AFS METALCASTING CONGRESS

April 12-22, 2021 | Streaming Live & On-Demand

125TH ANNIVERSARY

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2021 METALCASTING CONGRESS SHOW GUIDE

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AFS 125TH ANNIVERSARY

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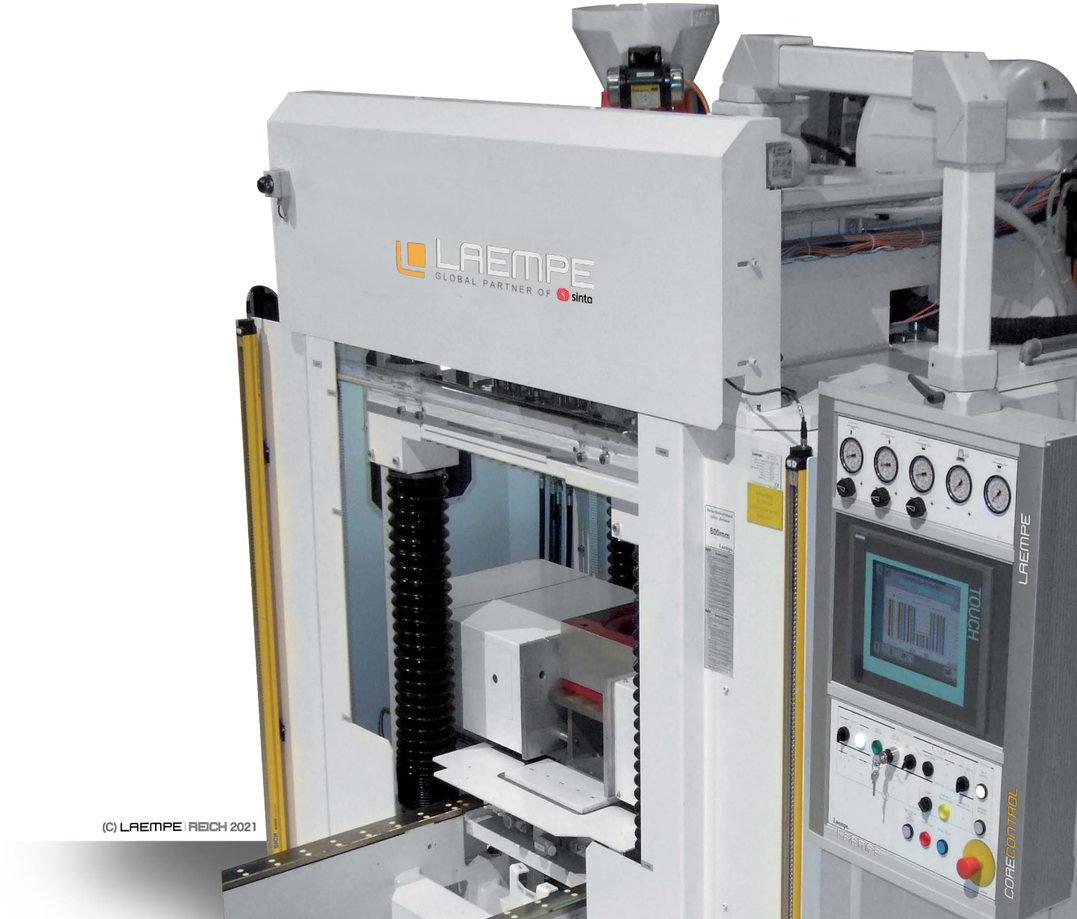

AFS **METALCASTING**CONGRESS
125TH ANNIVERSARY
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TABLE OF CONTENTS

AFS METALCASTING CONGRESS

April 12-22, 2021
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To Our Members and Friends,

We are pleased to present this guide to the **2021 virtual Metalcasting Congress**. In this guide, you'll find summaries of more than 60 research papers, panel presentations, and buyer/designer sessions that comprise the **heart of Metalcasting Congress**.

The guide also includes valuable information about the industry suppliers and foundries that are virtual exhibitors, and we trust that registrants will take full advantage of the chance to learn about exhibitors' offerings. Plus, there are tips on how to make the most of the **virtual Metalcasting Congress 2021** experience.

Whether you are a foundry representative, supplier to the industry, casting buyer/designer, or AFS student member, there is much for everyone to visit, learn and enjoy. With all that it has to offer, **Metalcasting Congress 2021** is an industry event unlike any other.

We salute our session presenters and panelists, event sponsors, exhibitors and registrants. Enjoy the experience and thank you for your involvement!

Sincerely,

Doug Kurkul
Chief Executive Officer
American Foundry Society

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AFS 125TH ANNIVERSARY

KEYNOTE & HOYT MEMORIAL LECTURE SPEAKERS

MONDAY, APRIL 12
HOYT LECTURE KEYNOTE SPEAKER
SPONSORED BY LAEMPE REICH

GREG MISKINIS

Retired, Waupaca Foundry

"Transformation of the Modern Foundry"

The foundry industry has been in a state of transformation for over 2,600 years. From shapes carved into stone, to topologically optimized and additive manufacturing-facilitated creations, the evolution of metalcasting is easily witnessed. Whether this change has come about by man, method, material or market is debatable. With the gradual shift from personal vehicles with internal combustion engines to semi- or fully autonomous electric vehicles, competing in these shrinking markets will likely require agile and novel foundry solutions. This Hoyt Lecture will examine how foundries have been transformed primarily by shifts in the workforce, market pressures brought by global flattening (competition), environmental, health and safety changes and even by disaster.

MONDAY, APRIL 19
KEYNOTE SPEAKER

HARRY MOSER

Founder, Reshoring Initiative

"How to Benefit From Shorter Supply Chains"

Reshoring and foreign direct investment (FDI) have brought back over 700,000 U.S. manufacturing jobs in the last 11 years. At the same time, the COVID crisis has demonstrated the risk of long supply chains. In fact, a recent BDO survey showed that 24% of companies are planning to change the country in which they source or produce, and 22% plan to reshore to the U.S.

Harry Moser, president of Reshoring Initiative, will explore how U.S. foundries can take advantage of the trend toward shorter supply chains and what that means for reshoring and FDI. Plus, discover how Reshoring Initiative's Total Cost of Ownership Estimator and the Import Substitution Program can help your company land contracts that otherwise would have gone overseas.

TUESDAY, APRIL 20
HOYT LECTURE KEYNOTE SPEAKER

TOM PRUCHA

President, Metal Morphasis LLC
Editor-in-Chief, International Journal of Metalcasting

"Metalmorphasis Change and Transition"

Change is constant, as nothing stays the same. Consider the words of the Chinese philosopher Lao Tzu: "Life is a series of natural and spontaneous changes. Don't resist them—that only creates sorrow. Let reality be reality. Let things flow naturally forward in whatever way they like." Some changes are the result of biology and the passage of time, within the natural cycle or order of things. Others are self-generated, under our own control and willful effort, or dependent upon encounters with significant others—family, friends, colleagues, and others close to us. Still, other changes occur because of circumstance or fate, a proverbial "date with destiny" and often beyond what we feel is in our control. Whether it is our personal life or occupation, like metalcasting, this change can facilitate transition and transformation. Prucha has coined the term metalmorphasis, and this lecture is a reflection of how to embrace change and use it as a vehicle for new opportunities. Beyond the philosophical, this lecture looks at how we as metallurgists and metalcasters apply change (time, temperature, pressure, chemical reactions, etc.) to transform metals and create metalmorphasis.

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ABOUT METALCASTING CONGRESS 2021

Metalcasting Congress 2021 is a virtual event that allows you to participate from anywhere in the world – all you need is a web browser and an Internet connection. Here are a few things to know.

ACCESSING METALCASTING CONGRESS

Log in with your email address at **https://afs.6connex.us/event/MetalcastingCongress/login**.

You will receive detailed login instructions via email prior to the show.

Not registered?

Purchase a pass at **www.metalcastingcongress.org**.

PARTICIPATION & SCHEDULES

Metalcasting Congress is open to visitors 24/7 from **April 12-22, 2021**, with live events happening Mondays through Thursdays. To view a presentation, visit the Exhibit Hall, or take part in other activities, simply click the corresponding area in the **Metalcasting Congress lobby**, where you'll be directed after logging in.

- Most booths in the Exhibit Hall will be staffed by representatives from 9 a.m. to 4 p.m. CDT, April 12-15 and April 19-22. Exhibits are on display 24/7.
- Live support will be available 9 a.m. to 4 p.m. CDT, April 12-15 and April 19-22.
- Schedules of presentations and other live events are shown in this guide. Unless otherwise noted, times reflect the North American Central Time Zone (Chicago).

VIEWING ON DEMAND

Many Congress sessions will be recorded and made available to stream at any time. You can view all on-demand presentations after they go **live through May 17, 2021**. Just log in with your registration credentials to stream this content.

MORE INFORMATION & WAYS TO CONTACT US

You can view a list of FAQs at **www.afsinc.org/frequently-asked-questions**. Need more help? If you're an exhibitor, please contact us at **exhibits@metalcastingcongress.org**.

Attendees and others should email **customerservice@afsinc.org**.

The following schedule is subject to change.

MONDAY, APRIL 12

9 a.m. | Auditorium
ALUMINUM & LIGHT METALS DIVISION

RELATION BETWEEN THE POROSITY LEVEL AND THE RADIOGRAPHIC QUALITY IN ALUMINUM A356 CASTINGS (2021-007)

Franco Chiesa, Jean-Nicolas Rousseau, David Levasseur, Quebec Metallurgy Center, Trois-Rivières, QC, Canada

Aluminum A356 stepped castings, with plates 6mm, 19mm and 38mm in thickness, were sand cast from melts with three gas contents, providing a wide range of casting conditions and solidification times varying from 0.6 min to 15 min. The plates were radiographed and the local microporosity distribution measured so the level of microporosity could be related to the radiographic quality expressed by a frame number per standard ASTM E155 reference radiographs. This made predicting the radiographic quality of a casting by solidification modeling possible.

9 a.m. | Auditorium
CAST IRON DIVISION

PANEL: NON-SILICA SANDS (2021-106)

Scott Giese, University of Northern Iowa, Cedar Falls, IA; Jerrod Miller, Wear-Tek, Spokane, WA; Chris Barnes, Caterpillar Inc., Deerfield, IL

Iron casting experiments were performed to observe the effect of a high- and low-thermal diffusivity ceramic sand on graphite morphology and ferrite/pearlite ratio. When compared to baseline silica sand, observable differences in mechanical properties were noted as a result of the thermal behavior of the ceramic sands. Panelists from both academia and industry will speak to the challenges and considerations when operating a foundry using non-silica sands.

9 a.m. | Innovation Theater
INNOVATION THEATER
SPONSOR PRESENTATION:

PRACTICAL EXAMPLES OF HOW FOUNDRIES BENEFIT FROM DIGITALIZATION

ABP INDUCTION

9:30 a.m. | Auditorium
ALUMINUM & LIGHT METALS DIVISION

HOT TEARING SUSCEPTIBILITY OF AL-ZN ALLOYS (2021-011)

Kumar Sadayappan, CanmetMaterials, Hamilton, ON, Canada; Amanada Aguiar, Sumanth Shankar, Light Metal Casting Research Centre, Mechanical Engineering, McMaster University, Hamilton, ON, Canada

Hot Tearing Susceptibility of aluminum alloys was investigated using a constrained rod hot tearing test apparatus to simulate and characterize hot tearing. The test apparatus and procedure were validated using Al-Si-Mg and Al-Cu families of alloys. Subsequently, the test was used to characterize new structural Al-Zn alloys being developed for high-pressure die casting application. It was found that introducing small amounts of Fe that promotes evolution of eutectic phases can alleviate the hot tearing problem. In this presentation, the details of the investigation are presented and discussed.

