

Program Book

5TH ESTAD

European Steel Technology and Application Days

Stockholm, Sweden

Digital Platform and The Brewery Conference Centre

August 30 – September 2, 2021

IRONMAKING

STEELMAKING

ROLLING AND FORGING

STEEL MATERIALS AND THEIR APPLICATION,
ADDITIVE MANUFACTURING, SURFACE TECHNOLOGIES

INDUSTRY 4.0

ENVIRONMENTAL AND
ENERGY ASPECTS

Jernkontoret

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Photo: Henrik Trygg/mediabank.visitstockholm.com

Dear ESTAD2021 Participant,

We are proud to welcome you to the 5th ESTAD Conference in Stockholm on August 30 to September 2, 2021.

This is an outstanding opportunity to meet leading experts and suppliers and listen to the latest developments in steel technology and applications.

The European Steel Technology and Application Days (ESTAD) conference is hosted in cooperation between the German Steel Institute VDEh, Austrian Society for Metallurgy and Materials (ASMET), Associazione Italiana di Metallurgia (AIM), and the Swedish Steel Producers Association (Jernkontoret) since 2013.

After careful consideration and considering the Coronavirus (COVID-19) developments, we rescheduled ESTAD2021 from June to August as well as decided to conduct ESTAD2021 as digital conference with great options to be on-site in our "Steel-bar". We hope this will enable us to provide the experience that our attendees, speakers, partners, employees, sponsors, and exhibitors expect and deserve, in a safe environment. We want to thank all of you for your support, open discussions, and encouragement. As everyone has been reminding us, great things happen when the steel community comes together and connects at ESTAD.

Nowadays we are aware of the potential hazards of greenhouse gas emissions. The steel industry is responsible for a significant part of such emissions. At the same time, steel is vital for building a sustainable society. New technologies are required for virtually all processes related to steel production. Open exchange of ideas and knowledge is a very good starting point for developing the new, smart and sustainable processes the steel industry needs. Therefore, we are pleased to announce our theme for the plenary session: Steel and Sustainability – shaping a better future together.

We will do our utmost to provide a frictionless experience in our digital platform and to give you a pleasant stay in what is perhaps the most beautiful city in Europe.

Stockholm August 2021



Bo-Erik Pers
Managing Director
Jernkontoret



Gert Nilson
Technical Director
Jernkontoret

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Our Gold Sponsor



Our Silver Sponsors



About The Conference

In 2021, ASMET, AIM, Steel Institute VDEh and Jernkontoret organize the 5th European Steel Technology & Application Days (ESTAD), the leading European technical conference for the Steel industry.

Focus

This international conference focuses on the latest trends and issues and provides a wide networking and information platform for equipment and service suppliers, plant manufacturers, steelmakers and scientists. The Conference will focus on all technical aspects within the following six main fields:

- Ironmaking
- Steelmaking
- Rolling and forging
- Steel materials and their application, powder metallurgy and surface technologies
- Industry 4.0
- Environment and energy

Social Events

Get together – Monday, August 30

We will meet in the Steel Bar for a catch up with colleagues and peers.

Time: the Get together will start directly after the closure of the Plenary session.

Conference dinner – Wednesday, September 1

The dinner will take place at the conference venue. The Steel Bar will be open throughout whole Wednesday, which gives you an opportunity to mingle before the dinner starts.

Time: 19:00

Useful Information

Conference venue – the Münchenbryggeriet

Münchenbryggeriet is one of the most characteristic features in Stockholm's cityscape today. It is also a much-appreciated monument of Stockholm's industrial past. Here beer was produced for over a hundred years, to the delight of thirsty Stockholmers.

Address to the venue: Torkel Knutssonsgatan 2

Force Majeure and Disclaimer

The organisers are not liable for any claims for damages and/or losses if the entire conference has to be cancelled due to a force majeure incident. The organisers are not liable for damages and/or losses of any kind which may be incurred by the conference delegates or by any other individuals accompanying them, both during the official activities as well as going to/from the conference. Delegates are responsible for their own safety and belongings.

Health and Safety

The venue, Münchenbryggeriet, follows carefully the recommendations the Public Health Agency of Sweden. Due to the pandemic, the Münchenbryggeriet has extended cleaning routines in both public areas and meeting rooms and are extra careful with toilets and contact areas. Participants are offered the opportunity to wash their hands with soap and water and are offered hand sanitizer. The staff is updated regarding the latest

recommendations regarding hygiene routines and how to limit the spread of infections at the venue.

The headphones that are used by participants during the sessions will be cleaned when they have been returned. Face masks are available at the registration desk.

If you get sick during the conference, it is important that you contact the registration desk immediately.

Internet

Wi-Fi: ESTAD

Password: ESTAD2021

Name badge

Name badges will be provided to the participants. Please wear your name badge during the conference.

Registration desk

The registration desk is staffed all conference days until 13:00 except Monday, open until 18:00. If you have any questions or need help after 13:00, please go to the registration desk where you will find a telephone number, call for assistance.

Smoking Policy

Smoking is banned in all indoor public places and restaurants in Sweden.

Taxi

We recommend the following companies:

Taxi Stockholm +46 8-15 00 00 TaxiKurir +46 8-30 00 00 Sverigetaxi +46 20-20 20 20

Tourist Information

Please contact the registration desk or visit one of the tourist information desks e.g. "Tours and Tickets" at the Central railway station +46(0)76-196 92 33.

