MI

Phygen Coatings Inc.
Minneapolis, MN

Progressive Components
Wauconda, IL

Prolong Surface Technologies
West Chicago, IL

Pyrotek Inc.
Columbia City, IN

Q

Quaker Houghton
Dayton, OH

R

Regloplas Corporation
Sodus, MI

Rochester Aluminum Smelting Canada Ltd.
Concord, ON, Canada

Rosler Metal Finishing USA LLC*
Battle Creek, MI

S

Sandvik Machining Solutions AB*
Mebane, NC

Sanji Industries
Celina, OH

Sanyo Special Steel USA Inc.
New York, NY

SAPP Inc.
Edinburgh, IN

The Schaefer Group Inc.
Dayton, OH

Shibaura Machine Company, America
Elk Grove Village, IL

SIJ Metal Ravne - SIJ Americas
Hazlet, NJ

Sinto America
Grand Ledge, MI

Socitec US LLC*
Broadview, IL

Spectro Alloys Corp.
Rosemount, MN

Stotek Inc. *
Pewaukee, WI

StrikoWestofen America
Kalamazoo, MI

Sun Metalon
Cambridge, MA

Sun Steel Treating, Inc.
South Lyon, MI

Superior Aluminum Alloys
New Haven, IN

Swiss Steel Canada, Inc.
Mississauga, ON, Canada

Swiss Steel USA, Inc.
Carol Stream, IL

T

Techmire
Pointe-Claire, QC, Canada

Therm-Tech of Waukesha
Waukesha, WI

Titus Group / Titus Technologies*
Columbia City, IN

TOYO Machine America, LLC
The Villages, FL

Transvalor Americas Corp.*
Chicago, IL

Tvarit GmbH *
Ottawa, IL

U

UBE Machinery Inc.
Ann Arbor, MI

Uddeholm USA
Elgin, IL

Ultraseal America Inc.
Ann Arbor, MI

V

Valor Alloys, LLC
Houston, TX

VERSEVO Inc.
Hartland, WI

Visi-Trak Worldwide LLC
Valley View, OH

voestalpine Additive Manufacturing Centre Ltd.
Mississauga, ON, Canada

voestalpine Eifeler Coatings Technology
Saint Charles, IL

voestalpine High Performance Metals Corp.
Elgin, IL

W

Wheelabrator Group
LaGrange, GA

Wollin USA
Plymouth, MI

Y

YIZUMI-HPM Corp.
Iberia, OH

Yushiro Manufacturing America, Inc.
Shelbyville, IN

Z

Zitai USA - Die Casting Equipment Group
Highland Park, IL

*New Corporate Member Companies

Chapter News & New Members

Chapter 3 - Michigan

Chapter 3 Supports NADCA Washington DC Briefing

NADCA's annual trip to Washington for meetings with our Senators and Representatives is very important for Die Casters, allowing die casters to speak directly to government officials. Chapter 3 promotes the Washington Briefing by providing financial support for members wanting to attend. This year Chapter 3 had 5 members attend the briefing, two of them took advantage of our support. They met with the officials to promote the R&D tax credit and discussed the OSHA Heat Index.

***Chapter 3** – Members: Steve Jacobson (BuhlerPrince, Inc.), Todd Ikerd (Autocast, Inc.), Bob Worthy (Worthy Co.) and Sandy and Bill Berry (Die-Tech & Engineering) met with congressman Bill Huizenga of Michigan's 4th District.*

Todd and Bill provided a detailed report to the Chapter 3 Board at our June board meeting. They reported that the meetings were productive and that our topics were received by the officials.

Chapter 3 would like to thank NADCA for organizing this event and we are looking forward to reaping the benefits of the meeting. Please refer to the chapter's web site www.nadcachapter3.org for other chapter information.

New Members: *Mark Berlin, Aludyne - Pierceton Plant; Jaspal Singh Bhachu, Richard Brewart, both with Troy Design & Manufacturing; Ken Constant, Lindberg MPH; Kyle Hildreth, Hildreth Manufacturing LLC; Nick Johnson, John Keogh, both with LIFT - American Lightweight Materials anufacturing Innovation Institute; Don Kublick, Lindberg MPH; Dalyn Loomis, Troy Design & Manufacturing; Lewis Marshall, LIFT - American Lightweight Materials Manufacturing Innovation Institute; Traci Simmons, Rosler Metal Finishing USA LLC; Bruce W. Skarnulis, Swiss Steel USA, Inc.; Charlie Slabaugh, Lindberg MPH; Jim Smith, Jr., New GLDC LLC; Steven White, Metalworks Recycle-Reload, LLC*

Chapter 5 - Chicago

Please visit www.diecasting.org and click on Chapters under the Become a Member tab for details on upcoming events.