10:30 a.m. | Auditorium
HOYT LECTURE

TRANSFORMATION OF THE MODERN FOUNDRY (21-126)

Greg Miskinis
Retired, Waupaca Foundry

The foundry industry has been in a state of transformation for over 2,600 years. From shapes carved into stone, to topologically optimized and additive manufacturing-facilitated creations, the evolution of metalcasting is easily witnessed. Whether this change has come about by man, method, material or market is debatable. With the gradual shift from personal vehicles with internal combustion engines to semi- or fully autonomous electric vehicles, competing in these shrinking markets will likely require agile and novel foundry solutions. This Hoyt Lecture will examine how foundries have been transformed primarily by shifts in the workforce, market pressures brought by global flattening (competition), environmental, health and safety changes, and even by disaster.

SPONSORED BY:

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1 p.m. | Innovation Theater
CASTING DESIGNERS AND BUYERS

TRENDS IN REDUCING WEIGHT WITH METAL CASTINGS (2021-137)

Andrew Halonen, Mayflower Consulting LLC, Calumet, MI

Opportunities for lightweighting with metal castings abound through material choice and smart designs. Examples in iron and aluminum will be shared, along with current trends and future opportunities for reducing weight in cast components.

1 p.m. | Auditorium
COPPER DIVISION

LEAD CONTRIBUTORS IN DRINKING WATER AND BEYOND—WHAT THE SCIENCE IS SAYING (2021-133)

Justine Parker, Cardno Chemrisk, Boulder, CO

The continued appearance of lead in drinking water is likely due to a variety of conditions besides the 0.25% in the newer brass fittings. This talk will look at the range of possible lead sources that could be significant contributors to lead in drinking water and how this compares to brass fitting data. We will also take a broader view and discuss what the current science is saying regarding the sources of lead contributions to elevated blood lead levels in children.

KEYNOTE SPEAKERS
TECHNICAL TRACK
MANAGEMENT TRACK
CASTING DESIGNERS AND BUYERS TRACK

2 p.m. | Auditorium
WOMEN IN METALCASTING
2020 HINDSIGHT: REFLECT ON DIVERSITY, EQUALITY, AND INCLUSION (2021-135)

Sandy Calabrese, General Motors, Defiance, OH

The social movements that defined 2020 are causing companies to identify and address barriers to creating and sustaining a more diverse and inclusive workforce. What steps can individuals take to nurture diversity, equality, and inclusion? Join us for a presentation on how we can champion ourselves and others toward achieving professional milestones and progressing equal-access opportunities.

Lobby
CASTING OF THE YEAR COMPETITION

View the best in foundry achievements in the Casting of the Year gallery. Presented by AFS and Casting Source magazine, this annual competition recognizes manufacturing excellence by North American metalcasters and designers/users of metal castings.

SPONSORED BY:

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Lobby
PRODUCT SHOWCASE

Gain in-depth insight into a selection of curated products and services for foundry customers in the Product Showcase, accessible 24/7 from the virtual lobby.

TUESDAY, APRIL 13

9 a.m. | Auditorium
ALUMINUM & LIGHT METALS DIVISION
SPRUE BUSHING FILTER BENEFITS IN THE LOW PRESSURE CASTING PROCESS (2021-078)

Rafael Gallo, Spencer Bishop, Pyrotek Inc., Aurora, OH

The intention of this paper is not to delve in all the engineering and metallurgical intricacies of the low pressure casting process but rather to concentrate in one specific area, which is sometimes neglected: the filter being used in the sprue bushing during the filling of the mold cavity. While the final quality of the casting is strongly affected, among many other variables, by the mold filling process, the efficiency and throughput of the process is negatively influenced by operational issues encountered around mold filling factors induced by using steel filters, such as erosion of the sprue bushing and the spreader, need of special handling of sprue returns, more frequent mold changes, lack of casting process consistency, etc. A filter technology is introduced to assist in eliminating and/or reducing the mentioned issues. Detailed qualitative and quantitative analysis of the benefits are provided.

9 a.m. | Auditorium
CAST IRON DIVISION

EFFECT OF THE TYPE OF INOCULANT ON THE SHRINKAGE POROSITY OF HIGH SILICON SG IRON (2021-028)

Gorka Alonso, Jon Sánchez, Gorka Zarrabeitia, Ramon Suarez, IK4-Azterlan, Durango, Spain; Dr. Doru Stefanescu, The Ohio State University and University of Alabama, Dublin, OH

High-silicon spheroidal graphite (SG) irons present significant challenges to the production of sound castings as it is particularly susceptible to significant shrinkage defects. The critical phase is the end of solidification when, as the amount of eutectic graphite generated decreases, graphite expansion may become insufficient to compensate the solidification shrinkage, increasing the risk of microshrinkage (microporosity) formation. The goal of this industrial research was to assess the efficiency of eight commercial inoculants in minimizing porosity occurrence in a 3.45%C, 3.75%Si SG iron. Metallographic analysis was conducted on the TA cups to evaluate the nodule count and size distribution. SEM analysis was used to study the type of nuclei, and tomography to quantify the amount of porosity in each TA cup. An attempt was made to correlate the graphite formation rate during eutectic solidification with the porosity level. Inoculants rich in Zr seemed to produce the best results.

9 a.m. | Innovation Theater
INNOVATION THEATER
SPONSOR PRESENTATION:
LAEMPEARSM

When being there soon is not soon enough.

LAEMPEREICH

9:30 a.m. | Auditorium
ALUMINUM & LIGHT METALS DIVISION

MELT-REFRACTORY INTERACTIONS DURING ALUMINUM MELT PROCESSING (21-041)

Emre Cinkilic, Michael Moodispaw, The Ohio State University, Columbus, OH; Yeou-Li Chu, Ryobi Die Casting, Shelbyville, IN; Xinyan Yan, Alcoa Technical Center, New Kensington, PA; Francis Caron, Alcoa Technical Center, Deschambault, QC, Canada

Molten aluminum processing is crucial to energy and melt efficiency and product quality (chemistry and cleanliness) in the casting industry. Many materials are involved in aluminum melt processing, including refractory and flux materials. The fundamental thermodynamic reactions among these materials in melt processing determine the energy efficiency and throughput (melt recovery) of the melting and casting operations. Currently, most of the process control and optimization in molten aluminum processing is conducted using traditional trial-and-error and design of experiment methods, with limited use of analytical tools available to the industry. This session presents fundamental thermodynamic modeling for aluminum melt processing involving refractory materials. Various ingredients of refractory materials were evaluated for higher melt recovery rates, and the modeling results were validated in lab-scale experiments.

KEYNOTE SPEAKERS
TECHNICAL TRACK
MANAGEMENT TRACK
CASTING DESIGNERS AND BUYERS TRACK

9:30 a.m. | Auditorium
CAST IRON DIVISION

THE HISTORY AND EVOLUTION OF INOCULANTS (2021-038)

Cathrine Hartung, Elkem Foundry Products, Kristiansand, Norway; Robert Logan, Elkem, Mooresville, NC; Leander Michels, Elkem Silicon Products, Kristiansand, Norway

Historically, inoculation has been around since the 1930s. Over the years, many different theories have evolved to explain how inoculation works. At the same time, many different inoculation compositions have been developed for use in foundry operations. In today's foundry, the inoculation process utilizes a typical addition of between 0.05 to 1% of a specialized FeSi alloy containing controlled amounts of one or more elements, including Al, Ca, Ba, Sr, Ce, La, Mn, Bi, S, O, and Zr. The inoculant provides nucleation sites that promote graphite precipitation and growth, together with iron solidification based on a stable Fe-C system. In this session, the history and evolution of inoculation will be presented, along with a description of the common understanding of what an inoculant is, how the effect and performance of an inoculant can be measured, and what factors can affect inoculation performance.

10:30 a.m. | Auditorium
METALCASTING RESEARCH

DATA DRIVEN DESIGN & INTELLIGENT MANUFACTURING (2021-156)

Jiten Shah, PDA LLC, Naperville, IL

Shah will give an update on a newly upgraded, user-friendly, web-based Casting Alloy Data Search (CADS V 3.0) tool for casting design engineers with over 350 engineering properties data sets of commonly used ferrous and nonferrous alloys with pedigree information, such as the molding process, section thickness and composition. Also, another ongoing research project focused on data mining historical production data and applying modern tools, such as physics-based virtual simulation, ICME, machine learning and artificial intelligence, to develop meta models for better casting designs and an intelligent manufacturing system, will be presented. This Industry 4.0 big data project demonstrates how to optimize design and solve quality issues and is capable of real time process control with further integration. Both research projects are funded by AMC/DLA, managed by AFS and led by PDA LLC.

1 p.m. | Innovation Theater
CASTING DESIGNERS AND BUYERS

WORKING WITH YOUR FOUNDRY TO DESIGN FOR MANUFACTURABILITY (2021-141)

Andy Mastalir, The C.A. Lawton Co., De Pere, WI

Small but important changes to a component's design can lead to significant cost, weight, and time savings. Early design discussions with a qualified casting source will pay dividends.

1 p.m. | Auditorium
COPPER DIVISION

INVESTIGATING THE EFFECTS OF TURBULENT GATING ON C89833 MATERIAL (2021-110)

Andy Shea, A.Y. McDonald Manufacturing Co., Dubuque, IA

Brass foundries have seen an increase in leaker scrap when pressure testing brass castings since the switch to no-lead materials. This investigation examines the impact of turbulent gating on pressure tightness and mechanical properties for the C89833 material.

2:30 p.m. | Auditorium
FUTURE LEADERS OF METALCASTING

PANEL: FOUNDRY EXECUTIVES SHARE KEY LESSONS — A Q&A SESSION (2021-136)

Your 1st Year in Metalcasting
JB Brown, BCI Solutions Inc., Bremen, IN

3 C's- Culture, Connection and
Dana Cooper-Hayes, Cooper Hayes LLC, Stevensville, MI

How to Influence Without Authority
Denny Dotson, Dotson Iron Castings, Madison Lakes, MN

The Importance of Data Driven Goals
Henry Lodge, Lodge Mfg. Co., South Pittsburg, TN

Leadership Self-Awareness
John Wiesbrock, Waupaca Foundry, Waupaca, WI

AFS Future Leaders of Metalcasting presents an interactive session of metalcasting leaders sharing their stories with attendees through panel discussions. Bring your questions and share your stories in these worthwhile mentoring discussions.

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WEDNESDAY, APRIL 14

9 a.m. | Auditorium
ALUMINUM & LIGHT METALS DIVISION

NOVEL APPROACH TO THERMAL PROCESSING DEVELOPMENT FOR PRECISION SAND CASTING PROCESS (PSCP) IN ALUMINUM 319 ALLOY (2021-070)

Robert Mackay, Glenn Byczynski, Nemak US/CAN Business Unit, Windsor, ON, Canada; Abdallah Elsayed, University of Guelph, Guelph, ON, Canada

The latest generation of high-performance cylinder blocks are produced with the precision sand casting process (PSCP). To achieve the required properties, integrated chills are incorporated and can result in large variations in secondary dendrite arm spacing (l2) throughout the casting, providing unique challenges to optimizing the heat treatment (T7 temper) and complying with existing automotive requirements. This work proposes a new way to fully assess the appropriate heat treat development for PSCP engine blocks. The results indicated artificial age temperature differences of as little as 4C (within CQI-9 for furnace temperature specification of 35C) can produce significantly different casting properties. Mechanical properties, the Quality Index, and cryogenic stress testing were all measured to determine casting suitability for service. The work finally outlines a more effective protocol for the selection of artificial age temperature which produces an optimized and functional engine block casting.