<https://www.visitstockholm.com/>

Contact Information

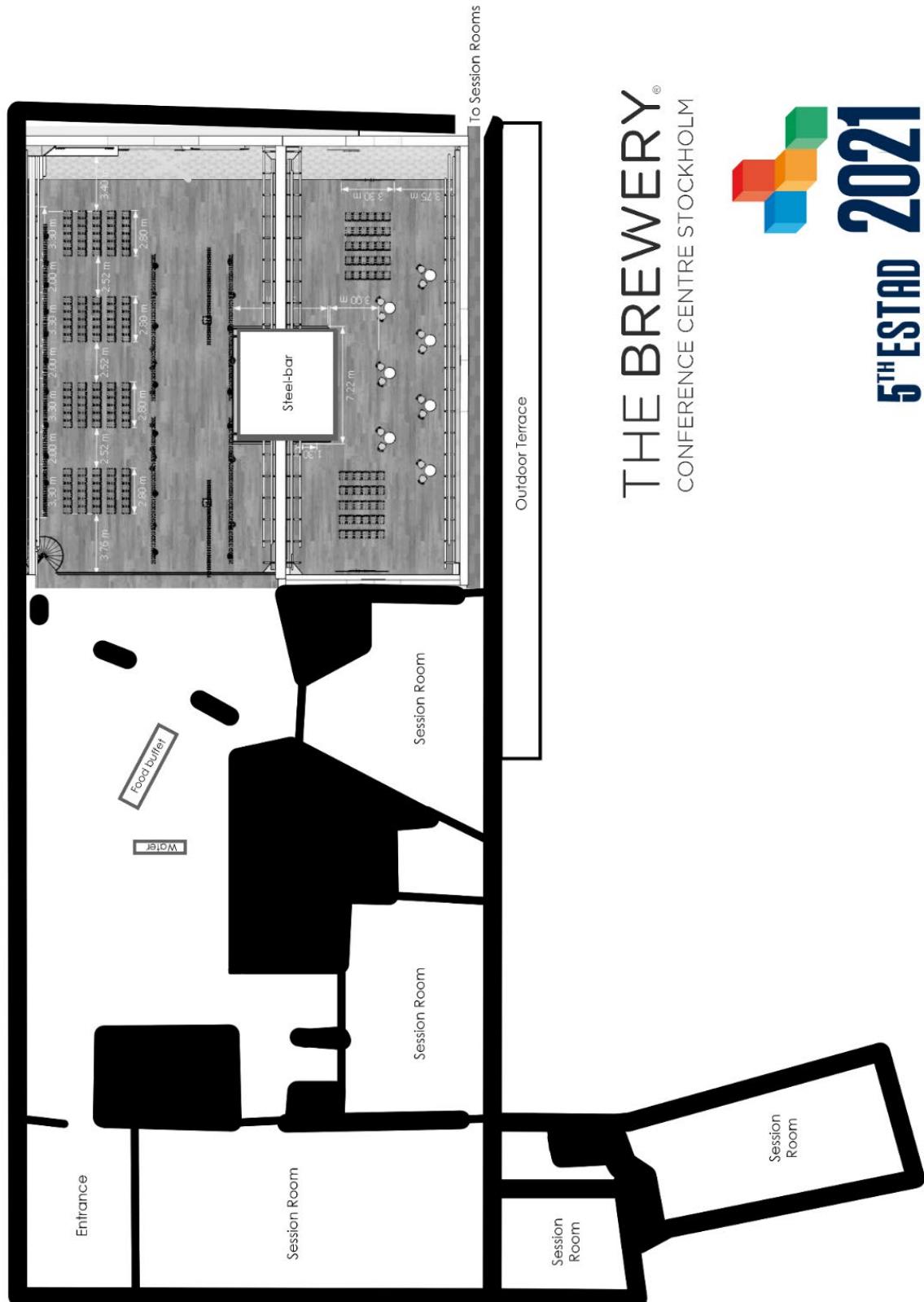
Follow us on the web, information is continuously updated: www.estad2021.com

Contact us on e-mail: estad2021@akademikonferens.se

You can contact the organisers directly:

<p>Bo Larsson Senior Project Leader +46 70 593 06 86 bo.larsson@jernkontoret.se</p>	<p>Nathalie Krumm Deputy Project Leader +46 72 242 56 97 nathalie.krumm@jernkontoret.se</p>	<p>Monica Gunnarson PCO Akademikonferens +46 725 09 53 75 monica.gunnarson@slu.se</p>
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Map



THE BREWER Y[®]
CONFERENCE CENTRE STOCKHOLM



Program

Practical information about the program

All technical presentations are pre-recorded*. The starting time for each session will be synchronized between each other. The chairman will start each session by presenting all papers and after that, all presentations are running in a row. After the last presentation, the chairmen will lead the Q&A session, covering all papers. Since the length of each presentation may differ, it is impossible to synchronize each individual presentation between the sessions. Remember that all presentation as well as the Q&A session can be seen on the platform several months after the conference.

*) Except the Plenary session, REUSteel symposium and the Hybrit symposium

Special information about Session 36 and 42

The content in those presentation covers information about Sustainable Steel Region – an innovation platform focusing on the regional world-leading area Advanced Steel (<https://www.sustainablesteelregion.se/en-GB>). All presentations are pre-recorded.

Monday 30 August 2021

13:30-15:00 Plenar session part I: Steel and Sustainability - Shapes a better future together (live broadcasting), A: Riddarsalen
Moderator: Karin Klingensierna

13:30-13:30 Content in preparation

13:30-13:35 Opening of ESTAD 2021 and welcome words, Gert Nilson, Host

13:35-14:05 Fit for 55 and its effects on the European Steel Industry, Adolfo Aiello, Director Climate And Energy, Eurofer

14:05-14:35 New environmental demands on the Chinese steel industry, Li Xinchuang, MPI

14:35-15:00 Discussion

15:30-17:00 Plenar session part II: Steel and Sustainability - Shapes a better future together (live broadcasting), A: Riddarsalen

15:30-16:00 Our reasons for sourcing "green steel", Jonas Eriksson, VP Scania CV AB