New Members: *Monica Figueroa, CompX Security Products*

Chapter 6 - Cleveland

Please visit www.diecasting.org and click on Chapters under the Become a Member tab for details on upcoming events.

New Members: *Eric Bollinger, Hoffman Die Cast Technologies Inc.; Bryant Bronner, BGH Specialty Steel, Inc.; Matthew A. Willard, Case Western Reserve University*

Chapter 7 - New York

Please visit www.diecasting.org and click on Chapters under the Become a Member tab for details on upcoming events.

Chapter 10 - Ontario

March 2024 Meeting Review

Bigger Castings Bigger Problems - Castool

Paul Robbins and Yahya Mahmoodkhani from Castool Tooling Systems presented "Bigger Castings, Bigger Problems." The discussion centered on the challenges and innovations related to shot-end systems and materials in large-scale die casting, particularly with the use of GIGA Presses. They highlighted the importance of precise material specifications, shot sleeve designs, and plunger tips in managing the complexities of casting larger automotive parts. The presentation also covered the need for efficient thermal regulation and lubrication methods to maintain consistency and quality in the casting process, emphasizing that advancements in these areas are crucial for the success of large-scale die casting operations.

There were a total of 30 attendees.

April 2024 Meeting Review
GIGA Casting From The Tooling Perspective – Cana-Datum

The Speaker Ignacio Musalem focussed on the challenges of building high pressure die casting tooling for large structural EV components. Attendance was 22 in-person and 23 virtual, 45 total.

- A historical review of tooling challenges
- Product design requirements
- Thermal Control
- Distortion
- Tool Steel Availability
- High investment in equipment

***Chapter 10** – Attendees listen to Ignacio Musalem speak on the challenges of high pressure die casting tooling.*

Cana-Datum presented the evolution of the technologies that have been developed throughout the last 20 years in die casting, from the conventional powertrain components.

Evolution of HPDC for automotive - al, mg, new low iron al alloys to the latest technologies applied in GIGA casting tooling.

High vacuum, specific thermal controls including conformal cooled inserts, segmented cavities, jet cooling and micro-spray are some of the technologies currently being implemented for this new generation of giga casting tools. Also presented were the new requirements for tool steels, combined with special coatings and surface finishes to counter the aggressive wear from these new Al-alloys.

New Members: *Carlos Emilio Alvarez, Michael Anderson, both with Bholster Tech; Hunter Carpenter, Carpenter Die Casting Company Limited; Hassen Feki, Groupe PMF Inc.; Xavier Tremblay, Université Du Québec À Chicoutimi; Dario Zambrano, Bholster Tech*

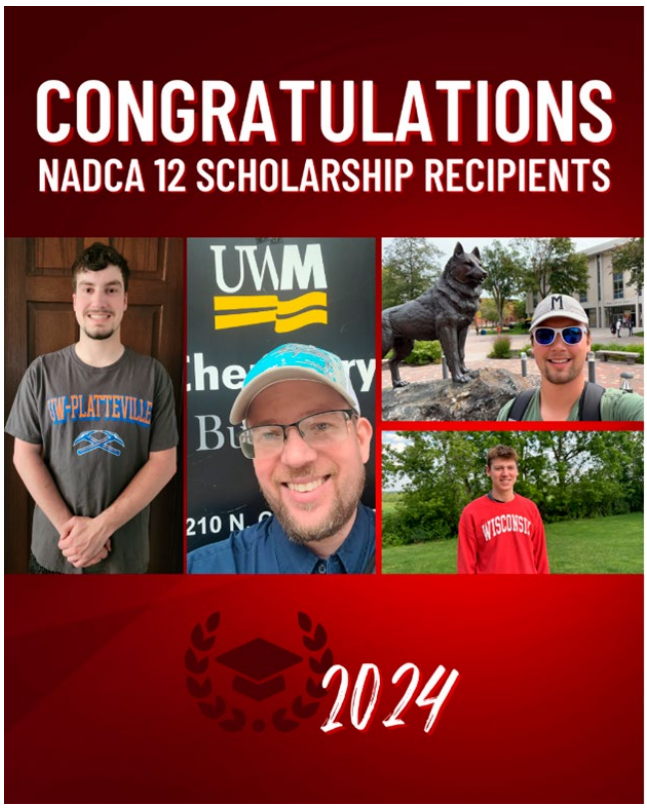
Chapter 12 - Wisconsin

In June, Chapter 12 hosted the Annual Dave Williams Classic Golf Outing at Broadlands Golf Club in North Prairie, Wisconsin. The event had a good turn-out with 70 people attending. The weather was perfect for a day out on the links. The chapter members had lots of fun with a great networking opportunity!