KEYNOTE SPEAKERS

TECHNICAL TRACK

MANAGEMENT TRACK

CASTING DESIGNERS AND BUYERS TRACK

9 a.m. | Auditorium
CAST IRON DIVISION

HONORARY LECTURE: TECHNOLOGY TRENDS AND CHALLENGES FOR IRON FOUNDRIES (2021-090)

Patricio Gil, MAPPSA, Ramos Arizpe, Mexico

Understand the current world market trends in terms of manufacturing technology and how those changes are affecting the iron foundry industry and questioning the traditional business models. Gil will review the main variables that influence the iron foundry's performance from a management perspective and discuss how those variables are linked to our technical infrastructure and our market decisions.

9 a.m. | Innovation Theater
INNOVATION THEATER
SPONSOR PRESENTATION:

LEARN HOW INDUSTRY 4.0 AND ARTIFICIAL INTELLIGENCE HELP CUT SCRAP BY 40%

Starting your digital journey doesn't have to be complicated. You can start small with Industry 4.0 tools to centralize all your foundry data, and then apply AI to consistently cut scrap. We will show you how a green sand foundry cut scrap by 40% using AI-driven recommendations to identify process optimization across the entire casting process.

DISA
A Norican Technology

9:30 a.m. | Auditorium
ALUMINUM & LIGHT METALS DIVISION

MACHINABILITY CHARACTERISTICS OF ALUMINUM CAST ALLOYS (2021-029)

Dr. Yasser Zedan; Marawn Hamid, British University in Egypt, Cairo, Egypt; Yasser Zedan, ETS-Montreal, Canada, Montreal, QC, Canada; Herbert Doty, General Motors, Pontiac, MI; Salvador Valtierra Gallardo, Nemak, S.A., Garza Garcia, N.L., Mexico

The present study was carried out to study the machinability, i.e., milling characteristics, of an Al-6%Cu-0.7%Si alloy (in the as-cast, T5 and T7 aging conditions) and compare these characteristics to those of well-defined B319.0 (as-cast, T7-treated) and A356.0 (as-cast, T6-treated) alloys. Wet milling was carried out on 15 blocks prepared from each alloy using new carbide inserts for about 120m machining distance. Thirty-five blocks (12 in x 7 in x 1.5 in) were employed. The experiment comprised the CNC machine, the blocks to be machined, a table dynamometer with piezoelectric sensors that are responsible for detecting and measuring the cutting forces, a signal amplifier and an A/D converting unit. New and dull cutting inserts were used for each alloy group. Thirteen layers of material were removed from each block, where each layer consisted of 10 paths, and the depth of cut was 1.35 mm.

KEYNOTE SPEAKERS
TECHNICAL TRACK
MANAGEMENT TRACK
CASTING DESIGNERS AND BUYERS TRACK

10 a.m. | Auditorium
CAST IRON DIVISION

UNDERSTANDING THE EFFECT OF BORON IN GRAY IRON (2021-073)

Laura Bartlett, Simon Lekakh, Suyash Pawaskar, Missouri University of Science and Technology, Rolla, MO

Increasing usage of boron in automotive steels progressively contaminates cast iron charge mixtures. Many controversial opinions are held about boron's effect on the structure and properties of cast iron with no agreement about acceptable critical concentrations of this element in cast iron. Therefore, an experimental study was performed to uncover the effects of boron in Class-30 gray iron. Ferro-boron additions were used to increase boron up to 130 ppm in several laboratory heats. Thermal analysis was utilized to determine the effect of boron on phase transformations during solidification and the eutectoid transformation. Mechanical property tests and microstructural analysis were conducted to determine the effect of boron at different carbon equivalents. The results showed that the effect of boron in cast iron was significantly affected by carbon equivalent. Preliminary discussion about the mechanisms of boron effects on phase transformations and properties of gray cast iron will be presented.

10:30 a.m. | Auditorium
CAST IRON DIVISION

DUCTILE IRON FRONT-END ULTRASONIC NODULARITY DETERMINATION USING STANDARD COUPONS (2021-009)

James Cree, Mike Robles, Jr., Adam Hoover, Grede - New Castle, New Castle, IN

Ductile iron nodularity is of critical importance to its quality, but nodularity determination by metallographic analysis can be problematic. The widespread practice of estimating nodularity via comparator chart is highly subjective and prone to unacceptably high variation. An improvement over visual metallographic estimates is digital image analysis (IA) by which subjectivity can be greatly reduced, but the more reliable results obtained from IA are time consuming and difficult to implement in a production environment. For this session, the use of ultrasonic velocity testing via a standard coupon was evaluated as a possibly more reliable technique for determining front-end (real time) nodularity. Major results will be presented, along with details necessary for implementation of front-end ultrasonic nodularity determination using standard coupons (FEUNDUSC) as standard practice.

1 p.m. | Innovation Theater
CASTING DESIGNERS AND BUYERS

FINDING A SOLUTION WITH LOST FOAM: AN ALUMINUM CASE STUDY (2021-142)

Curtis Taylor, BRP, Spruce Pine, NC

Hear the story of how the two-stroke 300HP V-6 marine engine block called the G2 Snipe came to be cast in aluminum via the lost foam method. The one-piece design eliminated the need for multiple castings, weldments, and their assembly. Casting such a complicated part may seem like more trouble than it's worth, but the cost savings from eliminating individual parts were considerable.

KEYNOTE SPEAKERS

TECHNICAL TRACK

MANAGEMENT TRACK

CASTING DESIGNERS AND BUYERS TRACK

1 p.m. | Auditorium
GOVERNMENT AFFAIRS DIVISION

KEY METALCASTING ISSUES MOVING THROUGH THE U.S. CONGRESS AND KEY AGENCIES (2021-139)

Eric Meyers, Oil City Iron Works Inc., Corsicana, TX; Stephanie Salmon, AFS Washington Office, Washington, D.C.

AFS is focused on ensuring that policies crucial to the metalcasting industry remain front and center of the new 117th Congress and Biden Administration. Hear critical updates on the most recent advocacy efforts related to AFS priority issues in Washington, D.C., on pandemic relief, infrastructure, trade and safety.

THURSDAY, APRIL 15

9 a.m. | Auditorium
STEEL DIVISION

THE VALUE OF SCRAP, REWORK AND YIELD AT STEEL FOUNDRIES (2021-036)

Roy Stevenson, Daniel Coyle, Gerald Richard, MAGMA Foundry Technologies, Schaumburg, IL

Steel foundries seeking to survive and thrive in difficult economic environments must consider both internal and external opportunities and threats when planning for the short- and long-terms. While external threats, such as sharp decreases in steel casting demand, are outside of the control of steel foundry management, opportunities are present within all steel foundries to reduce costs, improve on-time delivery performance and shorten lead times. This session will investigate the impact inconsistent as-cast quality has on scrap and rework costs and how inconsistent as-cast quality makes it difficult for steel foundries to remain responsive while trying to win new work and/or meet customer delivery requirements. A model will be used to estimate the cost of scrap, rework and yield for different size steel foundries and case studies will help to highlight the potential that exists for each of these categories.

9 a.m. | Innovation Theater
INNOVATION THEATER
SPONSOR PRESENTATION:

AUTOMATED TECHNOLOGIES FOR TODAY'S MELT SHOP

Having been at the forefront of the thermal processing industry for close to 70 years—Inductotherm knows how to take foundry automation to the next level. By providing melt shops with efficient, customized equipment for their induction melting, heating, holding and pouring requirements while employing the latest "end-to-end" automated technology like IoT and robotics for virtually any metal or material, we are able to provide foundries with advanced solutions. Please watch our presentation to learn how technology is shaping the future of the melt shop and what it can do for you.

INDUCTOTHERM

9:30 a.m. | Auditorium
STEEL DIVISION

SAND CASTING OF SURFACE-ALLOYED BUTTERFLY VALVE WITH IMPROVED HARDNESS AND CORROSION RESISTANCE BY INCORPORATING METAL POWDERS IN-MOLD COATINGS (2021-093)

Kaustubh Rane, Michael Beining, Swaroop Behera, Amir Kordijazi, Ajay Kumar, Radeep Rohatgi, University of Wisconsin-Milwaukee, Milwaukee, WI

A cost-effective procedure to surface alloy WCB steel butterfly valve sand castings using mold coatings incorporating metal and ferroalloy powders was studied in this research.

10 a.m. | Auditorium
STEEL DIVISION

TITANIUM MASTER ALLOY EFFECT ON 1030 (2021-018)

Robert Tuttle, Saginaw Valley State University, University Center, MI

The work presented in this session uses two different TiC master alloys in casting experiments. The goal was to determine whether these master alloys could produce grain refinement. Metallography, mechanical testing, and thermal analysis were employed to understand the role of these master alloys on the microstructure of 1030. The mechanical properties of the treated steels were lower than the baseline, yet the macrostructure was finer in the treated steels. Thermal analysis found no change in solidification reactions. It appears that TiC is likely formed at the end of solidification and acts as a grain growth restrictors while the casting cools.

10:30 a.m. | Auditorium
STEEL DIVISION

POTENTIAL APPLICATIONS OF PATENTED LIGHTWEIGHT STEEL IN ARMORED VEHICLES (2021-019)

Hathibelagal Roshan, Maynard Steel Casting Co., Milwaukee, WI

Development of lightweight steel for use in armored vehicles has been the subject matter of research by several institutions for many years. Maynard Steel Casting Company in Milwaukee has invented lightweight steel weighing up to 70% less than solid steel on an industrial scale using a sand casting process. Two U.S. patents have been granted for this invention. In order for a material to be used to make components in armored vehicles, it needs to have ballistic- and blast-resistant properties listed in military specifications. The designers of components in military vehicles expect optimization of the behavior of the component based on computer simulations using appropriate failure models. There is a paradigm shift from design-make-shoot and evaluate concept to model-simulate-optimize-make-shoot and evaluate. Various requirements of components used in armored vehicles and the research efforts to meet these requirements will be presented and discussed.

KEYNOTE SPEAKERS

TECHNICAL TRACK

MANAGEMENT TRACK

CASTING DESIGNERS AND BUYERS TRACK

11 a.m. | Auditorium
STEEL DIVISION

QUANTIFYING THE EFFECT OF FILLING CONDITIONS ON 8630 STEEL CASTING QUALITY (2021-079)

Laura Bartlett, Koushik Karthikeyan Balasubramanian, Missouri University of Science and Technology, Rolla, MO; Zach Henderson, Doug Imrie, Southern Cast Products, Jonesboro, AR; Mingzhi Xu, Georgia Southern University, Statesboro, GA

Gating system design plays an important role in determining the quality and mechanical properties of castings. Recently developed naturally pressurized gating systems have been proclaimed by some to completely eliminate defects in steel castings; however, this has not been quantitatively studied. In the current study, the efficiency of different gating systems on reduction of inclusions and the corresponding mechanical properties was studied in quenched and tempered SAE 8630 steel castings using a combination of computational modeling coupled with experimental evaluation of industrially produced test castings. A novel mold design allowed for the simultaneous comparison of four different best practices and gating systems. Inclusion analysis revealed presence of mainly Al2O3, complex Al2O3-MnS inclusions, and eutectic type II MnS. The naturally pressurized system provided the cleanest castings with the highest notch toughness. Eutectic type II MnS that formed during solidification negatively affected toughness and this obscured the effect of pre-existing alumina inclusions.