16:00-16:30 Hybrit - a path to fossil-free steelmaking, Martin Pei, CTO SSAB

16:30-17:00 Discussion

Tuesday 31 August 2021

- 08:15-08:30 **Opening words** by Gert Nilson, Technical Director of Jernkontoret, *A: Riddarsalen*
- 08:30-10:00 **Session 1 - REUSteel symposium part 1 (live broadcasting), A: Riddarsalen**
Moderator: Sara Rosendahl
- 08:30-08:30 Important information - The presentations in this session are not synchronized with other sessions
- 08:30-08:50 Swerim symposium Part 1.1 General presentation
Valentina Colla, Sara Rosendahl; Hanna Granbom; Teresa Annunziata Branca; Agnieszka Morillon; David Algermissen; Roland Pietruck; Umberto Martini
- 08:50-09:10 Swerim symposium Part 1.2 Research of use of slag from steel industry
Teresa Annunziata Branca; Sara Rosendahl; Hanna Granbom; Valentina Colla; Agnieszka Morillon; David Algermissen; Roland Pietruck; Umberto Martini
- 09:10-09:30 Swerim symposium Part 1.3 Discussions
Hanna Granbom, Sara Rosendahl; Valentina Colla; Teresa Annunziata Branca; Agnieszka Morillon; David Algermissen; Roland Pietruck; Umberto Martini
- 09:30-10:00 Discussion
- 08:30-10:00 **Session 2 Ironmaking, B: Fogelström**
Moderator: Göran Carlsson
- 08:30-08:50 SINTERING WITH HIGH BY-PRODUCTS RECYCLING RATE AND ENVIRONMENTAL OPTIMIZATION BY SELECTIVE PREPARATION
Clément Polato, Rafael Jaimes Contreras; Frédéric Blaffart; Laurent Fraikin; Maria Martinez Pacheco; Olivier Havelange

- 08:50-09:10 Automated semi-continuous measurement of the water droplet and dust content in the cleaned gas of a wet type Blast Furnace Gas Cleaning Plant
Peter Klut, Ruud Herold
- 09:10-09:30 Combustion behavior of iron coke in tuyere area of blast furnace
Hua Zhang, Yunpeng Fang; Yucen Kuang; Shengfu Zhang
- 09:30-09:50 Mathematical Model of Induration Furnaces for Optimization and Digitization Applications
Jayant Borana, Claire Velikonja; Oghenebrorhie Emuophedaro; Umesh Shah; Manuel Huerta; Janice Bolen; Jennifer Woloshyn; Iakov Gordon; Tom Plikas
- 09:50-10:00 Discussion
- 08:30-10:00 Session 3 Industry 4.0 Steelmaking, C: Galleriet
Moderator: Lotta Sörlin
- 08:30-08:50 SKF Artificial Intelligence: Scaling Machine Learning Predictive Maintenance to enhance productivity and lower steel operations and maintenance costs
Patrick Kuster, Hanh Nguyen; Ophir Glazer
- 08:50-09:10 Analysis of steel making processes using material flow simulation
Torsten Mosebach, Holger Rosemann; Bernhart Stranzinger
- 09:10-09:30 Melt-Shop Logistics Simulation delivers Proof-of-Concept for Plant Transformation towards Hybrid Steel Making
Stefan Muehlboeck, Gerhard Kurka; Bernhard Voraberger; Peter Örtelt
- 09:30-10:00 Discussion

- 08:30-10:00 Session 4 Electric Steelmaking, D: Arkaden
Moderator: Jens Kempen
- 08:30-08:50 Use of a comprehensive electric arc furnace process model in the investigation of alternative and optimized operating strategies
Thomas Hay, Thomas Echterhof
- 08:50-09:10 Numerical Simulation and Industrial Test of Electromagnetic Stirring Technology in Electric Arc Furnace
Lidong Teng, Hongliang Yang
- 09:10-09:30 Decreasing EAF electrode wear in stainless steelmaking by controlling the arc exposure
Matti Aula
- 09:30-10:00 Discussion
- 08:30-10:00 Session 5 Steelmaking Casting, E: Poseidon
Chair: Robert Vikman
- 08:30-08:50 An industry oriented computational tool for modelling microstructure in casting of steel based on CALPHAD and Finite Element Method
Chunhui Luo
- 08:50-09:10 Interaction between alloy elements in micro-alloy steels with Boron and its effect on hot ductility during solidification and cooling
Jacek Komenda, Chunhui Luo; Johan Lönnqvist
- 09:10-09:30 Some aspects of directional solidification of duplex stainless steels
Yu-Chiao Lu, Nils Andersson; Björn Glaser; Anders Tilliander
- 09:30-09:50 Development of mould powders for aluminium alloyed steels
Matthias Rohmann, Sven Karrasch; Martin Niggemeier; Matthias Dresler; Heinz-Günter Braß; Aleksander Matos Costa; Klaus Schulz; Rüdiger Delke

- 09:50-10:00 Discussion
- 08:30-10:00 **Session 6 Rolling & Forging, F: Pegasus**
Moderator: Jonas Lagergren
- 08:30-08:50 ASRA - Adaptive control of steel strips in hot rolling based on high-precision radar signal processing
Bettina Fischer, Horst Krauthäuser; Christian Krebs; Sabine Gütgemann; Thomas Haschke; Thorsten Huge
- 08:50-09:10 Green steel casting and rolling via CSP® Nexus
Björn Kintscher, Cosimo Cecere; Christian Sprung; Karl Hoen; Tim Kleier
- 09:10-09:30 Cutting-edge strip processing technologies to enhance electrical steel performances
Stéphane Mehrain
- 09:30-09:50 Radar-based thickness measurement system for rolling mills
Bettina Fischer, Horst Krauthäuser; Sabine Gütgemann; Christian Krebs
- 09:50-10:00 Discussion
- 10:00-10:30 Break, *Steel Bar*
- 10:30-12:00 **Session 7 - REUSteel Symposium part 2 (live broadcasting), A: Riddarsalen**
Moderator: Hanna Granbom
- 10:30-10:30 Important information - The presentations in this session are not synchronized with other sessions