The golf outing is a way to fundraise for Chapter 12's scholarships. The meeting after golfing included announcing these annual scholarship winners. Four students were selected and awarded scholarships. David Palmer of UW-Milwaukee, Mitchell Hainstock of UW-Platteville, Brendan Marshall of Michigan Technological University, and Gabe Riska of UW-Madison were all selected.

As summer starts to wind down, the board is busy trying to build out an excellent set of programs for the 2024-2025 season. Omar Nashashibi, from The Franklin Partnership and National NADCA's insight into the government, is coming to speak at our October 22nd meeting at Delafield Brewhaus. Omar should be able to give insight into what is happening in Washington DC a few weeks before the election. It will be an exciting event! Details for this and all our events can be found at: www.nadca12.org

***Chapter 12** – Golfers getting ready to start on a beautiful Wisconsin summer day!*



Chapter 12 *– NADCA Chapter 12 Scholarship Recipients pictured: Mitchell Hainstock (left), David Palmer (middle), Brendan Marshall (upper right), Gabe Riska (lower right).*

New Members: *Alan Arriaga, Pace Industries, Grafton; Aidan Fitchko, Nemak Wisconsin; Ryan Klagmann, Midwest Die Casting Corporation; Joshua Gene Miller, Otter Lake Technologies, LLC; Rich Neill, Francisco Olivas, both with Madison-Kipp Corp.*

Chapter 14 - S. Ohio

Please visit www.diecasting.org and click on Chapters under the Become a Member tab for details on upcoming events.

New Members: *Nicole Trometer, The Ohio State University Light Materials and Manufacturing Laboratory*

Chapter 15 - Southeastern

Please visit www.diecasting.org and click on Chapters under the Become a Member tab for details on upcoming events.

New Members: *Patrick Brisson, United Tool and Mold; Joel Cleverly, Alupress LLC; Jonathan Edwards, Wheelabrator Group; Yoshihisa Hayakawa, Yushiro Manufacturing America, Inc.; Kent New, Anviloy By Astaras Inc.*

Chapter 16 - Minnesota

Please visit www.diecasting.org and click on Chapters under the Become a Member tab for details on upcoming events.

New Members: *Chase J. Toms, South Dakota School of Mines and Technology*

Chapter 17 - St. Louis

Greetings from the Chapter 17 Board of Directors. Our last DCE News entry announced that the annual Alan Loeffelman Memorial Golf Outing would be Friday, September 20. Please disregard that date. Due to an unforeseen conflict, we must move the outing to Friday, October 18, 2024. We hope this doesn't cause undue stress for anyone and do so hope you will join us for the Golf Outing and other Chapter 17 activities when we reconvene in the Fall.

Please watch your email for information/signups for upcoming Membership Meetings, Educational Seminars and Social Events.

New Members: *Brant Allegretti, Commercial Metals Company; Eli Villegas, Valor Alloys, LLC*

Chapter 25 - Indiana

Please visit www.diecasting.org and click on Chapters under the Become a Member tab for details on upcoming events.

New Members: *Devansh Agrawal, Toyota Motor Manufacturing Tennessee (TMMTN); Mayra Gomez; Skyler Knisely, Aludyne - Pierceton Plant; Sarah R. Lueckenhoff, Yushiro Manufacturing America, Inc.; Ryan Nolan, Madison Precision Products; Aaron Robbins, Aludyne - Pierceton Plant; Zach Sheridan, Superior Aluminum Alloys; Sarah Strain, Madison-Kipp Corp. - Richmond*

Chapter 30 - Los Angeles

Please visit www.diecasting.org and click on Chapters under the Become a Member tab for details on upcoming events.

New Members: *Kevin Omar Sangabriel, Schlage De Mexico*

International Members: *Hangjune Choi, MEU Techno; Haran Guroonath, Shri Visakha Industries (SVI); Arunvinay Prabakaran, Dietech India Pvt Ltd*

Live NADCA CUSTOM WEBINARS

NORTH AMERICAN DIE CASTING ASSOCIATION

Courses can be **created to meet your organization's specific needs and taught live via webinar**. This means the education and training program can more directly improve your "bottom-line".

The **overall costs are lower** than sending students to offsite for training. When we deliver the training to you, the expenses associated with the program are the total cost of the actual education and training — no travel expense.

