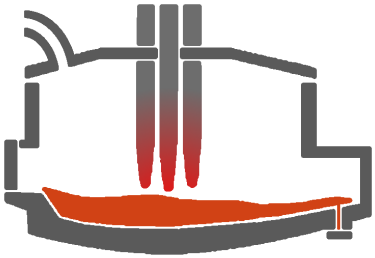
Programme

EASES 2023
5th European Academic Symposium on EAF Steelmaking



05 - 07 June 2023

Oulu, Finland

Greeting from the chairs

On behalf of the Process Metallurgy Research Unit at the University of Oulu and the Department for Industrial Furnaces and Heat Engineering at RWTH Aachen University, we are delighted to welcome you to the 5th European Academic Symposium on EAF Steelmaking - EASES 2023.

The EASES concept emerged at RWTH Aachen University to gather researchers working in the field of EAF steelmaking. EASES has established itself as a prominent platform for academia and industry experts to come together, exchange knowledge, and explore advancements in the field of EAF steelmaking. This 5th EASES marks a distinct step in the internationalization of the symposium in three ways. Firstly, we have an international scientific committee with representatives from research institutes and companies in Finland, Germany, Italy, and Slovenia. Secondly, the proceedings will be peer-reviewed and published by IOP Proceedings to promote a high impact and visibility. Finally, and most importantly, the event is organized for the first-time outside Germany with the intention to have a rotating location in the upcoming events. The choosing of University of Oulu as the first location represents a milestone in the decade-long collaboration on EAF steelmaking between RWTH Aachen University and University of Oulu.

With this introduction, it is our great pleasure that we gather here at the University of Oulu in Oulu, Finland. As the host for EASES 2023, Oulu provides an ideal backdrop for our symposium as it not only serves as the main hub of steel research in Finland but is also home to several start-ups located at the university campus. Located in the Gulf of Bothnia, Oulu is a city renowned for its lively student culture, technological prowess, excellent cycling opportunities, and proximity to nature. On our city tour, we will go for a refreshing stroll along the waterfront, wander through the scenic **Ainolanpuisto**, and experience the bright summer evening. The dinner will be held at **Ravintola Rauhala**, where you can sense the flair of neo-renaissance architecture and Finland's rich academic culture while enjoying the company of fellow researchers.

We encourage you to participate actively, contribute your insights, and join in fruitful discussions to exchange ideas and visions on the future of this dynamic field, the importance of which is likely to only grow in the future.

We hope you enjoy your time in Oulu!

Assoc. Prof. Ville-Valteri Visuri
Co-Chair

Dr.-Ing. Thomas Echterhof
Co-Chair

Locations

Conference venue

Saalastinsali Auditorium
University of Oulu
Pentti Kaiteran katu 1
Oulu, Finland

Meeting point for City tour

Toripoliisi statue
Kauppatori 1
Oulu, Finland

Dinner location

Ravintola Rauhala
Mannenkatu 4
Oulu, Finland

Programme

Monday, 05. June 2023

18:00 **Get together and city tour**
Henri Pauna
Meeting at: Toripoliisi statue, Kauppatori 1, Oulu, Finnland

Tuesday, 06. June 2023

8:00 Registration open

9:00 **Welcome to EASES 2023**
Ville-Valtteri Visuri

Session on Process control and sensors
Session chairs: Matti Aula and Henri Pauna

9:20 **Electric steelmaking process monitoring with optical emission spectroscopy – An in-depth review**
Arto Rautioaho, Henri Pauna, Ville-Valtteri Visuri, Marko Huttula, Timo Fabritius

9:40 **An In-Situ Analysis Method in EAF and BOF Steelmaking**
Bernhard Mitas, Henri Pauna, Joachim Feldbacher, Johannes Schenk

10:00 **Soft sensor approach for continuous estimation of EAF bath temperature**
Aljaž Blažič, Igor Škrjanc, Vito Logar