- 10:30-10:50 Swerim symposium Part 2.1 Research of the use of sludge, dust, refractory, mill scale and other residual materials from the steel industry.....
- Roland Pietruck, Sara Rosendahl; Hanna Granbom; Valentina Colla; Teresa Annunziata Branca; Agnieszka Morillon; David Algermissen; Umberto Martini*
- 10:50-11:10 Swerim symposium Part 2.2 Research of the use of sludge, dust, refractory mill scale and other... (EAF)
- Umberto Martini, Sara Rosendahl; Hanna Granbom; Valentina Colla; Teresa Annunziata Branca; Agnieszka Morillon; David Algermissen; Roland Pietruck*
- 11:10-11:30 Swerim symposium Part 2.3 An outlook: How will the use of residual materials change the future?
- Valentina Colla, Sara Rosendahl; Hanna Granbom; Teresa Annunziata Branca; Agnieszka Morillon; David Algermissen; Roland Pietruck; Umberto Martini*
- 11:30-12:00 Discussion
- 10:30-12:00 Session 8 Ironmaking, B: Fogelström
Moderator: Göran Carlsson
- 10:30-10:50 Knowledge-Driven Process, KPI, Maintenance and Safety Monitoring through Paul Wurth CMXpert®.
Pieter Claes
- 10:50-11:10 Predicting Blast Furnace Reline Timing: Methods, Results, and Comparisons
Afshin Sadri, Mitchel Henstock
- 11:10-11:30 Development and utilization of hydrothermally carbonized biocarbon for the cupola furnace
Frank Wondra, Marisa Hernández; Martin Hitzl; Chuan Wang; Gert Karlsson

11:30-11:50 Recent development in Ironmaking in Russia

Yakov Gordon, Dmitriy Tikhonov

11:50-12:00 Discussion

10:30-12:00 Session 9 Steelmaking - Oxygen Steelmaking, C: Galleriet

Moderator: Lotta Sörlin

10:30-10:50 Value in Use of Lime in BOF Steelmaking Process

Zhiming Yan, Zushu Li; Manocha Sanjeev; Ponchon Francois; Naifornita Sorinel

10:50-11:10 Increased operational safety and BOF productivity with advanced relining solutions

Bernhard Voraberger, Leonardo Demuner; Mario Hirth; Gerald Wimmer

11:10-11:30 Hybrid Solutions for CO₂ Reduction in Converter Steel Plants

Gerald Wimmer, Jens Apfel; Peter Örtelt

11:30-11:50 CFD simulation of supersonic submerged gas injection in metallurgical reactors

Andreas Kemminger, Hans-Jürgen Odenthal; Andreas Schüring; Stephan Geimer; Tim Haas; Moritz Eickhoff

11:50-12:00 Discussion

10:30-12:00 Session 10 Electric Steelmaking, D: Arkaden

Moderator: Jens Kempen

10:30-10:50 Cloud-based tools for on-line supervision of EAF raw-material properties based on statistical analysis of process model calculation errors

Erik Sandberg, Johan Björkvall; Patrik Strandberg

- 10:50-11:10 Early detection of deviations in charge material properties and adjustment for optimal scrap usage in the EAF
Bernd Kleimt, Diana Mier Vasallo; David Maza Ruiz
- 11:10-11:30 Effect of Lime characteristics and the benefits of Lime Injection for Electric Arc Furnaces
Sanjeev Manocha, Francois Ponchon; Giorgio Brulletti; Roberto Moreschi; Scott Fraley
- 11:30-11:50 Use of injected polymers derived from plastic waste as substitution of fossil carbon and natural gas in electrical arc furnace (EAF)
Jaroslav Brhet, Radek Lan; Daniele Gaspardo; Alberto Viotto; Loris Bianco; Matteo Chini; FILIPPO CIRILLI; Daphne Mirabile; Elia Gosparini
- 11:50-12:00 Discussion
- 10:30-12:00 **Session 11 Steelmaking Casting, E: Poseidon**
Moderator: Robert Vikman
- 10:30-10:50 Implementation of chamfered mold technique at ArcelorMittal Eisenhüttenstadt
Jens Gellert, Jörn Bräske; Bertram Seher; Nadine Decker; Maximillian Materne; Florian Grund; Peter Gross; Steffen Tiede; Josef Watzinger
- 10:50-11:10 The impact of varying deformation parameters on the surface ductility behavior of a directly-cast construction steel
Roman Krobath, Christian Bernhard
- 11:10-11:30 Testing Results of CASTEV model in a CSP plant
Eloy Martinez Rehlaender
- 11:30-11:50 Mathematical Modeling of Slag Infiltration and Solidification in a Continuous Casting Mold
Hamzeh HAMADEH
- 11:50-12:00 Discussion

- 10:30-12:00 **Session 12 Industry 4.0 General, F: Pegasus**
Moderator: Helena Malmqvist
- 10:30-10:50 Neokoil Smartline, the automatic pilot for strip processing lines
Maxime Monnoyer, Etienne Menigault; Philippe Rocabois; Arnaud Ollagnier; Aldo Fiorini; Stefano Pantarotto; Alessandro Ferraiuolo
- 10:50-11:10 Virtuo™, a new generation of furnace dynamic predictive modeling to enhance strip quality and productivity
Thierry Robin, Francis Pradel; Alexandre Gauche
- 11:10-11:30 Implementation of multi-objective production scheduling in the dynamic environment of the flat steel industry
Erwin Sirovnik, Markus Rabe; Christoph Schirm; Dirk Müller; Jens Brandenburger; Ahmad Rajabi; Andreas Wolff; Joaquin Ordieres; Miguel Gutierrez; Vincenzo Iannino; Valentina Colla; Alessandro Maddaloni
- 11:30-11:50 Implementation of Augmented Reality (AR) System to Empower Front-Line Steel Plant Workers
Eric Almquist
- 11:50-12:00 Discussion
- 12:00-13:00 Lunch, *Steel Bar*
- 13:00-14:30 **Session 13 Environmental & Energy aspects, Tornet**
Moderator: Robert Eriksson
- 13:00-13:20 Steel Product Development in line with steel companies' Sustainability Strategy
Dirk Vandershueren
- 13:20-13:40 Challenges for the slag value chain in Europe
Thomas Reiche