1 p.m. | Auditorium
ALUMINUM & LIGHT METALS DIVISION

PREDICTIVE ANALYSIS OF WATER WETTABILITY AND CORROSION RESISTANCE OF SECONDARY AlSi10MnMg(Fe) ALLOY MANUFACTURED BY VACUUM ASSISTED HIGH PRESSURE DIE CASTING (2021-048)

Swaroop Behera, Amir Kordijazi, Arthur Jamet, Pradeep Rohatgi, University of Wisconsin-Milwaukee, Milwaukee, WI; Ana Fernández-Calvo, AZTERLAN, Basque Research and Technology Alliance (BRTA), Durango, Spain

An Artificial Neural Network was developed to investigate the effect of section size and type of AlSi10MnMg alloys (primary or secondary) on water wettability of the cast samples. Additionally, corrosion resistance was studied using a linear polarization experiment. The developed model was able to predict CA values with the Pearson correlation coefficient of 0.96. The section size of the casting did not appear to have a measurable effect on the contact angle. However, the secondary alloy exhibited significantly higher contact angles than the primary alloy; as demonstrated by confocal microscopy images, the secondary alloy exhibited higher surface roughness than the primary alloy when polished under identical conditions, presumably due to more intermetallic compounds. The primary alloy possesses more corrosion resistance than the secondary alloy, possibly due to the larger fraction of intermetallic compounds in the microstructure of the secondary alloy serving as galvanic sites in the corrosion reaction.

KEYNOTE SPEAKERS

TECHNICAL TRACK

MANAGEMENT TRACK

CASTING DESIGNERS AND BUYERS TRACK

1 p.m. | Innovation Theater
CASTING DESIGNERS AND BUYERS

3D PRINTING: FROM PROTOTYPE TO PRODUCTION (2021-143)

Dave Rittmeyer, Hoosier Pattern Inc., Decatur, IN

Advancements in additive sand technology have fostered its emergence from a prototype-only process to a process viable for production casting applications. This presentation will provide a view of how the use of additive sand for production castings will grow in the coming years.

1:30 p.m. | Auditorium
ALUMINUM & LIGHT METALS DIVISION

THERMODYNAMIC MODELING OF SOLID FLUX INTERACTIONS WITH MOLTEN ALUMINUM (2021-034)

Michael Moodispaw, Emre Cinkilic, Alan Luo, The Ohio State University, Columbus, OH

The total melt loss generated during melt processing can be greatly reduced by efficient use of flux, particularly for melting aluminum scrap or secondary alloys. Effective use of cover fluxes can significantly reduce dross generation and the amount of metallic aluminum trapped within the dross, while drossing fluxes can return up to 50% of the trapped aluminum. To evaluate flux ingredients used in the casting industry, computational thermodynamic software was used to calculate the driving force for reactions between 15 flux ingredients and 15 common alloying and impurity elements in foundry alloys. The thermodynamic calculations, combined with other properties, were used to provide a desirable list of cover and drossing ingredients, which are being experimentally validated.

2:30 p.m. | Auditorium
MARKETING DIVISION

MODERN DAY PROSPECTING AND SELLING FOR ELITE PERFORMANCE (2021-155)

Rich Austin, Corporate Strategies, A Sandler Training Center, Naperville, IL

Selling in the COVID era has not changed what we sell; it has changed how we sell it. Twenty-five years ago, salespeople thrived by developing expertise in their products and services and furthermore, the features and benefits associated with both. Today, prospective clients are savvy, sophisticated, and well-educated. They are no longer looking for features and benefits; they crave value-added, customized, efficient interactions that are personally impactful. With furloughs, budget freezes, and work-from-home policies, getting prospective decision-makers to engage is indefinitely harder and every opportunity needs to be re-qualified in each step of the sales process. It is no wonder that salespeople are reluctant to hunt for new business and fear their approach is intrusive or inappropriate in the current environment.

Re-envisioning the psychology that drives salesperson and prospect behavior today provides striking data toward process change for the success of both parties. This session will peer behind the curtain of the adaptation of modern sales and give attendees a glance at not only what overperforming salespeople are doing right now, but the technology they are leveraging to change the game.

Attendees will learn:

- The top five psychological anchors that hamper salespeople.
- How to engage in ethical prospecting practices.
- Habits of consistently overperforming salespeople.
- How to leverage a predictable process for sales efficiency during unpredictable times.

MONDAY, APRIL 19

9 a.m. | Auditorium
ENGINEERING DIVISION

CASTING COOLING TECHNOLOGY: NEW SOLUTIONS AND APPLICATIONS (2021-032)

Gaetano Coraggio,
Magaldi Technologies LLC, Atlanta, GA

Over the years, the casting procedures for steel and aluminum alloy products have developed distinctive features in terms of casting practices, machinery, process, and quality control methodologies. This session will discuss the casting cooling curves that affect the material properties and how it is possible to cool down the castings per client requests through accurate cooling system design. The combined use of analytical methods (i.e., CFD analysis), experimental tests, an in-house built test rig, and on-field measurements allow setting the correct parameters to obtain an effective cooling process.

9 a.m. | Auditorium
MOLDING METHODS
& MATERIALS DIVISION

CAST MAGNESIUM FOAM FOR ENERGY ABSORPTION AND BONE REGROWTH (2021-052)

Hannah Ullberg, Kaustubh Rane, Amir Kordijazi, Pradeep Rohatgi, University of Wisconsin-Milwaukee, Milwaukee, WI

In this work, a critical review of the casting of metal foams for biomedical applications is presented, outlining the opportunities for markets for castings. Additionally, this work presents a novel, low-cost pressure infiltration casting technique which enables the synthesis of magnesium foams for use as bone scaffolds. Foam and mold shapes were designed to take into account the requirements of bone cell regrowth. These designs were 3D printed using polylactic acid (PLA), then placed in plaster to form the molds. The plaster molds were sintered, then pressure infiltrated with a magnesium alloy, AZ91E, to form foams. Simulations were performed for compression response of foams for varying beam and pore sizes and shapes. A simulated foam compressed 0.23mm under loading that cortical bone can withstand, 150MPa. The experimental and simulated results show that a low-cost magnesium foam can be cast with a controlled porosity and strength similar to bone.

9:30 a.m. | Auditorium
MOLDING METHODS
& MATERIALS DIVISION

ROOT-CAUSE ANALYSIS AND PROBLEM SOLVING OF SHRINK DEFECTS IN ALUMINUM ALLOY BY SOLIDIFICATION RATE STUDY (2021-013)

Sritama Kar, ASK Chemicals LP,
Dublin, OH

In order to investigate the root cause of shrink defects in aluminum alloy A319, the solidification rate of this alloy in the sand molds prepared by a Cold Box system, has been studied. A statistical analysis is done on the time-temperature data collected during the solidification process in the range of 650C to 583C right before the liquid metal loses its ability to flow as it reaches the critical fraction of solid. This analysis predicts the factors that would affect the rate of solidification of the castings by a certain percentage. The order of impact of the factors found in this study is different than that of the previous study based on the temperature range of 650C-400C degrees - 400 and conclusive for finding a solution to shrink defects.

10:30 a.m. | Auditorium
KEYNOTE SPEAKER

HOW TO BENEFIT FROM SHORTER SUPPLY CHAINS (2021-144)

Harry Moser
Reshoring Initiative, Kildeer, IL

Reshoring and foreign direct investment (FDI) have brought back over 700,000 U.S. manufacturing jobs in the last 11 years. At the same time, the COVID crisis has demonstrated the risk of long supply chains. In fact, a recent BDO survey showed that 24% of companies are planning to change the country in which they source or produce, and 22% plan to reshore to the U.S.

Harry Moser, president of Reshoring Initiative, will explore how U.S. foundries can take advantage of the trend toward shorter supply chains and what that means for reshoring and FDI. Plus, discover how Reshoring Initiative's Total Cost of Ownership Estimator and the Import Substitution Program can help your company land contracts that otherwise would have gone overseas.

1 p.m. | Auditorium
ADDITIVE MANUFACTURING DIVISION

THE PREFERRED NUMERICAL METHOD FOR PROCESS SIMULATION OF 3D PRINTED SAND MOLD CASTINGS (2021-058)

Ken Siersma, Mahfuj Ahbab, Chung-Whee Kim, EKK, Inc., Farmington Hills, MI

Product designs created with topology optimization or generative design include geometrical features that are lean and organically derived. Metalcasting continues to be a practical process for manufacturing, but traditional casting processes are often incapable of creating parts with such complex organic geometries. 3D printed sand mold casting technology can eliminate or greatly reduce this limitation. Accurately modeling the filling and solidification processes for these complex castings is of utmost importance. This session will show that a geometrically flexible finite element method mesh is particularly suitable for 3D printed sand mold casting simulation, compared to the more commonly used orthogonal structured mesh. A demonstration of a novel advanced mesh coarsening scheme will be included.

1:30 p.m. | Auditorium
ADDITIVE MANUFACTURING DIVISION

WIRELESS FOUNDRY PROCESS SENSORS FOR IOT APPLICATIONS (2021-096)

Jerry Thiel, University of Northern Iowa, Cedar Falls, IA; Eric MacDonald, University of Texas at El Paso, El Paso, TX

Molding process variation has been the source of casting defects and ultimately delays in product delivery. It is estimated that quality issues including casting defects resulting from process variation can cost manufacturers millions in rejected parts or delivery delays. Determining variations in the molding and casting processes can provide valuable information to improve the casting process. This information can form the basis for foundries to advance into manufacturing 4.0. Data from the molding and casting process can aid metalcasters in refining their processes to higher levels than ever before possible. Sensors within molds can collect process data which includes temperature, pressure, moisture, and gas chemistries. Temperature as well as mold gas emissions are used to determine the degree of sand curing by measuring volatile organic compounds released during polymerization. Sensors in areas or rooms of the foundry can measure environmental conditions as well as respirable dust.

2:30 p.m. | Innovation Theater
CASTING DESIGNERS AND BUYERS

THE UNDERUTILIZED COMPETITIVE ADVANTAGE: BENEFITING FROM LIFE CYCLE ANALYSES (2021-025)

Jeremy Lipshaw, Unaffiliated, Ferndale, MI

The casting supply chain has an opportunity to leverage the inherent strengths of its product into a competitive advantage by embracing sustainability assessments based on Life Cycle Analysis (LCA). While classical vehicle sustainability metrics primarily consider how materials affect fuel economy via lightweighting, LCA accounts for the entire life cycle of the material or product, including the production, use, and end-of-life. Due to their recyclability and lower embodied energy, castings have the potential to be more sustainable in this framework compared to other metals manufacturing methods. However, the casting industry is currently underprepared to compete in LCA-based evaluations. There is a significant shortage of LCA literature for castings compared to other material processes. Furthermore, the well-documented and inaccurate perception problem within industry that castings are heavy and outdated discourages researchers from considering this line of study. This presentation speaks about how the casting industry would benefit from LCA-based sustainability metrics.