10:20 **Determination of the Hot Heel in an Electric Arc Furnace Using Computer Vision**
Amit Sharma, Thomas Echterhof, Herbert Pfeifer

10:40 **A Decision Support System for Optimizing Electric Arc Furnace Operations using Mechanistic and Data-driven Models**
Simon Tomažič, Vito Logar, Igor Škrjanc

11:00 Coffee break

Tuesday, 06. June 2023

Session on Process modelling and simulation I
Session chairs: Alberto Conejo and Chuan Wang

11:20 **Simulations of 3D Hydrogen Electric Arc and Effect of External Magnetic Field on Arc Flow Dynamics**
Mohamad Al-Nasser, Abdellah Kharicha, Hadi Barati, Menghuai Wu, Andreas Ludwig, Christian Redl, Bertram Ofner, Anton Ishmurzin, Nikolaus Voller, Gernot Hackl

11:40 **Modelling 3D Electro vortex Flow inside liquid metal and Effect of External Magnetic Fields on Flow Pattern**
Mohamad Al-Nasser, Abdellah Kharicha, Hadi Barati, Menghuai Wu, Andreas Ludwig, Christian Redl, Bertram Ofner, Anton Ishmurzin, Nikolaus Voller, Gernot Hackl

12:00 **Fluid flow simulation of an EAF with bottom gas injection and coherent jets**
Fornah Samuel, Zhu Rong, Wei Guangsheng, Junfeng Yang, Conejo Alberto

12:20 Lunch

13:20 **Hydrogen-Ready CoJet Technologies For EAF Steelmaking**
Pascal Kwaschny, Joachim von Scheele, David Muren

13:40 **A Review of Thermodynamic and Kinetic Models for the behavior of Nitrogen in an Electric Arc Furnace**
Siddharth Nachankar, Thomas Echterhof, Herbert Pfeifer

Session on Process modelling and simulation II
Session chairs: Vito Logar and Petri Sulasalmi

14:00 **On the differences of modelling scrap- and DRI-based EAF processes**
Ville-Valtteri Visuri, Ilpo Mäkelä

14:20 **EAF process simulation on using hydrochar as a carburization agent**
Chuan Wang and Mikael Lindvall

14:40 Coffee break

15:00 **Coupled dynamic modelling of scrap melting and gas phase reactions in the EAF process**
Ilpo Mäkelä, Ville-Valtteri Visuri, Matti Aula, Thomas Echterhof

Tuesday, 06. June 2023

15:20 **Theoretical electric arc furnace model for online estimation of the unmeasured process variables**
Vito Logar, Igor Škrjanc

15:40 **Simulation and analysis of the EAF-based steel production process using dynamic models**
Dimitra Papamantellou, Saikat Chatterjee, Sourav Panda

16:00 Laboratory tour

16:45 Bus transfer to the City Centre

18:00 Dinner at Ravintola Rauhala
including the Award presentation

Ravintola Rauhala
Mannenkatu 4
Oulu, Finland

Wednesday, 07. June 2023

9:00 **Opening of Day 2**
Thomas Echterhof

Session on Slag and by-products engineering, processing and valorisation
Session chairs: Rita Kallio and Davide Mombelli

9:10 **Software tool to estimate the influence of Cu content of scrap in the scrap mix TCO**
Asier Vicente Rojo, Edurne Nuñez