Timing of the program and scheduling can be **designed to fit your time schedule** and operational hours. This cuts down on time lost by having employees out for extended periods of time.

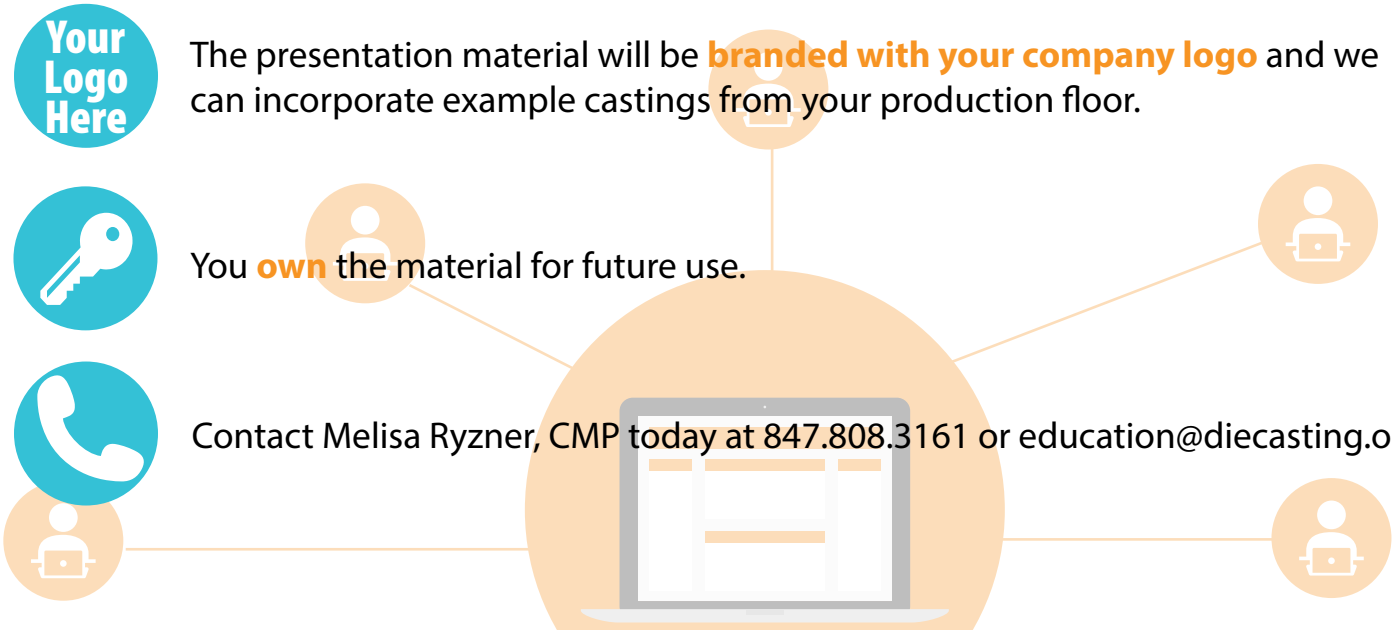
The program can **economically accommodate more people** and is taught by top-notch NADCA instructors. Custom courses can be delivered for as little as $300!

Webinars can be **100% custom** from the length of the webinar to the content to the look and feel of the information presented.

The presentation material will be **branded with your company logo** and we can incorporate example castings from your production floor.

You **own** the material for future use.

Contact Melisa Ryzner, CMP today at 847.808.3161 or education@diecasting.org



Industry News

GENERAL MOTORS NAMES RYOBI DIE CASTING "SUPPLIER OF THE YEAR" FOR 2023

General Motors has once again recognized RYOBI DIE CASTING (USA), Inc. as a Supplier of the Year for 2023.

GM recently celebrated honorees at the 32nd annual Supplier of the Year event in Miami, FL. General Motors has recognized its top global suppliers of 2023 during its annual Supplier of the Year recognition event. In total, 86 suppliers were recognized with a Supplier of the Year award, and an additional eight Overdrive Awards were handed to suppliers who far exceeded expectations.

This is the 5th consecutive year RYOBI has received the award. "We're honored to partner with these top suppliers who have made notable contributions to our transformation. Together, we're pushing boundaries, pioneering new technologies and redefining what's possible," said Jeff Morrison, vice president, Global Purchasing and Supply Chain. "Their innovation and support are critical to helping us deliver the world-class vehicles our customers have to come expect."