2:30 p.m. | Auditorium
LOST FOAM DIVISION

THIN-WALLED DUCTILE IRON WITH CARBIDE-FREE MICROSTRUCTURE DOWN TO UNDER ONE MILLIMETER IN LOST FOAM AND NOBAKE CASTING (2021-068)

Sarah Jordan, Mark DeBruin, Skuld, LLC, Gahanna, OH; Alan Luo, Emre Cinkilic, The Ohio State University, Columbus, OH

Ductile iron is desirable for lightweighting as it has an optimum specific strength when cost is considered. This is especially true for its heat-treated variation, austempered ductile iron (ADI). The authors report on U.S. Department of Energy funded research for thin-walled ductile iron. The influence of chemistry for 65-45-12, 80-55-06, and 100-70-03 was studied across various thicknesses for ductile iron cast in lost foam and resin bonded nobake sand. Carbide-free results in sections as thin as 0.76mm were obtained. Lost foam casting's dimensional tolerance control was also investigated.

3 p.m. | Auditorium
LOST FOAM DIVISION

HOW ANY FOUNDRY CAN DIVERSIFY INTO LOST FOAM CASTING AT NEGLIGIBLE COST (2021-067)

Sarah Jordan, Mark DeBruin, Skuld, LLC, Gahanna, OH

Decades ago, it was predicted that lost foam would take over nearly 30 percent of the casting industry. Yet despite its advantages, the process has a negligible market share. This presentation will address the idea that lost foam is unsuitable for small volumes. Many hold the belief that lost foam casting requires expensive tooling and specialized equipment. This large upfront investment in tooling and equipment then has to be amortized across large production volumes. However, lost foam casting can be done by machining foam and manual compaction. This method still maintains the tight dimensional tolerances of lost foam casting: typically 0.002 per inch tolerance plus the machined foam tolerance. Process details on how any foundry can diversify into lost foam casting as well as common defects to avoid will be shared. The design benefits of lost foam, including the latest research showing the ability for as-cast threads, will also be covered.

TUESDAY, APRIL 20

9 a.m. | Auditorium
ADDITIVE MANUFACTURING DIVISION

PANEL: RESEARCH, SUPPLIER, OPERATOR, A LOOK AT THE FUTURE OF AM4MC (2021-091)

Brandon Lamoncha, Humtown Products, Columbiana, OH; Kelley Kerns, HA-International LLC, Westmont, IL; Travis Frush, University of Northern Iowa, Cedar Falls, IA

The panel, made up of researchers, material suppliers and operators, will discuss where we were, where we are and where we are going in additive manufacturing in the foundry Industry. The presentation will cover the latest advancements in materials and equipment for 3D sand printing.

9 a.m. | Auditorium
LOST FOAM DIVISION

LOST FOAM STAINLESS STEEL (2021-063)

Marshall Miller, Tesserract4D, Irving, TX

While successful in the production of aluminum base, copper base, irons and carbon steel, the lost foam process has been unable to produce lower carbon content stainless steels such as CF8M (0.08C maximum) due to carbon pick up and non-uniform carbon distribution. The session will demonstrate the successful production of CF8M stainless steel through the application of the latest in bead technology for patterns and gating, gating design, aggregate permeability and LOI impact and coating as developed by the lost foam process products supply chain in the actual operating foundry environment.

10:30 a.m. | Auditorium
HOYT MEMORIAL LECTURE

HOYT MEMORIAL LECTURE: METALMORPHASIS CHANGE AND TRANSITION (2021-127)

Tom Prucha
Metal Morphasis LLC, Editor-in-Chief, International Journal of Metalcasting, Rochester Hills, MI

Change is constant, as nothing stays the same. Consider the words of the Chinese philosopher Lao Tzu: "Life is a series of natural and spontaneous changes. Don't resist them—that only creates sorrow. Let reality be reality. Let things flow naturally forward in whatever way they like." Some changes are the result of biology and the passage of time, within the natural cycle or order of things. Others are self-generated, under our own control and willful effort, or dependent upon encounters with significant others—family, friends, colleagues, and others close to us. Still, other changes occur because of circumstance or fate, a proverbial "date with destiny" and often beyond what we feel is in our control. Whether it is our personal life or occupation, like metalcasting, this change can facilitate transition and transformation. Prucha has coined the term metalmorphasis and this lecture is a reflection of how to embrace change and utilize it as a vehicle for new opportunities. Beyond the philosophical, this lecture looks at how we as metallurgists and metalcasters apply change (time, temperature, pressure, chemical reactions, etc.) to transform metals and create metalmorphasis.

1 p.m. | Innovation Theater
CASTING DESIGNERS AND BUYERS

IRON CASTING CONVERSION CASE STUDY (2021-138)

Mark Mundell, Lethbridge Iron Works Co. Ltd., Lethbridge, AB, Canada

In this case study presentation on the 2020 Casting of the Year, Mundell will talk about the process of manufacturing an opener main body casting — a textbook example for a casting conversion from a steel fabrication.

1 p.m. | Auditorium
MOLDING METHODS & MATERIALS DIVISION

SILVER ANNIVERSARY LECTURE: AIR FLOW VARIATIONS WITHIN A COREBOX: A STUDY OF VENT OPEN AREA AND SAND VARIABLES (2021-121)

David Gilson, SinterCast Inc., Naperville, IL

This Silver Anniversary Lecture provides a timely update on a paper originally presented at Metalcasting Congress in 1996, "Air Flow Variations Within a Corebox: A Study of Vent Open Area and Sand Variables" by D.M. Gilson, K.B. Horton, and P.B. Carr of Ashland Chemical Co. in Columbus, Ohio. This study confirmed some generally accepted venting guidelines, but also contradicted some expected outcomes. Gilson will provide new insights into this research on the air flow characteristics of common foundry vents.

KEYNOTE SPEAKERS

TECHNICAL TRACK

MANAGEMENT TRACK

CASTING DESIGNERS AND BUYERS TRACK

2 p.m. | Auditorium
ADDITIVE MANUFACTURING DIVISION

CHARACTERIZATION OF 3D PRINTED POLYMETHYL METHACRYLATE FOR EXPENDABLE TOOLING APPLICATIONS (2021-098)

Nathaniel Bryant, Jiayi Wang, Travis Frush, Jerry Thiel, University of Northern Iowa, Cedar Falls, IA

Recent advancements in additive manufacturing technology for metalcasting have revolutionized the foundry industry's capability to create molds, cores, and expendable tooling. While extensive research has been conducted to optimize materials and parameters used in 3D sand printing, little progress in these areas has been made in the field of expendable tooling for investment casting. The University of Northern Iowa has completed a preliminary investigation to realize the effect of binder saturation and wax infiltration on the burnout characteristics, as well as the physical and mechanical properties of a commercially available polymethyl methacrylate (PMMA) powder commonly used for the additive manufacturing of expendable tooling. Specimens were created using the University VX1000 3D printing system and subsequently post-processed according to the manufacturer's specifications. It was determined that both the saturation level and wax infiltration process significantly influence the measured properties.

2 p.m. | Auditorium
ENGINEERING DIVISION

DO YOU HAVE ENERGY LEECHES IN YOUR PLANT? (INTERACTIVE JEOPARDY SESSION) (2021-104)

Bob Baird, General Motors, Carmel, IN; Zach Meadows, EC&S, Birmingham, AL

As foundries analyze energy efficiencies that can dramatically improve production processes, they must recognize energy leeches and guide operations on how to implement change. There are melting operational "leeches," such as excess holding of molten metal, charging methods and practices, as well as improved designs for gates and sprues. Another leech in foundry operations is compressed air. Dirty inlet filters, excessive operating pressures or air leaks are all leeches that can be easily recognized and corrected — with sustained maintenance practices. Additionally, lighting leeches are often overlooked, but improvement in this area is extremely beneficial. Outdated, dirty light fixtures or simply leaving lights on unnecessarily are both opportunities to conserve energy consumption.

KEYNOTE SPEAKERS

TECHNICAL TRACK

MANAGEMENT TRACK

CASTING DESIGNERS AND BUYERS TRACK

2:30 p.m. | Auditorium
ADDITIVE MANUFACTURING DIVISION

EVALUATION OF A LOW-COST MATERIAL EXTRUSION PRINTER FOR INVESTMENT CASTING APPLICATIONS (2021-148)

Tom Mueller, Mueller AMS, New Berlin, WI

3D-printed patterns have been used to create prototype investment castings for more than 25 years and have become the preferred method of creating prototype castings. Not only do printed patterns save time and money in the development of investment castings, they reduce the risk of cost overruns and delays in market introduction of the product incorporating that casting. However, the additive manufacturing systems currently used to print the vast majority of prototype patterns range in price from $70k to $800k. Considering prototype castings average about 2% of most investment foundry revenues, it is hard for foundries to justify making that large of a capital investment that only affects a small percentage of their revenues.

3 p.m. | Auditorium
ADDITIVE MANUFACTURING DIVISION

3D-PRINTED SAND PRECISION CASTING PROCESS EXPERIENCE AND DIMENSIONAL TOLERANCE ASSESSMENT UPDATE (2021-149)

Tyler Nooyen, Waupaca Foundry, Waupaca, WI; Jiten Shah, Product Development & Analysis LLC, Naperville, IL

3D printed sand processes are being adopted by conventional production foundries over the last few years and has a promise to provide tighter dimensional tolerances than conventional sand castings, in addition to the design and rigging flexibility and agility without the need for any hard tooling. Authors will give an update on an AFS-funded research project on the dimensional tolerance assessment with 3D-printed sand iron castings. Additionally, Waupaca Foundry will share its experiences with 3D printed sand cores in a production environment.

3:30 p.m. | Auditorium
ADDITIVE MANUFACTURING DIVISION

LIGHTWEIGHTING AN AIRCRAFT CASTING: A CASE STUDY (2021-147)

Tom Mueller, Mueller AMS, New Berlin, WI

Weight is critical in aircraft and is a primary driver of fuel costs. This case study documents the efforts of Solidiform, an aluminum aerospace investment foundry, to undertake a lightweighting study on a casting they currently provide to a military supplier but that was targeted to be replaced with a lighter weight component. Solidiform teamed with an AM company and a software company to use topology optimization to redesign the component, use filling and solidification simulation to ensure that the redesigned casting could be successfully cast, and provide financial justification for a change to the new design. The effort resulted in a 65% reduction in weight and an 18-month payback for the military.

KEYNOTE SPEAKERS

TECHNICAL TRACK

MANAGEMENT TRACK

CASTING DESIGNERS AND BUYERS TRACK

WEDNESDAY, APRIL 21

9 a.m. | Auditorium
MELTING METHODS & MATERIALS DIVISION

PANEL: CORELESS INDUCTION FURNACE MAINTENANCE (2021-129)

Pete Satre, Allied Mineral Products Inc., Columbus, OH; Chuck Cushing, EMSCO Inc., Oregon, WI

This panel presents various aspects of coreless induction furnace startup, maintenance, controls upgrade and coil repair.

9 a.m. | Auditorium
MOLDING METHODS & MATERIALS DIVISION

REVISITING THE DALTON CHART: PREDICTING THE IMPACT ON GREEN SAND PROPERTIES AS A FUNCTION OF CARBONACEOUS ADDITIVE CONCENTRATION (2021-053)

Liam Miller, Larry Kaiser, Jerald Darlington, Minerals Technologies Inc., Hoffman Estates, IL

Bentonite bonded molding sands often use green sand additives to provide beneficial properties to the molding sand and the casting process. In the 1980s, the AFS Green Sand Additive Committee generated the Dalton Chart, which outlines the relative impact common green sand additives have on green sand properties. Carbonaceous materials such as seacoal and causticized lignite are two additives that are widely used in green sand molding and appear in the Dalton Chart. In the present study, the impact of adding seacoal and causticized lignite to clay bonded molding sands was evaluated using a Design of Experiment and Analysis of Variance (ANOVA) methodology. Lab-prepared green sand mixtures were prepared and tested for all green sand properties listed in the original Dalton chart. The findings will be discussed and compared to the original findings in the Dalton Chart.