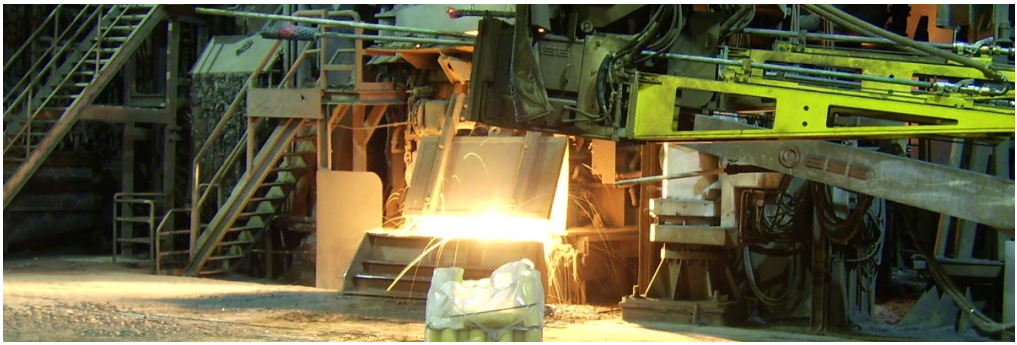
9:30 **Evaluating suitability of bricks to be charged to electric arc furnace**
Ahmed Abdelrahim, Matti Aula, Timo Fabritius

9:50 **Laboratory Scale Evaluation of the Slag Foaming Behavior**
Andreas Pfeiffer, Kathrin Thiele, Gerald Wimmer, Johannes Schenk

10:10 **Forecasting slag compositions for the optimal valorisation of electric steelworks slags**
Alice Petrucciani, Antonella Zaccara, Ismael Matino, Marco Vannucci, Valentina Colla

10:30 **Manipulation of the leaching behavior of high-alloyed steel EAF slags through the particle size modulation**
Davide Mombelli, Gianluca Dall'Osto, Salvatore Cozzo, Carlo Mapelli

10:50 Coffee break



Wednesday, 07. June 2023

Session on CO_2 emission reduction and environmental impact
Session chairs: Thomas Echterhof and Simon Tomažič

11:20 **Pathways for the environmental impact mitigation of the scrap recycling route in Italy**
Gianluca Dall'Osto, Giacomo Villa, Davide Mombelli, Silvia Barella, Andrea Gruttadauria, Carlo Mapelli

11:40 **Decreasing the environmental impact of the electric steel making process through implementation of retrofitting solutions**
Felix Kaiser, Tim Reichel, Thomas Echterhof, Diana Mier, Iñigo Unamuno, Herbert Pfeifer

12:00 **Low impact Electric Arc Furnace: how to combine decarbonization, energy saving and limited environmental emissions in modern electric steelmaking**
Andrea Lanari, Massimiliano Daita

12:20 Lunch

13:00 **Biochar as a slag foaming agent in EAF – A novel experimental setup**
Eetu Hoikkaniemi, Petri Sulasalmi, Ville-Valtteri Visuri, Timo Fabritius

13:20 **Application of hydrogen operated burners in the electric arc furnace**
Lilly Schüttensack, Thomas Echterhof, Herbert Pfeifer

13:40 **Feasibility of direct carbon fuel cells as a synergistic energy source in the scrap recycling route**
Gianluca Dall'Osto, Davide Mombelli, Andrea Pittalis, Carlo Mapelli

14:00 Cofffee break

Wednesday, 07. June 2023

Session on Fossil-free raw materials in the EAF
Session chairs: Isnaldi R. Souza Filho and Petri Sulasalmi

14:20 **Investigations in Hydrogen Ironmaking**
Joe Govro

14:40 **Fundamentals of the hydrogen plasma reduction of iron ores**
Isnaldi R. Souza Filho, Dierk Raabe, Hauke Springer

15:00 **Development of a New Laboratory-scale Reduction Facility For the H_2 Plasma Smelting Reduction of Iron Ores Based on a Multi-electrode Arc Furnace Concept**
Felix Hoffelner, Johannes Schenk, Michael Zarl

15:20 End of the Symposium

Contact

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Ilpo Mäkelä, University of Oulu
Dr. Henri Pauna, University of Oulu
Assoc. Prof. Ville-Valtteri Visuri, University of Oulu
Dr.-Ing. Thomas Echterhof, RWTH Aachen University

Scientific Committee

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