"Receiving our fifth consecutive GM Supplier of the Year award demonstrates the great collaborative relationship we have with General Motors and the results of all our valued associates' hard work and dedication. Moving forward, we remain committed to continuously providing great value to all of our customers with the unwavering commitment of our associates" states Ryan Willhelm, president & chief operating officer.

Each year, a global, cross-functional GM team rigorously selects Supplier of the Year and Overdrive award winners based on performance, innovation, cultural alignment with GM's values, and commitment to achieving GM's ambitious goals.

SHAPIRO CELEBRATES 120 YEARS OF INNOVATION AND SUSTAINABILITY IN INDUSTRIAL RECYCLING

St. Louis, MO - July 2024 marks the 120th anniversary of Shapiro, a leader in industrial recycling and sustainability solutions. From its humble beginnings in 1904 as a one-man operation, Shapiro has grown into a global pioneer, championing the circular economy and setting benchmarks in sustainability.

The journey began in 1884 when Harry Shapiro immigrated to the United States from Russia and listed his occupation as Junk Peddler on his Declaration of Intention. In 1904, Harry's brother Max began collecting scrap metal with a horse and buggy. Through decades of visionary leadership and innovation, Shapiro has now grown into a company that works with environmentally conscious manufacturers to assist them in reaching their sustainability goals.

Throughout the 1980s and 1990s, Shapiro expanded its services and footprint, moving into new markets and diversifying its recycling capabilities. The turn of the millennium saw further expansion and technological advancements, including the launch of state-of-the-art facilities, the development of a Sustainability Dashboard, focusing on the positive environmental impacts of all sustainable materials, and providing a circular economy for our clients and consumers.

As Shapiro celebrates this monumental anniversary, it reflects on a history rich with achievements such as receiving multiple Alcoa Strategic Supplier Awards and joining and serving on the board of the Bureau of International Recycling. Recent years have seen the launch of transformative initiatives like Circular by Shapiro, the Sustainability Dashboard, and the Master Alloys program, further solidifying Shapiro's commitment to environmental stewardship and circular economy principles and dedication to living their purpose of Making the Planet Better Together.

"As we celebrate 120 years of innovation and sustainability, we are reminded of our responsibility to the planet and future generations," says Bob Alvarez, CEO of Shapiro. "Our journey from a small family business to an industry leader reflects our commitment to continuous improvement, environmental sustainability, and the circular economy. We're excited for what the future holds and remain dedicated to pioneering solutions that benefit our partners, communities, and the planet."

INTERNATIONAL ZINC ASSOCIATION ANNOUNCES WINNERS IN THE 2023-2024 ZINC CHALLENGE STUDENT DESIGN COMPETITION

Durham, NC - The International Zinc Association (IZA) awarded three winners in its 2023-2024 Zinc Challenge Student Design Competition, which evaluates students on their knowledge of zinc alloys and practical design for die casting. The contest is open to all undergraduate design students in Canada, the United States, and Mexico.

This year's Zinc Challenge focused on sustainable beauty products, in an effort to replace disposable plastic products with robust, reusable, and recyclable designs using zinc alloys.

"IZA is thrilled to recognize the future industrial design stars of the consumer products industry, particularly in the growing market of sustainable beauty products," said Martin van Leeuwen, IZA Director of Technology & Market Development. "The challenge provides an opportunity for industrial design students to work with zinc, which is the fourth most commonly used metal in the world, and to learn about designing for manufacturing products by die casting."

Each winner receives $2,000, and faculty sponsors receive $1,000 for the associated university.

The winners of the 2023-24 Zinc Challenge are:

- OURU by Demitri Cortez Zehrung, Purdue University, Professor Steve Visser
- *refloss by Miles Menely, University of Oregon, Professor Kiersten Muenchinger
- ZaFa by Alexander Yuhin Ho, Purdue University, Professor Steve Visser

The winning entries from this and previous years can be viewed by visiting diecasting.zinc.org