- 13:40-14:00 Comprehensive waste-free processing of residue slag from steelmaking
Alla Tragt, Vladislav Ivanchenko; Yury Chugunov; Andrey Ivanchenko; Nikolai Shaenko
- 14:00-14:20 An integrated approach to assessing the value of compositional information and steel scrap quality
Reinol Josef Compañera, Andreas Feldmann; Anders Tilliander; Rutger Gyllenram
- 14:20-14:30 Discussion
- 13:00-14:30 Session 14 Ironmaking, B: Fogelström
Moderator: Jarmo Lilja
- 13:00-13:20 Reconstruction of Conventional Stove Designs with Highly-Efficient Kalugin Top Combustion Technology
Sergey Ivlev, Boris Prokofiev; Yury Murzin; Anton Subbotin; Mikhail Kalugin
- 13:20-13:40 New Hot Blast Stove 47 at SSAB Oxelösund - First ever stove vessel shell erected in one piece
Victor van Straaten, Edo Engel; Peter Öberg; Alain Woltheus
- 13:40-14:00 Digitalization of the Hot Blast Stove
Mark Geach, John Croot; Dieter Bettinger; Bernhard Voglmayr; Martin Schaler
- 14:00-14:20 STRATEGY FOR SUSTAINING, ENHANCEMENT AND COST REDUCTION AT SEVERSTAL'S PRIMARY END
Yakov Gordon, Evgeniy Vinogradov
- 14:20-14:30 Discussion

- 13:00-14:30 **Session 15 Oxygen steelmaking, C: Galleriet**
Moderator: Johan Eriksson
- 13:00-13:20 Development and first application of Operator Vision Assistance System for Steelmaking
Bharath Vasudev Rangavittal, Herbert Köchner; Björn Glaser
- 13:20-13:40 Simulating the Equilibrium and the Kinetics of Steel Making and Steel Refining Using the TCOX Database and Thermo-Calc's New Process Metallurgy Module
Ralf Rettig, Nicholas Grundy; Lina Kjellqvist; Rui Zhang; Qing Chen; Johan Jeppsson; Johan Bratberg
- 13:40-14:00 Next Level for Virtual Commissioning of Automation Systems by using a Digital Melt Shop
Paul Uhl-Hädicke, Alexander Kaiblinger
- 14:00-14:30 Discussion
- 13:00-14:30 **Session 16 Electric Steelmaking, D: Arkaden**
Moderator: Jesper Janis
- 13:00-13:20 Broad band spectral thermometer - continuous monitoring of melts
Erik Zetterlund, Erik Zetterlund; Jan-Peter Nilsson; Johan Rengstedt; Oleksandr Tarasenko
- 13:20-13:40 Quality improvements on billets production of Acciaierie di Calvisano through innovative technology applications and control of solidification process
Ganna Tsymokh; Piero Frittella; Lorenzo Angelini; Massimiliano Bersani; Christian Senes; Francesco Guerra; Cosmo Di Cecca; Stefano De Monte; Cristiano Persi; Carlo Mapelli; Bernd Feldmeyer; Alessandro Milan
- 13:40-14:00 Rapid chemical analysis of molten slag and metal at the production
Jonas Petersson, Mélina Gillbert-Gatty; Louise Hagesjö; David Malmström; Arne Bengtson

- 14:00-14:05 Sample size analysis for the linear multivariate analysis in Electric Steelmaking
María Teresa Rojas Sánchez, Thomas Echterhof; Herbert Pfeifer
- 14:05-14:30 Discussion
- 13:00-14:30 Session 17 Steelmaking Casting, *E: Poseidon*
Moderator: Lars Nyborg
- 13:00-13:20 Benefits of automated 3D surface inspection systems for continuous casting process
Thomas Köpset, Christian Mittag
- 13:20-13:40 Semi-continuous casting (VERSICON) process for blooms: past, present and future
Giovanni Cairoli, Marco Abram; Paolo Cobelli
- 13:40-14:00 Discussion
- 13:00-14:30 Session 18 Industry 4.0 Rolling & Forging, *F: Pegasus*
Moderator: Jonas Lagergren
- 13:00-13:20 Online, Non-Contact Surface Cleanliness Monitor
Eric Almquist
- 13:20-13:40 Introducing Machine Vision Matrix Camera Systems for Safety, Quality, & Productivity
Eric Almquist
- 13:40-14:30 Discussion
- 14:30-15:00 Break, *Steel Bar*

- 15:00-16:50 **Session 19 Environmental & Energy aspects, Tornet**
Moderator: Robert Eriksson
- 15:00-15:20 Blockchain-based tracking of a steel products CO2 footprint
Hannes Stiebitzhofer, Stefan Grüll
- 15:20-15:40 Improvement of the energy management in integrated steel mills by a better use of process gases
Matthias Baldermann, Michael Schuster; Holger Rosemann; Bernhart Stranzinger; Jörg Adam; Jürgen Schlimbach
- 15:40-16:00 Assessment of Energy Consumption and Greenhouse Gas Emissions of Molybdenum and Nickel Products
Wenjing Wei, Peter Samuelsson; Anders Tilliander; Rutger Gyllenram; Pär Jönsson
- 16:00-16:20 ionicLife cast technology - real copper in copper cast for tuyeres
Martina Hanet, Hans-Jörg Krassnig; Javier Bolado; Andreas Filzwieser
- 16:20-16:40 Innovative, Zero-Waste Dust Recycling with a New Two-Step Dust Recycling Process
Bernhard Voraberger, Krzysztof Pastucha; Uxia Dieguez Salgado; Alexander Fleischanderl; Gerald Wimmer; Jürgen Antrekotwisch; Michael Auer
- 16:40-16:50 Discussion
- 15:00-16:50 **Session 20 Ironmaking, B: Fogelström**
Moderator: Jarmo Lilja
- 15:00-15:20 Circored Fine Ore Direct Reduction as one Route towards Carbon-free Steel
Sebastian Lang, Sebastian Richter; Max Koepf

