Metal Quality and Melt Treatment for LIGHT Components

Lunch-to-Lunch seminar December 2nd – 3rd 2019 Jönköping, Sweden

LIGHTer



Monday 2nd December Elite Stora Hotellet Jönköping*

12:00 Lunch

13:00 Workshop

Challenging the Current Thinking through Physics and Extreme Data: An Exploration of the Potential of Aluminum Castings and its Use to Improve Quality - **Prof. Murat Tiryakioğlu, Jacksonville University**

~14.30 Swedish fika

- 16:30 Melt quality The role of microstructure -Prof. Arne Dahle, Jönköping University
- 17:00 Rheocasting perfect imperfections and the environment - **Prof. Anders Jarfors, Jönköping University**

-17:30

19.00 Conference Dinner

*Elite Stora Hotellet Hotellplan 3 ,Jönköping **Tekniska Högskolan Hus E, E1405, Jönköping

Tuesday 3rd December *Gjuterisalen, Jönköping University***

08:00 Metal quality in practice - Tomas Liljenfors Bryne

08:30 Challenges - Sven Hedlund, Volvo Cars

09.00 Examples from a foundry of how to design for and assure metal quality - **Bo Mattsson, Fundo Components**

09.30 Coffee break

- 10.00 Iron rich phases in cast aluminium Anton Bjurenstedt, RISE Swecast
- 10.30 Recycled aluminium production of high-quality alloys **Terje Lofthus, Metallco Aluminium**
- 11.00 Prototyping HPDC components, minimizing defects in HPDC components **Toni Bogdanoff, Jönköping University**
- 11.30 Sum-up and road map ahead Anders Jarfors, Jönköping University

12.00 Lunch





Invitation to a lunch-to-lunch conference 2nd to 3rd of December at Jönköping University

LIGHTer nod Småland and Jönköping University invite to a lunch-to-lunch conference, aimed for both industry and academy. Metal quality and melt treatment practices are considered to be among the main factors to produce optimized and light-weight cast aluminium products. Industrial and academic partners are sharing state-of-art knowledge in the field. The first day includes a metal quality workshop and as the second day will have focus on applications of industrial development and future requirements.

Professor **Murat Tiryakioğlu** from Jacksonville University, USA, initiates the conference by giving a half-day workshop, where the current thinking in aluminum castings are to be challenged. The knowledge from the workshop applies to improve the quality of castings and their performance. Attendees will be provided with a set of tools that can be applied in production and/or research. The workshop will be followed by two seminars from ongoing research activities before the conference dinner takes place at *Stora Hotellet* in Jönköping.

The second-day representatives from end-users, deliverers and foundries will share their knowledge in the field of metal quality and melt treatment. Buyers of cast components from the Swedish industry intend bring their perspective into the future of casted products and future needs, that together with cast houses and their deliverers will give their perspectives.

The conference is designed for people that work with melt treatment, design, production planning, casting, purchase, technical sales, or other roles that depends on the cast metal quality. The conference is given in English.

Your application is sent to <u>sofie.andersson@ju.se</u> no later than November 22nd. The conference fee is SEK 1000 form lunch to lunch, that includes lectures, laboratory tour, lunch, dinner and coffee. Do not forget to notify particular food preferences. Include your invoice address together with an invoice notice. For questions or concerns, contact Tomas Liljenfors at +46 730-222 987, or tomas.liljenfors@ju.se.

Accommodation can be booked at "Elite - Stora Hotellet". Specify reference no. *497 48 98* at phone no. *+46 36-100 000* at your booking to get the discounted price 862 SEK/night (ex VAT).

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Murat Tiryakioğlu, PhD, CQE Executive Vice President for STEAM Jacksonville University



ABSTRACT

Challenging the Current Thinking through Physics and Extreme Data: An Exploration of the Potential of Aluminum Castings and its Use to Improve Quality

Aluminum metallurgists have been traditionally taught to think differently based on the type of final product: cast or wrought. Although the metal is the same, the behavior and performance of cast aluminum alloys have been regarded as different from, usually inferior to, those of their wrought siblings. The current thinking in the metallurgy of cast aluminum alloys can be summarized as follows:

• Pores are intrinsic in aluminum castings and form mainly due to hydrogen

• Important microstructural parameters to control properties and performance are dendrite arm spacing and particle size of Si and intermetallics, especially 6-AI5FeSi platelets, which are brittle leading to premature fracture

• In Al-Si alloys, Si eutectic particles fracture in early stages of plastic deformation, causing cracks to form, leading to premature fracture

• Aluminum castings have low ductility, which can be improved mainly by faster solidification, i.e., reducing dendrite arm spacing

To the author's knowledge, the points listed above are thought to apply only to cast aluminum alloys. Moreover, many models to predict porosity and/or hot tears during solidification, estimate mechanical properties from microstructure have been developed by building the "physics" around the observed behavior. This approach has filled the literature with papers that can describe the behavior of cast aluminum alloys in some cases, but not in general. Whether the observed correlation between microstructure and property is based on causation has not been asked unfortunately.

In this half-day workshop, we will challenge the current thinking in aluminum castings by;

- Using physics and material science principles
- Learning to see extreme data and provide their interpretation
- Differentiating symptom from root cause, i.e., intrinsic and extrinsic effects

Finally, how to apply this knowledge to improve quality of castings and their performance will be discussed. Attendees will be provided with a set of tools that they can apply to their production and/or research.

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