9:30 a.m. | Auditorium
MOLDING METHODS & MATERIALS DIVISION

EVALUATING FOUNDRY MOLDING EMISSION REDUCTION THROUGH USE OF SLURRY FROM DUST RECLAMATION (2021-081)

Victor LaFay; Patricia LaFay, Common Sense Applications, Cincinnati, OH; Robert Steele, FACT, PonteVedra Beach, FL; Sandra Boehnke, IMERYS, Oberhausen, Germany

The green sand metalcasting process will generate emissions during pouring, cooling and shakeout because of the decomposition of organic materials that exist in the prepared molding sand. The selection of molding additives and core process has been the historical method of reducing these emissions. Through the introduction of a slurry that was recovered from a foundry green sand dust collection, a sustained reduction in emissions can be achieved.

10:30 a.m. | Auditorium
ENVIRONMENTAL, HEALTH, AND SAFETY DIVISION

COMMUNITY ENGAGEMENT STRATEGIES FOR THE PROACTIVE METALCASTER (2021-123)

Bryant Esch, Waupaca Foundry Inc., Waupaca, WI; Jenny Pappalardo, Charlotte Pipe and Foundry Co., Charlotte, NC; Zeydi Gutierrez, McWane, Oakland, CA

Speakers will go over proactive vs. reactive community engagement, best practices for engagement strategies, case studies in community/stakeholder

involvement (both positive and negative outcomes), and implementing a proactive engagement strategy at your facility.

11 a.m. | Auditorium
ENVIRONMENTAL, HEALTH, AND SAFETY DIVISION

ENGAGEMENT: SAFETY'S GOLDEN STANDARD (21-124)

Dr. Ken Chapman, Ken Chapman & Associates, Tuscaloosa, AL

- No organization rises above its leader
- The connection between engagement and behavior
- From Engagement to behavior to ownership
- How "perspective" anchors "ownership"

1 p.m. | Innovation Theater
CASTING DESIGNERS AND BUYERS

WORKING WITH YOUR CASTING VENDOR FOR A FLAWLESS PRODUCT LAUNCH (2021-145)

James Bohlen, Allison Transmission Inc., Indianapolis, IN

A supplier quality development engineer shares best-practice strategies for casting sourcing.

1 p.m. | Auditorium
ENGINEERING DIVISION

BEYOND THE BUZZ, A PRACTICAL IMPLEMENTATION AND RESULTS OF INDUSTRY 4.0 IN WORKING FOUNDRIES (2021-066)

Jim Wenson, Roberts Sinto Corp., Lansing, MI; Eric Nelson, Dotson Iron Castings, Mankato, MN; Lizeth Medina-Balliet, Neenah Foundry, Neenah, WI

This session shares a practical case study on how several industry foundries implemented real-time data collection to visualize and optimize their processes in order to increase their OEE (Overall Equipment Efficiency) and reduce operating costs. These improvements stemmed from the use of data driven predictive maintenance, machine and operation optimization and by providing complete visibility of the process to their teams.

2 p.m. | Auditorium
MELTING METHODS & MATERIALS DIVISION

ENVIRONMENTALLY FRIENDLY PROCESS FOR FULLY RECYCLING ALKALINE BATTERIES IN CUPOLAS (2021-154)

Bruno Sokoloff, ECO Ring, Chambeon, France

An environmentally friendly process for fully recycling alkaline batteries in hot-air cupolas to gray iron was initially developed and tested in France and is now fully deployed in production foundries in France and Italy (Germany expected in 2021). This process reduces cost, CO2, and FeMn briquette/alloys requirements while meeting all other environmental restrictions. This session presents the sourcing, permitting, process, and metallurgical aspects for success.

KEYNOTE SPEAKERS

TECHNICAL TRACK

MANAGEMENT TRACK

CASTING DESIGNERS AND BUYERS TRACK

2 p.m. | Auditorium
MOLDING METHODS
& MATERIALS DIVISION

SAND PROCESSING METHODS SHOW REDUCTION OF RESPIRABLE SILICA FOR THE FOUNDRY INDUSTRY (2021-092)

Jerry Thiel, Sairam Ravi, University of Northern Iowa, Cedar Falls, IA

Research into the breakdown of silica sand through mechanical attrition has led University of Northern Iowa researchers to information that could reduce the generation of respirable silica dust in the foundry. Although the results of the testing are preliminary, the information sheds new light at the current issue of meeting recent changes to the permissible exposure limit for respirable silica. This new information could allow some foundries that are at risk to meet the new regulations without extensive engineering solutions or material changes. The research demonstrates current technologies that can be used to reduce silica breakdown and control respirable silica.

2:30 p.m. | Auditorium
MOLDING METHODS
& MATERIALS DIVISION

MACHINE-LEARNING BASED DYNAMIC COMPACTIBILITY SET-POINT CONTROL SOLUTION FOR IMPROVED CASTING OUTCOMES (2021-037)

Deepak Chowdhary, MPM INFOSOFT PRIVATE LIMITED, Chennai, India

Metalcasters have traditionally relied on experiential expertise in adjusting compactibility set-point at the compactibility controller. However, dynamically varying the set-point at the controller for near-precise translation to an optimal lab compactibility, factoring several influencing variables like relative humidity, ambient temperature, return sand moisture and temperature, GFN of the sand, and sand additives, is a challenge for most. Advanced machine learning technologies based on data-driven optimization of the green sand are applied to predict optimal lab compactibility. The research also integrates historical and real-time data of influencing variables from sensors and SCADA to predict dynamic and variable compactibility set-point at the controller. The study shows reduced variance of the delta between set and lab compactibility. Correspondingly, reduction in standard deviation in related sand properties and in casting defects was observed compared to pre and post machine-learning based compactibility control.

3 p.m. | Auditorium
GOVERNMENT AFFAIRS DIVISION

NAVIGATING COMPLIANCE AND ENFORCEMENT OF THE BUY AMERICA AND THE BUY AMERICAN PROVISIONS (2021-140)

Christopher Weld, Wiley Rein LLP, Washington, D.C.

In recent years, Buy America and the Buy American Acts within the various federal agencies have received heightened focus and changes. This session will help American metalcasting facilities navigate through the various agency programs and requirements. You will learn what are the main differences between Buy America and Buy American, how agencies grant waivers, and how they enforce these key provisions.

KEYNOTE SPEAKERS
TECHNICAL TRACK
MANAGEMENT TRACK
CASTING DESIGNERS AND BUYERS TRACK

THURSDAY, APRIL 22

9 a.m. | Auditorium
MELTING METHODS
& MATERIALS DIVISION

PANEL: CHANNEL INDUCTION FURNACE REFRACTORY TROUBLESHOOTING (2021-128)

Pat Leper, Saveway USA Corp., North Canton, OH; Tim Hoyt, Allied Mineral Products, Columbus, OH

In the attempt to increase utilization and reduce costs per ton of alloy throughput, channel furnace operators inherently have issues that need to be addressed. These issues can be costly or develop into added costs or reduced production over time. Some of the more common areas of concern are inductor issues, floor concerns, uppercase refractory issues such as erosion and build-up of materials, receiver and refractory cleaning. Our panel of refractory and operational experts will address these issues and be available for questions at the end of the presentation.

9 a.m. | Auditorium
MOLDING METHODS
& MATERIALS DIVISION

SMOKE SUPPRESSION IN PHENOLIC URETHANE-BONDED SAND SYSTEMS THROUGH THE USE OF ENGINEERED SAND ADDITIVES (2021-045)

Paula Vivas, Matthew Shoffner, Lee Horvath, ASK Chemicals LP, Dublin, OH

Chemically bonded resin systems like the phenolic urethane binder (PUB) are great binder systems for foundry core mold-making productivity and generation of high-quality castings. One of the drawbacks of some of these resin systems is the generation of high levels of smoke as the molten metal comes in contact with the chemically bonded sand structures (CBSS). Although a lot of work has been done to reduce pollutants and emissions by reformulating resin systems, the level of contaminants can still be an issue. This session will show the potential of a recently developed dual system engineered sand additive (ESA) that can reduce, in addition to veining, the level of smoke. This kind of dual engineered concept could improve foundry air quality and reduce undesired emissions and pollutants.

9:30 a.m. | Auditorium
ENGINEERING DIVISION

FLASH PREDICTION THROUGH MOLD DISTORTION SIMULATIONS (2021-059)

Johnathan Corkery; Ken Siersma; Chung-Whee Kim, EKK, Inc., Farmington Hills, MI

Thermal distortion simulation has played a large role in identifying possible issues in the casting process. Despite the benefits of mold distortion simulations, flash remains a problem for casting manufacturers. It has been demonstrated that, using sufficiently accurate, yet-cost-effective, mold distortion simulations for multiple mold sections in conjunction with proper sets of simulation parameters, the areas most prone to flash can be identified. With further analysis, the areas of flash can be ranked in severity and visualized so the process and mold can be engineered to reduce post-processing and machining costs. Using this process, a strong correlation between flash predicted in the simulation and created in the casting process was observed.

10 a.m. | Auditorium
MOLDING METHODS
& MATERIALS DIVISION

AUTOMATED IMPACT TESTING USING AN AFS STANDARD DISC-SHAPED SPECIMEN (21-061)

Owen Herner, General Motors; Sam Ramrattan, Western Michigan University, Kalamazoo, MI

An automated impact testing machine was developed at Western Michigan University. The device can accommodate the AFS standard 50 mm diameter by 8 mm thick disc-shaped specimen (cookie). The new design allows the specimen to be automatically brought into test position. A linear impact energy is delivered to destructively fail the specimen. Further, the machine is designed to run with inline production of chemically bonded sand cores, molds, and disc-shaped specimens. The instrument measures the toughness of the sand binder composite and saves the data for analytics. This paper presents the machine design and tests results for various chemically bonded disc-shaped specimens.

1 p.m. | Innovation Theater
CASTING DESIGNERS AND BUYERS

SHOULD YOU CAST IT? (2021-146)

Jiten Shah, PDA LLC, Naperville, IL

This session, led by Casting Source Design Details columnist Jiten Shah, covers the tell-tale factors of a component or assembly that indicate producing it as an engineered cast metal part would save time and money and increase value.

1 p.m. | Auditorium
ENVIRONMENTAL,
HEALTH, AND SAFETY DIVISION

PANEL: EHS HOT TOPICS (2021-122)

Jeet Radia, McWane Inc., Birmingham, AL; Stephanie Salmon, AFS Washington Office, Washington, D.C.

- Water, Waste and Byproducts Management Committee
- Air Quality Committee
- Health and Safety Committee

2 p.m. | Auditorium
ENGINEERING DIVISION

STRATEGIC ENERGY MANAGEMENT OPPORTUNITIES FOR FOUNDRIES: DETAILS ON A DEPARTMENT OF ENERGY FUNDED COHORT PROGRAM (2021-132)

Michael Stowe, Advanced Energy, Raleigh, NC

Foundry processes tend to be very energy intense as it requires large amounts of energy in various forms to melt, hold and then process molten metals. Managing and optimizing the consumption of this energy can provide economic, environmental and process improvements. This session will focus on the opportunity for AFS member foundries to participate in a strategic energy management cohort for implementing the principals of the ISO 50001 Energy Management standard and the DOE 50001 Ready program through a program sponsored by the Department of Energy (DOE) Advanced Manufacturing Office (AMO). This presentation will provide an overview of the ISO 50001 Energy Management Standard, the 50001 Ready program, and the DOE AMO cohort program.