- 15:20-15:40 Artificial Intelligence based assessment of tuyere damage risks
Hauke Bartusch, Jörg Adam; Thorsten Hauck; Andrej Johnen; Dirk Gotthelf
- 15:40-16:00 Valorizing coal injection in BF: Role and identification of low ordered carbon
Varsha Pridhivi, Samuel Mani
- 16:00-16:20 Blast Furnaces Of Ukraine
Viacheslav Pronskyi, Mykyta Vvedenskyi; Boris Shulga
- 16:20-16:25 SPH simulations of packed bed deformation in cohesive zone of blast furnace with Bingham fluid model
Mizuki Tanaka, Shungo Natsui; Hiroshi Nogami
- 16:25-16:50 Discussion
- 15:00-16:30 Session 21 Steelmaking - Oxygen steelmaking, C: Galleriet
Moderator: Johan Eriksson
- 15:00-15:20 A comprehensive investigation on the thermodynamics of gaseous magnesium solubility in hot metal: Application in magnesium-lime co-injection hot metal
A. Emami, F. N. H. Schrama; K. A. Buist; M. W. Baltussen; S. K. Panda; E. M. Beunder; B. Santillana; Y. Yang; J. A. M. Kuipers; R Boom
- 15:20-15:40 Continuous hot metal desulphurisation: a new cost-efficient process with a lower environmental footprint
Frank N. H. Schrama, Ali Emami; Elisabeth M. Beunder; Johannes L. T. Hage; Johan W. K. van Boggelen; Pieter Broersen
- 15:40-16:00 Assessment of Impurities in Commercial Ferroalloys and Their Influence on the Inclusion Characteristics in Steel
Yong Wang, Andrey Karasev; Joo Hyun Park; Par G. Jönsson

- 16:00-16:20 From post-mortem to real-time slag analysis - How Laser OES enables smart and efficient furnace management for EAF and LF steelmaking
Alexander Schlemminger
- 16:20-16:30 Discussion
- 15:00-16:50 Session 22 Electric Steelmaking, D: Arkaden
Moderator: Jesper Janis
- 15:00-15:20 EAF Optimization Technology for Stainless Steel production with Dynamic Model applications
Emmanuel Placier, Alexandro d'Alfonso; Vincent Piret; Thierry Koeger; Jhovanny Rendon
- 15:20-15:40 Experience with the operation and maintenance of the Spray-Cooled™ EAF Roof at Ovako Hofors designed and manufactured by Systems Spray-Cooled Inc.
Markus Abel, Anders Johansson; Christoffer Dannberg; Scott Ferguson; Louis Valentas; Ralf Morgenthaler
- 15:40-16:00 Burner-injector technology ready for use of hydrogen in steelmaking applications – results of experiments and numerical simulations
Fabian Krause, Lilly Schüttensack; Andreas Kemminger; Hans-Jürgen Odenthal; Herbert Pfeifer
- 16:00-16:20 A novel method and online measurement system for measuring key parameters in furnace off gas
Hans Georg Conrads, Managing Director, Sebastian Metzner; Alexander Halm; Markus Abel; Markus Abel
- 16:20-16:25 Differential assimilation coefficients in computer steelmaking control systems
Oleksandr Kharchenko, Oleksiy Smirnov

- 16:25-16:30 Technology improvements and industry 4.0 strategies applied to whole steelmaking area for special steels production in Acciaierie di Calvisano
Piero Frittella, Lorenzo Angelini; Massimiliano Bersani; Christian Senes; Francesco Guerra; Giuseppe Miglietta; Andrea Zurru; Ganna Tsymokh
- 16:30-16:50 Discussion
- 15:00-16:30 Session 23 Steelmaking Casting, E: Poseidon
Moderator: Lars Nyborg
- 15:00-15:20 Are there still advances in ingot casting technology? Pushing an mature technology to new limits!
Christian Redl, Christian Buchmaier
- 15:20-15:40 Segment Casting: A New Technology Enters The Market – An Overview On Plant Design And First Results
Stefano Baf, Oleksii Novokshonov; Alexander Scheriau; Christian Redl
- 15:40-16:00 ESR Processing of a New HighPressureDieCasting Steel
Tobias Dubberstein, Alexander Hengst; Patricia Caballero; Iban Vicario
- 16:00-16:05 Numerical analysis of the influence of the angle between the horizontal runner and the mold on the fluid flow during filling of an ingot
Jun Yin, Nils Andersson; Mikael Ersson; Pär Jönsson
- 16:05-16:30 Discussion
- 15:00-16:30 Session 24 free, F: Pegasus
- 15:00-15:10 Discussion