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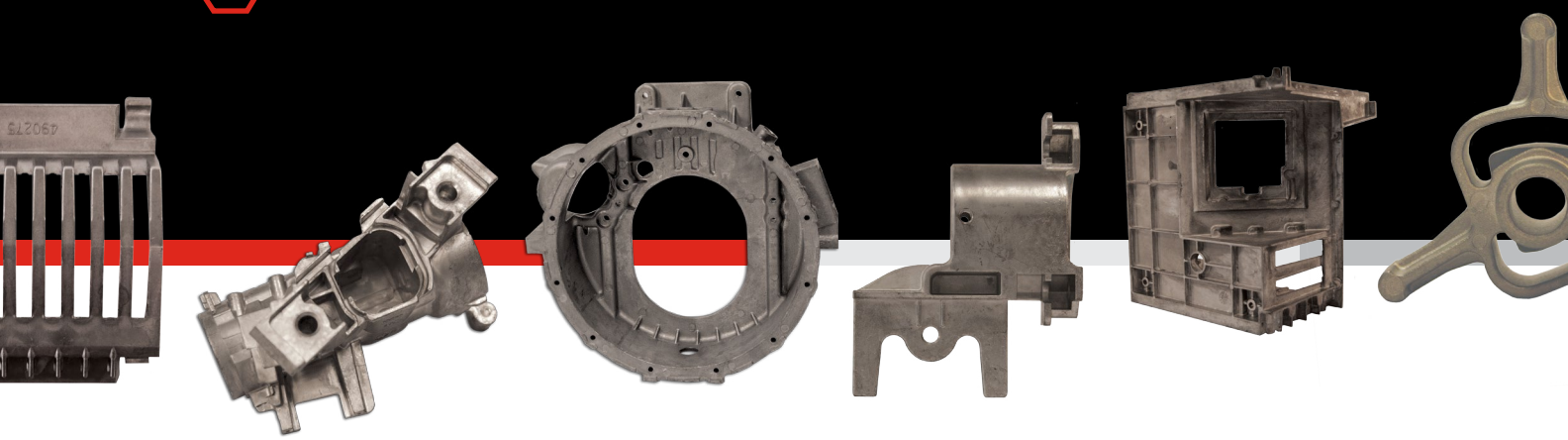

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The North American Die Casting Association (NADCA) is the sole trade and professional society of the die casting industry. Membership consists of both corporate and individual members from over 1000 companies located in every geographic region of the United States, Canada and Mexico.

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People in Die Casting

Gary Doyon

Inductotherm Group Announces Leadership Transition

Inductotherm Group, is announcing a significant leadership transition. After 15 years as CEO and 38 years with the company, Gary Doyon has stepped down from his role as CEO, effective July 1, 2024. This transition is part of Mr. Doyon's carefully planned succession strategy to ensure the continued growth and success of the Inductotherm Group.

Gary Doyon's tenure as CEO has been marked by his strategic vision of a steadfast commitment to innovation, successful delivery of quality products, and a focus on process development and end-to-end customer care. Under his guidance, Inductotherm Group has expanded its global footprint, diversified its product offerings, and strengthened its position as a market leader. Although he is stepping down as CEO, Mr. Doyon will remain actively involved with the company. He will continue to serve as the only non-family member on the parent company Board, assisting with specific operational needs of other businesses owned by the Rowan family and pursuing new business avenues and opportunities for the Inductotherm Group.

"We greatly appreciate and thank Gary Doyon for his exceptional leadership over the past 15 years," said Virginia Rowan Smith, Chairman of Inductotherm Group. "The Inductotherm Group is positioned for great things in the future based on its strength today. As we move forward with our succession plans, we are confident that the new leadership will continue to uphold the high standards and legacy that Gary has established."

On July 1, 2024, Mick Nallen and Satyen Prabhu took over as Co-Leaders of Inductotherm Group. This unique leadership arrangement is designed to leverage their complementary strengths and experiences.

Together, they bring a wealth of knowledge and a fresh perspective to the company, positioning Inductotherm Group for a stable, profitable, and exciting future.

NADCA Remembers

Ronald L. Schulz
1948 - 2024

Ronald L. Schulz, 76 of Berrien Springs, passed away peacefully in his home on June 27, 2024.

Ron was born June 1st, 1948, in Benton Harbor MI to William and Olga Schulz. Ron graduated from Benton Harbor High School in 1966.

Ron was an Army Veteran. He served in the US Army as a Sgt. from 1967 through 1969, serving in the Vietnam War.

His career in Tool & Die moved his family to Meridian, MS, then transferred his family to Ripley, TN and in 1990 he moved his family back to Michigan to be near all his other family. He worked as an engineering manager at Premier Tool and Die and they sold to Michigan Die Cast, where he was employed up until his death.

Ron was survived by his wife of 53 years, Sue; 3 daughters, Debbie (Harvey) Beasley, Kym (Mark) Anderson, Tracy (Jason) Bauer; 6 grandchildren, Ashley (Mando) Rodriguez, Caitlin Weaver, Jordan (Greg) Kugel, Riley Bauer all from Berrien Springs, Taylor (Alexis) Anderson of Murfeesboro, TN and Sarah Anderson of Dyersburg, TN; 2 great-grandsons, Pierce and Parker Bachman of Berrien Springs; twin sister, Susan Schulz of Berrien Springs; brother, Bill (Dara) Schulz of Benton Harbor and numerous nieces and nephews.