2:30 p.m. | Auditorium
MELTING METHODS
& MATERIALS DIVISION

STATISTICAL COMPARISONS OF FOUR DIFFERENT THERMAL ANALYSIS SAMPLE CUP TYPES FOR CHEMISTRY CONTROL OF DUCTILE BASE IRON (2021-046)

James Cree, Mike Robles, Jr., Isaiah Grybush, Ryan Sorrell, Adam Hoover, Grede - New Castle, New Castle, IN; Joseph Cruse, CC Metals & Alloys, LLC, Calvert City, KY; Kiel Krause; George Frigm, Heraeus Electro-Nite Co., LLC, Hartland, WI

The use of thermal analysis as a tool for the real-time chemistry control of carbon and silicon in ductile base iron is very important for seamless melt productivity by avoiding delays in waiting for laboratory analyses of those elements through the direct but time-consuming methods spectrometer or combustion.

With the standard market availability of four different thermal analysis cup types encompassing the two binary choices of round vs. square and plain vs. tellurium in amounting to the four choices, thorough comparative testing of each cup type was conducted for gage repeatability and reproducibility analyses and other correlativity analyses. Major results of this testing and data analysis are presented herein along with discussion and conclusions regarding the relative merits of each of the four available cup types.

End of Sessions

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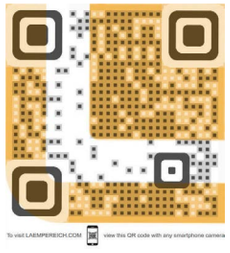

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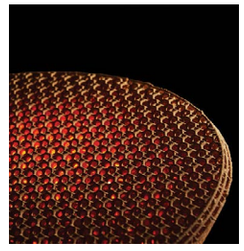

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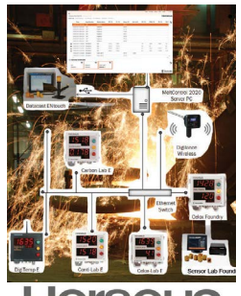

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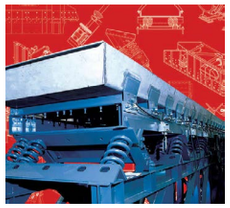

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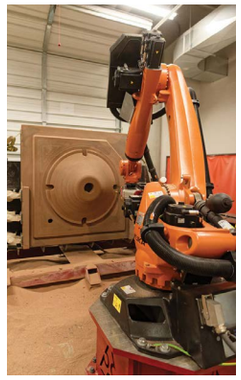

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Italpresse Gauss build machines and automated work cells for high pressure, gravity and low pressure die casting. Our machines are of the highest quality, ensuring process reliability, machine uptime and highest casting quality. For over half a century, we have focused exclusively on light alloy casting with constant attention to the needs of customer's big and small. Unlock Industry 4.0 possibilities: We are constantly developing new technologies that provide customers with innovative answers to their challenges: our Monitizer Suite, our HMe, our energy solutions.

Italpresse Gauss
616-772-3705
www.italpressegauss.com

Pillar Induction

Founded in 1966, Pillar Induction is committed to helping its melting customers achieve leaner, more profitable foundries. We continue to add products and engineered solutions for an integrated approach to foundry workflow. Pillar manufactures, services, and supports ferrous and nonferrous coreless melting systems. We pride ourselves on supplying the most reliable durable, and efficient equipment available to the industry today. Our line of melting furnaces range in capacity from 1 pound to 20 tons. Power supplies range in power from 10 to 6,000 kW.

Pillar Induction
800-558-7733
www.pillar.com

LAEMPE REICH CoreRoom

We sell em. We use em. When we started the CoreRoom, a core supply company, we chose the same machine we want you to buy. Laempe. And for the same reasons. Quality cores, at high efficiency, at a reasonable price.

LAEMPE REICH
205-655-2121
www.TheCoreRoom.com

REFCOTEC

REFCOTEC, a second-generation family-owned company has been a proud supplier to the North American metal casting industry for over 30 years. In our Ohio and Texas facilities, we manufacture the highest quality foundry products available on the market including, refractory coatings, sand additives, resin systems, pastes, partings, and many more. We specialize in custom product formulation, outstanding technical service, and short lead-times. We have products for every metal alloy and all molding methods. Bring us your casting challenges!

REFCOTEC Inc.
330-683-2200
www.refcotec.com

TOM-Series of Sand Mixers

Foundries know us best for our robust line of chemically-bonded sand mixers. From true rear-hinged doors to our revolutionary use of enhanced controls; we provide our customers with real savings. Our NexGen2™ controls can automatically adjust catalyst based on sand temperature; provides the easiest method of calibration on any standard mixer and can easily be upgraded with mass-flow resin pumps, our enhanced Smart-Gate automatic metering sand gates and even Auto-Path automated mixer path control. From the simple to the complex, Tinker Omega has the reputation of providing our customers with the most value and dependability.

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Wheelabrator

Wheelabrator is one of the world's leading providers of surface preparation technology, offering a complete range of airblast and wheel blast equipment (Continuous Tumblast Machine), shot peening solutions, as well as comprehensive global aftermarket support. Embracing automation and digitalisation, we are shaping industry with forward-thinking, intelligent solutions that help our customers optimise their processes - to deliver the results they need, the quality their customers demand, at the cost that their shareholders want to see. With a truly global network of engineering and manufacturing facilities, we are able to provide locally built machines that serve your needs, your application, your specification and your budget. Operating from strategically located service centres on four continents, Wheelabrator provides 15,000 active customers in over 100 countries with state-of-the-art parts preparation technology and services.

Wheelabrator
706-884-6884
www.wheelabratorgroup.com

Flexovit USA, Inc.

Flexovit is proud to announce the launch of Capstone™! Capstone™ is a brand new, patent pending, grinding wheel designed as an alternative to Type 6 and Type 11 cupwheels. With four full layers of fiberglass reinforcement, a built-in 20 degree grinding angle, a spin on zinc hub, and its unique shape, Capstone™ is a safer and more versatile option than standard cupwheels. Flexovit USA, Inc. is a manufacturer of high productivity abrasive products for the professional. Contact Jeff Franke, Foundry & Applications Manager, at jfranke@flexovitabrasives.com to schedule an evaluation and demo.

Flexovit USA, Inc.
800-689-3539
www.flexovitabrasives.com

LAEMPEAR℠

When being there soon is not soon enough℠

You rely on your LAEMPE CoreCenter. And you're skilled at keeping it running at peak performance. But when you need us, you need us now...and sometimes that can't wait until tomorrow. With one of the largest technical staff of experts in our market, standing-by to support you, you can now have us there virtually in a matter of minutes. Through technology, we can be with you, seeing what you see, supporting you in real-time. We can guide you in a way that has never been seen in our industry, without ever getting on a plane, regardless of where we are.

LAEMPE REICH
205-655-2121
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ASK Chemicals is one of the world's largest providers of comprehensive solutions and tailored consulting services in the castings industry. Beyond delivering exceptionally engineered products we also offer world-class research & development and unparalleled technical support. Present in 25 countries, ASK Chemicals helps you keep pace with global developments and trends in the casting industry.

ASK Chemicals LLC
800-848-7485
www.ask-chemicals.com

DISA

DISA develops and manufactures a complete range of green-sand metal casting and molding equipment, services and digital tools for ferrous and non-ferrous foundries. DISA's deep technical expertise plus global parts and service help our customers maximise molding process performance. Our comprehensive molding product range comprises vertical (DISAMATIC®), matchplate (DISA MATCH) and horizontal (DISA FLEX), plus complete integrated foundry lines including sand plants, conveyor systems, cleaning solutions and cooling drums. Our Monitizer® Industry 4.0 range supports the whole digital journey, from data collection and real-time process monitoring to Artificial-Intelligence-driven casting quality optimisation.

DISA
630-820-3000
www.disagroup.com

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2021 AWARDS

Every year, AFS honors the leaders and innovators whose ingenuity, hard work, and dedication move the metalcasting industry forward. Please join **Metalcasting Congress 2021** in recognizing this year's award-winners. Awards presentations are available to watch on demand in the **Innovation Theater.**

The following awards are unanimously recommended by the Society's incumbent **Board of Awards** for approval by the **AFS Board of Directors**.

GOLD MEDAL

KATHY L. HAYRYNEN

Vice President of R&D, Applied Process Inc. (Livonia, Michigan)

The **JOHN H. WHITING GOLD MEDAL** for her exemplary work in cast iron research and standards, chairing the AFS Technical Council, leadership in streamlining the AFS Cast Iron Division, as well as for advocacy and mentorship of students and Women in Metalcasting.

AWARD OF SCIENTIFIC MERIT

DIRAN APELIAN

Distinguished Professor of Materials Science and Engineering, University of California (Irvine, California)

The **AFS AWARD OF SCIENTIFIC MERIT** for his gold-standard contributions to the foundry industry in molten metal processing and solidification, alloy development and fatigue behavior of cast materials.

AFS SERVICE CITATION

BRIAN BEGAN

Senior Application Engineer, Foseco (Cleveland, Ohio)

The **AFS SERVICE CITATION** for his outstanding service to AFS and the foundry industry through chapter leadership, Technical Council and committee service, presentations and contributions to AFS Institute education programs.

RUSSELL L. ROSMAIT

Professor, Pittsburg State University (Pittsburg, Kansas)

The **AFS SERVICE CITATION** for his 40 years of distinguished service to AFS and the foundry industry, focused on encouraging innovation and developing future generations of leaders for all fields of the metalcasting industry.