Wednesday 01 September 2021

- 08:30-10:00 Session 25 - HYBRIT I Symposium (live broadcasting), *A: Riddarsalen*
Moderator: Mattias Elfwing
- 08:30-08:50 HYBRIT Symposium part 1 - The HYBRIT initiative
Eva Vitell
- 08:50-09:10 HYBRIT Symposium part 2 - Fossil-free iron ore pellets production
Charlotte Andersson
- 09:10-09:30 HYBRIT Symposium part 3 - Hydrogen based iron ore reduction
Johan Riesbeck
- 09:30-09:50 HYBRIT Symposium part 4 - Steelmaking from hydrogen reduced iron
Carl Allertz
- 09:50-10:00 Discussion
- 08:30-10:00 Session 26 Powder Metallurgi & AM, *B: Fogelström*
Moderator: Guocai Chai
- 08:30-08:50 Powder Production for Advanced Hot Isostatic Pressing – Technical features and challenges
Jürgen Cornelius, Alexander Scherian; Anatoliy Ryabtsev; Victor Klochay; Pavel Yavtushenko; Christian Redl
- 08:50-09:10 Simulations of physical phenomena in gas atomisation
Christopher Hulme-Smith
- 09:10-09:30 Powder characterization for Metal Additive Manufacturing: Relevant powder properties and their influencing factors
Yannik Wilkens, Tobias Brune

09:30-09:50 Powder characterization and mechanical properties of additive manufactured Superduplex stainless steels

Nikhil Dixit, André Larsson; Johan Wallin; Harald Kissel

09:50-10:00 Discussion

08:30-10:00 Session 27 Steelmaking Casting, C: Galleriet

Moderator: Robert Vikman

08:30-08:50 Quality prediction and crack occurrence minimization tool for continuous steel casting

Michal Březina, Lubomír Klimeš; Tomáš Mauder; Josef Štětina; Tomáš Návrat; Jindřich Petruška

08:50-09:10 Robot-Assisted Ladle Sliding Gate Maintenance

Gianluca Maccani

09:10-09:30 Numerical simulation of electromagnetic field impact on turbulent flow in the mold region of a slab caster with three different casting speeds

Bahareh Najafian Ashrafi, Martin Barna

09:30-09:50 Application of AI Lifts Quality Strip Production to the Next Level – ArcelorMittal Eisenhüttenstadt Significantly Reduces Surface Defects

Falk-Florian Henrich, Otmar Jannasch; Nadine Decker; Thorsten Müller; Bianka Thielecke; Jens Gellert; Jan-Oliver Daldrop

09:50-10:00 Discussion

08:30-10:00 Session 28 Industry 4.0 Rolling & Forging, D: Arkaden

Moderator: Ulrich Prahlf

08:30-08:50 Load and material optimized thermal furnace model

Moritz Eickhoff, Lilly Schüttensack; Herbert Pfeifer

08:50-09:10 Case Study: Torque monitoring system plus Torsional Vibration Analysis in combination with Finite Element Analysis using real torque collected data.

Ignacio Fernandez Echavarri, Dan Phillips

09:10-09:30 Advanced systems for future steel grade development

Axel Rimnac, Wolfgang Hackl; Alfred Seyr; Christoph Krueger; William Jacobs; Thomas Pfatschbacher; Grant Shoebridge

09:30-09:50 PMI 4.0 – How fully automatic, LIBS based Positive Material Identification (PMI) leads the way towards tomorrow's digital rolling mill

Christian Bohling, Constanze Schilder

09:50-10:00 Discussion

08:30-10:00 Session 29 Industry 4.0 Steelmaking, *E: Poseidon*

Moderator: Helena Malmqvist

08:30-08:50 Control of Metallurgical Processes with Indirect Measurements and Machine Learning

Konstantinos Rigas, Björn Glaser; Nils Andersson; Fredrik Sandin; Niklas Grip; Johan Björkwall; Dan Sandström; Jurki Pitkälä; Mikael Svensson

08:50-09:10 Effect of Inclination on Mixing Time in a Side-blown Converter

Serg Chanouian, Björn Ahlin; Mikael Ersson; Anders Tilliander

09:10-09:30 Improving melt shop productivity and energy efficiency with digital models

Anurag Nandwana, Sanjay Gurme; Tarun Mathur; Avinash Malpe; Ulaganathan Nallasivam; Prashant Akre; Thota Phanindra; Punit Kamaliya

09:30-10:00 Discussion

08:30-10:00 Session 30 Local event, *F: Pegasus*

- 10:00-10:30 Break, *Steel Bar*
- 10:30-12:00 Session 31 - HYBRIT II Symposium (live broadcasting), *A: Riddarsalen*
Moderator: Åsa Bäcklin
- 10:30-10:50 HYBRIT Symposium part 5 - Providing energy for fossil-free steel production and the effects on the electrical power system
Tobias Rehnholm
- 10:50-11:10 HYBRIT Symposium part 6 - Hydrogen production and storage
Nicklas Simonsson
- 11:10-11:30 HYBRIT Symposium part 7 - System integration, transition pathways and policy strategies
Max Åhman
- 11:30-11:50 HYBRIT Symposium part 8 - The way forward
Eva Vitell
- 11:50-12:00 Discussion
- 10:30-12:00 Session 32 Powder Metallurgy & AM, *B: Fogelström*
Moderator: Guocai Chai
- 10:30-10:50 Computational materials design for processibility of steels in additive manufacturing
Fuyao Yan, Martin Walbrühl; Jiayi Yan; David Linder; Ida Berglund
- 10:50-11:10 Corrosion testing of additive manufactured stainless steel for safe implementation in aggressive environments
Sara Munktelt, Nuria Fuertes; Jesper Flyg; James Shipley; Fredrik Falkenberg; Nikhil Dixit; Anna Delblanc; Peter Harlin; Rachel Pettersson

11:10-11:30 Modelling columnar-to-equiaxed transition in ferritic stainless steels processed by laser powder-bed fusion

Durga Ananthanarayanan, Niklas Holländer Pettersson; Greta Lindwall

11:30-11:50 Ex-situ inoculation of CoCrNi Medium Entropy Alloy manufactured by Laser Powder Bed Fusion