He was proceeded in death by his parents, William and Olga Schulz; sisters, Betty Zech, Nancy Bly and Margie Davis.

William Walter Vogel, II
1961 - 2024

William Walter Vogel II died at the age of 62 on July 4, 2024, at his home in Riverside, IL.

Will was born on August 18, 1961, in Chicago, IL, the first of six children born to William Walter Vogel I and Victoria Sue Vogel.

Will graduated from Riverside-Brookfield High School and worked at his family business DeCardy Diecasting, ultimately becoming owner of the company. He was a longtime resident of Riverside and member of the Riverside Presbyterian Church. Will was an avid music fan who frequently attended live concerts. He also loved spending time with family and friends at his second home in Long Beach, IN.

Will was preceded in death by his wife Susanne Vogel and his father. He is survived by his mother, his son William Walter Vogel III (Trey) and daughter Lauren Kathleen Vogel, his siblings Henry (Debbie) Vogel, Ginger (Keith) Schander, Dr. Ann (Dr. Tim Heilenbach) Vogel, Rachel (Dr. Michael Forseth) Vogel, and Amanda (Dr. Paul) Wright, his aunts Martha Kay Kappelmann and Karla (Michael) Becker, as well as his mother-in-law Joan (late Jim) Lalime, sister-in-law Judy Lalime, and brother-in-law Jimmy (Judy) Lalime. Will was also a beloved uncle, great uncle, cousin, and friend to many.

New Products, Services & Solutions

Lower Scrap Rates with IPG's Toggle Free Smart Series

By reducing scrap rates, and avoiding the need to re-cast replacement components, die casters can significantly lower raw material costs, energy expenditure, and carbon emissions. The Toggle Free Smart (TFs) series from ItalPresseGauss is designed to help by eliminating the potential for casting conditions that may result in defects and deformations.

Platens proven to cut casting distortions

Building on the excellent stability already delivered by its hydraulic closing mechanism, the TFs has platens optimised for local, high-stress areas – creating a strong and even distribution of force on the die to help minimize scrap-causing distortions.

Hydraulics that lock out imperfection

The TFs features a robust hydraulic locking system that automatically compensates for geometrical imperfections of the die and for thermal expansion, enabling it to adapt to different working conditions.

Tie-bars that tackle scrap independently

Tie bars in the TFs work independently, exerting the correct amount of pressure to reach the required closing force (from 1400t to 11000t) and maintain parallelism, before being locked in position on the mobile platen. This minimized distortion and potential for parting plane separation that may result in scrap.

Separate injection circuits for casting consistency

The TFs injection unit employs two circuits to manage a phased injection process. One fills the die at high speed, the other pushes metal that has already filled the cavity at maximum pressure to minimize the gas porosity, thereby avoiding potential defects that could result in scrap. Coupled with shot control software which continuously monitors melt flow into the die, and adjusts piston speed accordingly, the result is uniform casting quality as standard.

Unlock Aluminum's Shining Future:

StrikoWestofen along with Monitizer, Norican Group's Industry 4.0 solution unveil sustainable and innovative solutions at DieCasting Congress 2024.

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Energy efficient furnaces to boost your productivity.

Melting and dosing pioneer StrikoWestofen leads the way in energy-efficient melting and dosing. LeanMelter, powered by StrikoMelter technology, is perfect for vehicle giants, while our extensive range of options ensures flexibility for all, regardless of shape and size.

Peter Reuther, Senior Vice President at StrikoWestofen, assures you that "energy efficiency is in the DNA of our furnaces."

Sustainability solutions to get you fit for future.

Our commitment to a greener world is baked into StrikoWestofen's efficient melting furnaces. We're lowering emissions and boosting productivity, aligning with the planet's need for sustainability.

Monitizer's data-driven optimization.

Monitizer, part of the Norican family, empowers you to make decisions and continuously optimize processes with AI-powered data insights.

Peter Holm Larsen, President of Norican Aluminium, sums up the aluminum moment: "There's opportunity in all parts of the aluminum value chain, with new end products and demands emerging fast. We are ready to help customers seize the many growth opportunities out there, in ways that play to their individual strengths and unlock their unique potential."

For more information, visit StrikoWestofen.com.

Don't See Your Company's Products in DCE?

All NADCA Corporate Members are allowed one complimentary listing per issue and NADCA Individual Members may submit one free listing per year. For all others, there is a small fee. Don't delay, submit today! Visit www.diecasting.org/dce/products to learn how to put your company's new products, services and solutions in print.