PAPER & PRESENTATION AWARDS

2021 HOWARD F. TAYLOR AWARD

Paper No. 20-051: Quantifying Casting Quality Through Filling Conditions

Randy Oerhlein
Carley Foundry Inc., Blaine, MN

Dan Hoefert
ECK Industries, Manitowoc, WI

Cory Sents
Carley Foundry Inc., Blaine, MN

David Weiss
ECK Industries, Manitowoc, WI

Travis Bodick
Carley Foundry Inc., Blaine, MN

2021 APPLIED RESEARCH AWARD

AFS Health & Safety Committee Powered Industrial Sweeper Crystalline Silica Exposure Study (AFS Project 17-18#08)

Jason Lang
RHP Risk Management, Inc., Chicago, IL

ADDITIVE MANUFACTURING DIVISION

Technical Achievement Award
Marshall Miller
Rock Springs, GA

Group Service Award
HA International LLC
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ALUMINUM & LIGHT METALS DIVISION

Best Paper Award
Paper No. 20-051: Quantifying Casting Quality Through Filling Conditions

Dan Hoefert
ECK Industries, Manitowoc, WI

David Weiss
ECK Industries, Manitowoc, WI

Randy Oerhlein
Carley Foundry Inc., Blaine, MN

Cory Sents
Carley Foundry Inc., Blaine, MN

Travis Bodick
Carley Foundry Inc., Blaine, MN

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Mark R. Biehl
Ford Meter Box Co. Inc., Wabash, IN

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Dr. Paula Vivas
ASK Chemicals, Cleveland, OH

Lee Horvath
ASK Chemicals, Cleveland, OH

LOST FOAM DIVISION

Ray Donahue Service Award
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ABP Induction LLC, Union Grove, WI

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Kohler Co., Kohler, WI

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Ezra Kotzin Service Citation Award
Scott Giese
University of Northern Iowa, Cedar Falls, IA

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Waupaca Foundry Inc., Waupaca, WI

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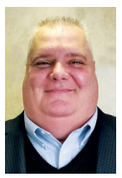

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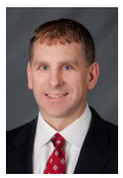

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Palmer Mfg. & Supply Inc.
Pangborn Corp.
Pattern Services LLC
Peerless Steel Abrasives
Penn-Mar Castings Inc.
Pentair
Pentair Delavan
Pentair Kansas City
Pentair Ltd.
Pentair Monterrey
Pentair New Brighton
Pentair North Aurora
Pentair Reynosa
Pentair Valves and Controls
Pentair Water - Brookfied
Pentair Water Casting Center
Penticton Foundry Ltd.
Perfect Patterns Inc.
Perkins Engine Co. Ltd.
Perma-Cast Co.
Pier Foundry & Pattern Shop
Pillar Induction
Pittsburgh Foundry & Machine
Plymouth Foundry Inc.
Poitras Foundry Ltd.
Porter Warner Industries Inc.
Powercast Mfg. Inc.
Precision Gage LLC
Precision Rail and Mfg. Inc.
Premier Aluminum LLC
Premier Thermal Solutions
PRL Industries Inc.
Product Development & Analysis LLC
Production Pattern & Foundry Co.
ProfitGuard LLC
Progress Rail, a Caterpillar Company
Prototype Casting Inc.
P.W. Gillibrand Co.
Quad City Safety Inc.
Quaker City Castings Inc.
Quality Castings Co.
Quality Electric Steel Castings LP
Quality Non-Ferrous Foundry
Ravenna Casting Center LLC
REFCOTEC Inc.
Regal Cast Inc.
Reliability Concepts
Renaissance Manufacturing Group - Waukesha LLC
Resource Recovery Corp
Rheocast Co.
Rhino Tool House
Rice Industries Inc.
Richmond Industries Inc.
Rimrock Corp.
Rio Tinto Alcan
Rio Tinto Aluminum Group
Rio Tinto Iron & Titanium Inc.
River Valley Recycling LLC
Roberts Sinto de Mexico
Rochester Metal Products Corp.
Rock Island Arsenal Joint Mfg. & Tech. Cntr (RIA-JMTC)
Rolls Royce Marine North America
Rolls Royce North America Inc.
Roloff Manufacturing Corp.
Romac Industries Inc.
RoMan Manufacturing Inc.
Ross Aluminum Castings LLC
Rowe Foundry Inc.
Sandmold Systems Inc.
Sandusky International Inc.
Schust
Scott Sales Co.
Seabee Cast Steel Foundry
Selee Corporation
Seneca Foundry Inc.
Setco Automotive (NA) Inc.
Shandong Jingang New Materials Co. Ltd.
Sigma Electric Manufacturing Corp.
Simpson Technologies Corp.
SinterCast Inc.
SinterCast Ltd.
Sintex Minerals & Services Inc.

Sinto America
Skat-Trak Inc.
Sloan Valve Co.
Smart Sand Inc.
Smith & Richardson Mfg. Inc.
Smith Foundry Co.
Solar Turbines Inc.
Solex Thermal Science Inc.
Southeastern Foundry
Products & Foundry Coatings Inc.
Southland Metals Inc.
Specialty Castings LLC
Spectro Analytical Instruments
SP Foundry
Spring City Electrical Mfg. Co.
Spuncast Inc.
Stahl Specialty Co.
Standard Alloys & Manufacturing
Star Pipe Products
State Line Foundries Inc.
St Louis Precision Casting Co.
St Marys Foundry Inc.
St Paul Foundry
StrikoWestofen
Summit Foundry Systems Inc.
SunCoke Energy Inc.
Superior Aluminum Alloys
Superior Aluminum Castings Inc.
Supreme Cores Holdings LLC
Supreme Cores Holdings LLC
Sure-Cast Alum Foundry Co.
Swedish Foundry Association
Synchro ERP Ltd.
SYSCON Sensors
Taylor Foundry Co.
TB Wood's Inc.
TDJ Group Inc.
Technetronix LLC
TechniSand Inc.
TEMC Metal & Chemical Corp.
Tengco Inc.
Tennetek Inc.
Terves Inc.
Textron Defense Systems
Textron Inc.
The Federal Metal Co.
The Hill & Griffith Co.
The Nugent Sand Co. Inc.
The Raymond Corp.
The Raymond Corporation
The Schaefer Group
The Wasmer Company LLC
TH Mfg. Co.
Thomas Machine & Foundry Inc.
Tinker Omega Sinto
Titan Metallurgy LLC
Titan Robotics Ltd.
Tonkawa Foundry Inc.
Tooling & Equip International
Torrance Casting Inc.
Toscelik Granul Sanayi AS
Townley Foundry & Machine Co. Inc.
TPI Arcade Inc.
Transvalor Americas Corp.
TRC
Tromley Industrial Holdings Inc.
Tyler Pipe Co.
Ultraseal America Inc.
United Brass Works Inc.
Universal Electric Foundry Inc.
Urick Ductile Solutions
Urschel Laboratories Inc.
US Aluminum Castings
US Foundry & Mfg Co.
US Pipe & Foundry Co.
Valmet Inc.
Van Hydraulics Inc.
Verichek Technical Services Inc.
Vermont Castings
Versevo Inc.
Victaulic Co.
Victaulic Co. of America
Victaulic Co. of Canada
Victaulic De Mexico S de RL de CV
Victaulic Technical Center
Viking Pump Inc.
Viking Technologies
Virginia Industries Inc.
Viridis3D an EnvisionTEC Co.
VJ Technologies Inc.
Voestalpine Nortrak Inc.
Voxeljet AG
Voxeljet America Inc.
Voxeljet China Co. Ltd.
Vulcan Engineering Co. Inc.
Wabash Castings Inc.
Wabtec
Ward Corporation
Ward Heat Treating
Ward Manufacturing LLC
Washburn Iron Works Inc.
Washington Mills Hennepin Inc.
Waterous Company
Watry Industries LLC
Watton Enterprises
Waupaca Foundry Inc.
Wear-Tek
Weaver Materiel Service Inc.
Webb Wheel Products Inc.
Webster Industries Inc.
Weil McLain
Weir Pump and Valve Solutions, Inc.
Western Foundries Inc.
West Salisbury Fdry. & Machine Co.
Wexford Sand Co.
WGB Industries Inc.
WGS Global Services LLC
Wheelabrator
Whibco Inc.
William Goetz and Associates
Wirco Inc.
Wisconsin Aluminum Foundry Co.
Wisconsin Oven Corporation
Woodland/Alloy Casting Inc.
Yamaha Marine Precision Propellers Inc.
YXLON

AFS UPCOMING EVENTS

May 2021

2021 AFS Government Affairs Fly-In

LIVE ONLINE

The AFS Government Affairs Fly-In connects metalcasters with legislators on Capitol Hill, giving them the tools they need to be a voice for the backbone of American manufacturing: the $44 billion U.S. foundry industry. You can find more information at **AFSinc.org**.

June 2021

Foundry Industry 4.0 Conference

LIVE ONLINE

What do metalcasting leaders need to know about Industry 4.0 to make smart investments and gain a lasting business advantage? How connected is your foundry? Industry 4.0 is no longer just about the future. Smart, proactive manufacturers are using innovation and technology to improve productivity, profitability, and worker safety. Evaluating and implementing technology today is the key to remaining competitive and sustainable.

This virtual conference will focus on how digital manufacturing is affecting all areas of the casting process today, and how this will change the foundry of the future. You can find more information at AFSinc.org.

July 20-23, 2021

Molten Aluminum Cleanliness Virtual Workshop

LIVE ONLINE

Join AFS and renowned aluminum casting expert Rafael Gallo for a virtual workshop providing a comprehensive look at molten aluminum quality, melt cleanliness assessment, and inclusions in castings. This live online event will give attendees the knowledge necessary to yield greater melt cleanliness and improved casting quality.

September 12-14, 2021

2021 Foundry Leadership Summit

Westin Kierland Resort & Spa
Scottsdale, AZ

Every September, more than 100 leaders from all corners of the metalcasting industry meet for the finest in highly rated speakers, thought-provoking discussion, and rich networking opportunities. At the 2021 Foundry Leadership Summit, metalcasting leaders will discuss the profound changes sweeping the worlds of manufacturing, technology, economics, trade and politics. Summit attendees will emerge refreshed, recharged, and ready to embrace the future.

September 14-15, 2021

2021 Casting Copper Alloys Workshop

AFS Headquarters, Schaumburg, IL

This workshop will provide details on commonly poured alloys and metallurgy, with emphasis on best practices for melt cleanliness, pouring and casting process control. Presentations include information on melting and pouring non-leaded alloys, new alloy developments, and the latest research and developments relevant to copper alloy casting. The seminar is geared towards foundry management, supervisors and operators to further their knowledge of copper-based alloy casting processes and help with finding solutions for the foundry.

October 3-4, 2021

Advanced Air Seminar

Birmingham, AL

Gain specialized EHS information for metalcasters. You can find more information at **AFSinc.org**.

October 5-7, 2021

33rd EHS Conference

Birmingham, AL

Leading EHS expertise for the metalcasting industry. You can find more information at **AFSinc.org**.

AFS INSTITUTE COURSES

37 am 3d

April 27 - 29, 2021 | 1 - 5 p.m. CT

Advanced 3D Manufacturing: Live Online

This course will cover basic casting design rules comparing traditional sand casting with toolingless 3D sand printing and emphasizing the design freedom that comes with it.

20 grd 201

May 4 - 6, 2021 | 1 - 5 p.m. CT

Gating & Riser Design 201: Live Online

This course is a continuation of Gating & Riser Design 101 with an emphasis on application of sands, chill, sleeves, and other thermal control properties, fluid flow principles and filtration, and your facility's process parameter ranges.

32 nmc 101

May 25 - 26, 2021 | 1 - 5 p.m. CT

Nobake Molding and Coremaking 101: Live Online

This course provides participants with a basic foundation of the nobake molding and coremaking process used within a foundry.

27 itm

June 1 - 3, 2021 | 1 - 5 p.m. CT

Introduction to Metalcasting: Live Online

This course introduces the process of metalcasting. It provides a broad picture of what happens in a casting production facility, while illustrating the technology, variables and complexity involved in producing a casting.

16 do 3dsp

June 15 - 17, 2021 | 1 - 5 p.m. CT

Design & Optimization for 3D Sand Printing: Live Online

This course focuses on designing castings for the 3D sand printing process, as well as optimizing existing designs to take advantage of the unique capabilities afforded. Topics covered include the advantages and limitations to the process.

6 cda

June 28 - 30, 2021 | Noon - 4 p.m. CT

Casting Defect Analysis: Live Online

Participants will become proficient in applying a ten-step procedure that will enable them to analyze and reduce metalcasting defects by correctly identifying defects, root causes, and determining corrective action.


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SHEPPARD


MTI


NovoCast


Buddy Bar
casting


Stahl


Quality Castings


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CARTER FOUNDRY


METEOR FOUNDRY CO.


ELYRIA EF FOUNDRY

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