

Copper Alloys Workshop 2023

Schaumburg, Illinois, USA
27-28 September 2023

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2023 Copper Alloy Workshop

September 27-28, 2023

AFS Headquarters (Schaumburg, IL)

Wednesday, September 27th, 2023

Session 1: Basics/Introductions

Session Chair: **Buddy Barnhill Jr.**, Lee Brass Co., Anniston, AL

7 am **Registration**

8 am **Introduction/Welcome**

8:15 am **Metallurgy Part #1 (review)...1**

Kumar Sadayappan, CanmetMATERIALS, Ontario, Canada

The basic metallurgy copper alloys is presented. Starting with an introduction to copper, followed with various major and minor alloying elements and their impact on properties. Copper alloy families are introduced with common applications.

9:15 am **Remaining Stoic in the Face of Change...N/A**

Chris Greenfield, The Federal Metal Co., Bedford, OH; Zach Spellman, Imperial Group LLC, Chicago, IL; Matt Levine, Leonard Levine Metals Corp., Chicago, IL

The only certainty in the evolving manufacturing sector is risk and uncertainty. This session will describe and analyze the current state of markets and provide strategies to succeed.

10:15 am **BREAK**

10:30 am **Green Sand Systems...15**

Michelle Ring, Norican Group, Carmel, IN

A refresher on Green Sand properties and recommendations to running an efficient green sand system.

11:15 am **Impacts of Recent Regulatory Actions to Reduce Occupational Exposure to Lead...35**

Kay Rowntree, Industrial Hygiene Sciences LLC, Waterford, WI

- Lead exposures in non-ferrous foundries
- Short Review of the Current Federal OSHA Standard
- Michigan Actions
- Washington and Oregon Proposals
- California- Big Changes with Big Impacts
- Federal OSHA Actions

12 pm (noon) **LUNCH**

1 pm Perspectives on Autonomous Inspection for Castings...52

Ted Schorn, Enkei America Inc., Columbus, IN

There is a strong current of excitement over autonomous inspection using machine vision coupled with artificial intelligence. Before a foundry jumps into such a project, a few words of caution are in order. Ted will describe what characteristics make sense for inspections without humans and those that continue to need direct human involvement.

1:30 pm What is the Goal of Safety Management Programs?...56

Ted Schorn, Enkei America Inc., Columbus, IN

Some authors in the safety field have offered the opinion that setting a “zero defect” goal for safety programs is not only not achievable, but harmful. Others insist that we must target zero injuries in our efforts to manage safety. Ted will review this controversy, offering an overview of the issues and why such a question matters practically as we try to reduce injury rates in our foundries.

Session 2: Gating & Riserling

Session Chair: *Gerald Richard, MAGMA Foundry Technologies, Schaumburg, IL*

2:15 pm Advanced Gating Techniques...64

Gerald Richard, MAGMA Foundry Technologies, Schaumburg, IL

In this talk we will begin by reviewing traditional gating methods and how to calculate them. Then, we will move to more advanced gating design practices including pouring basin design, parabolic sprues and vortex surges. The goal is to understand which set of practices will help minimize defects such as misrun, sand inclusions, and leakers.

3 pm Introduction to Copper Alloy Gating Practices...85

Paul Clements, Sloan Valve Co., Augusta, AR

This presentation will cover basic gating and risering principles for range of copper based alloys. Instruction will be supported with the aid of fluid flow and solidification modeling results to demonstrate root cause analysis of common filling and solidification defects. Emphasis will be put on understand molding and pour system constraints to maximize yield as it applies to casting quality.

3:30 pm BREAK

3:45 pm Gating Changes to Improve Casting Quality...N/A

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

Some casting designs become difficult for foundries to make. This presentation identifies some good designs for no lead brass castings with green sand molds and goes through gating changes that have reduced casting scrap.

4:15 pm Q&A/Panel

All Presenters & Attendees

4:30/4:45 pm Day 1 Concludes

5:30 pm Networking Reception (*Drinks, appetizers & golf!*)

TopGolf

2050 Progress Pkwy, Schaumburg, IL

Thursday, September 28th, 2023

Session 2: Advanced Metallurgy & Technologies

Session Chair: *Jeff Sorenson, Lee Brass, Anniston, AL*

8 am Metallurgy Part #2...93

Kumar Sadayappan, CanmetMATERIALS, Ontario, Canada

Principles and best practices of copper melting will be discussed. Topics include Charge materials, Oxidation, gas content, melt protection and processing (deoxidation, degassing, grain refinement. Presentation includes tests for melt and metal quality.

9 am Copper Related Research-IJMC Papers Presentation Overview...107

Tom Prucha, Metal Morphosis LLC, Rochester Hills, MI

Copper based alloys continue to be an important cast material offering unique engineering and performance properties. Over the past few years numerous papers of various topics that include alloy development, manufacturing, process modeling and optimization research, dissimilar melting joining and compound casting, and improvements in melt technology have been published in the International Journal of Metalcasting (IJMC. This talk will review some key findings from these papers and potential areas for further investigation to help advance copper-based metal castings. Finally, beneficial examples from research and findings outside of these copper specific papers, including topics like additive manufacturing and Industry 4.0, will be discussed.

9:30 am BREAK

9:45 am 3D Printed Molding and Pattern Equipment: Time to Get Started...118

Marshall Miller, 3D Systems, Rock Spring, GA

Customers rarely, if ever, tell us the molding equipment arrived so quickly and was so inexpensive they were astounded. Today, the technology is here to deliver resilient molding equipment more quickly and less expensively than conventional purely subtractive methods.

This presentation will provide comparisons between additively manufactured molding equipment and traditional methods for green sand, no-bake, lost foam and investment casting tooling and how additive manufacturing drives down cost and delivery dramatically.

10:15 am An Economic Outlook...145

David Oppedahl, Federal Reserve Bank of Chicago, Chicago, IL

This talk will provide an overview of key economic factors, such as output, employment, inflation and US monetary policy. An economic forecast for the US will be shared as well.

11 am Induction Furnace Linings and Practices...162

Jeremy Fischer, Foseco, Pittsburgh, PA

This presentation will introduce the basics of induction furnace linings for copper alloys. This includes how induction melting works, what types of linings are available, when each type of lining is used, how to properly install them, common mistakes made, and the cause of common lining failure modes. This will provide a basis of knowledge for attendees to better understand linings usage in their induction furnaces.

11: 45am **LUNCH**

12:45 pm **PANEL: Casting Defects**

Panelists:

- ***Leigh Omer, H. Kramer & Co., Chicago, IL***
- ***Kumar Sadayappan, CanmetMATERIALS, Ontario, Canada***
- ***Jeff Sorenson, Lee Brass Co., Anniston, AL***
- ***Jim Valentine, Neptune Technology Group, Inc., Tallassee, AL***

Have you ever had a scrap problem that you just cannot find a solution for? If so, we have a panel session that can help with that problem. Come join Industry Experts in this panel session that will focus on scrap issues and how to fix that problem casting that always seems to show up. You can bring that casting with you to the Copper Workshop on September 27th and 28th at AFS Headquarters in Schaumburg, IL. If you are worried about getting on the plane with your casting, you can send it to AFS attention Brian Began and we will make sure that it makes it to the session. Please include any specifics on molding process, alloy, sand properties, etc. - anything that can help the panel members and others in the session to help come up with a solution or solutions.

2:30/3 pm **Workshop Concludes**