DIE CASTING ENGINEER

CLASSIFIEDS

Classified advertisements are accepted for publication in *DIE CASTING ENGINEER* for sale of equipment and notice of services and employment available or wanted. The net rate is $60 per inch or fraction thereof (for NADCA members, individual and corporate) and $70 per inch for all others, in the $2^1/_8$ in. wide column, payable with order. Please make remittance payable to *DIE CASTING ENGINEER*, and send with copy to: NADCA, 3250 N. Arlington Heights Rd., Ste. 101, Arlington Heights, IL 60004. Contact Athena Catlett at 847.808.3153 or email catlett@diecasting.org

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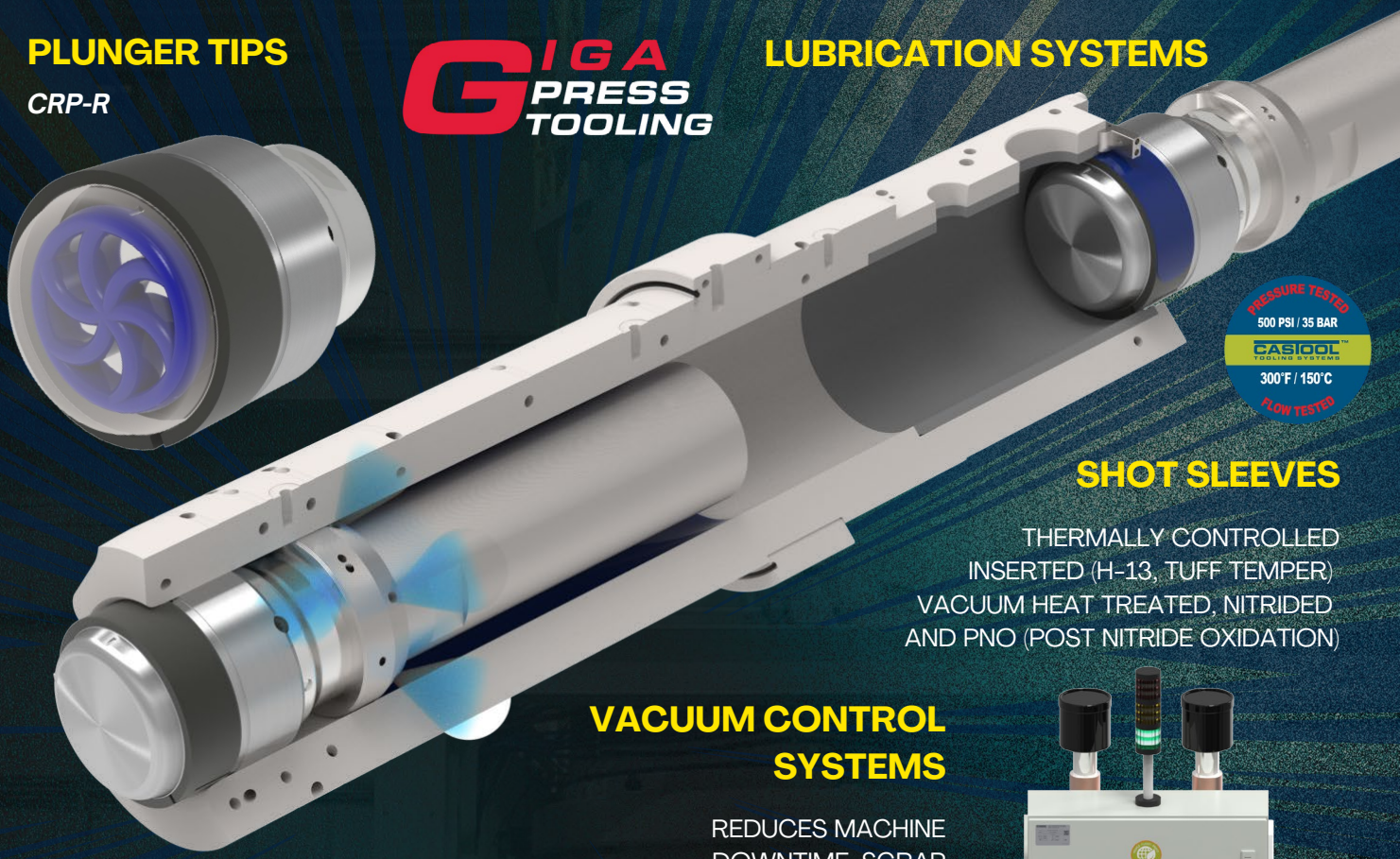

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