Lars Nyborg, Sheng Guo

11:50-12:00 Discussion

10:30-12:00 Session 33 Steelmaking Casting, C: Galleriet

Moderator: Robert Vikman

10:30-10:50 Numeric simulation of the liquid steel flow in the secondary cooling zone of a slab caster induced by in roll stirrers

Martin Barna, Mirko Javurek; Peter Wimmer; Felix Lindlbauer

10:50-11:10 Soft reduction with SRD segment technology – superior inner quality of billets and blooms

Michael Riedler, Denijel Burzic; Phillip Wieser

11:10-11:15 Production process of HSLA grades with focus on improve steel cleanliness in Ternium-BR

Bruno Suveges Cerchiari, Heber Gomes Segundo; Evanildo Bernabe Soares; Leonardo Martins Demuner; Felipe Elizario Gonçalves; Rolando Montemayor Júnior

11:15-12:00 Discussion

10:30-12:00 **Session 34 Industry 4.0 Rolling & Forging, D: Arkaden**

Moderator: Ulrich Prahl

10:30-10:50 VMAP-analytics – smart digital twin platform for reheating and hot-rolling.

Tania Irebo Schwartz, David Olevik; Sivaprasad Palla; Patrik Sidestam; Marcus Svadling; Edwin Prvschek; Per Åhman; Jonatan Stofkoper; Robbin Kantarp; Heli Wiberg; Jonas Bäckman

10:50-11:10 The review of whole production cycle from thermomechanical treatment and wire rods calibration, to application of 4.0 strategies for process control.

Piero Fittella, Lorenzo Angelini; Maurizio Fusato; Stefano Salvagno; Vittorio Valotti; Enrico Simonato; Giuseppe Politanò; Ganna Tsymokh; Fabio Morandini; Stefano Leali; Cosmo Di Cecca

11:10-11:30 Comparative study of structures in cold rolled 316 stainless steel using laser ultrasonics and electron backscatter diffraction measurements

Mikael Malmström; Anton Jansson; Bevis Hutchinson; David Lindell

11:30-11:40 Discussion

10:30-12:00 **Session 35 Industry 4.0 Steelmaking, E: Poseidon**

Moderator: Helena Malmqvist

10:30-10:50 CAS-OB process modelling – monitoring tool for process operators

Kasper Linnestad, Seppo Ollila; Stein O. Wasbø; Agne Bogdanoff; Torstein Rotevatn

10:50-11:10 Importance and Benefits of a Ladle Tracking System that is fully integrated into the automation system

Andreas Rohrhofer, Richard Stadlmayr

11:10-11:30 Synergistic integration of steel analysis and thermodynamic calculations to improve steel quality

FILIPPO CIRILLI, ANTONELLO DI DONATO; PATRIZIA MICELI

- 11:0-12:00 Discussion
- 10:30-12:00 Session 36 Attractiveness & Competence in Swedish Steel Industry, *F: Pegasus*
- 10:30-11:15 Sustainable Steel Region - Innovation and cutting-edge knowledge
Tiina Ohlsson
- 11:15-12:00 Young Global Center of Excellence in Advanced Steel
Hanna Escobar-Jansson
- 12:00-13:00 Lunch, Steel Bar
- 13:00-14:30 Session 37 Efficiency increase and CO2 mitigation, *Tornet*
Moderator: Jan Van der Stel
- 13:00-13:20 Integration possibilities in a H2-based DR-plant
Joel Orre, Johan Riesbeck; Mikael Larsson; Johanna Alatalo; Sandeep Kumar
- 13:20-13:40 Towards CO2-free Swedish steel industries: Application of plasma torches for heat-treating furnaces
Ilman Nuran Zaini, Rikard Svanberg; Daniel Sundberg; Maria Swartling; Jonas Engdahl; Andreas Johnsson; Weihong Yang; Nicklas Tarantino
- 13:40-14:00 ECO GRIDS for Power distribution in metallurgical plants
Wolfgang Linden, Mircea Ionita; Giacomo D'Ignazio
- 14:00-14:20 Fossil-free reduction of iron oxides
Edward Murray
- 14:20-14:30 Discussion

- 13:00-14:30 Session 38 Powder Metallurgy & AM, *B: Fogelström*
Moderator: Irene Calliari
- 13:00-13:20 Development of a Standardised, Lab-based Test for Powder Spreading Behaviour
Christopher Hulme-Smith, Sareh Götelid
- 13:20-13:40 Mechanical-corrosion properties of 17-4 PH stainless steel manufactured using laser powder bed fusion: The influence of post-process heat treatments
Soheil Sabooni, Huib Blaauw; Thomas Pijper; Yutao Pei
- 13:40-14:00 Health and Environmental Aspects of Metal Powder Based Additive Manufacturing
Sareh Götelid, Sareh Götelid; Yolanda Hedberg; Ann-Charlotte Almstrand; Benny Lyvén; Hanna Karlsson; Helen Karlsson; Inger Odnevall Wallinder
- 14:00-14:30 Discussion
- 13:00-14:30 Session 39 Steel making Casting, *C: Galleriet*
Moderator: Robert Eriksson
- 13:00-13:20 Submillimeter radar-based width measurement in the cooling zone of a continuous casting machine
Marc Banaszak, Andread Heutz; Guillaume Lefebvre; Ayaan Hakeem; Renaud Robert
- 13:20-13:40 Recent improvements in real-time thermal mapping of copper mold with Ergolines' ultrasonic sensor
Stefano Spagnut, Isabella Mazza; Giovanni Schiavon; Stefano Spagnut; Susanna Bosi
- 13:40-14:00 Enhanced breakout prevention by a knowledge based detection system
Stefan Petry, Sven Karrasch; Manuel Schmitz

- 14:00-14:20 ShapeMon – a New Sensor System for Improved Yield in Billet and Bloom Casting
Christian Brugger, Oliver Lang
- 14:20-14:30 Discussion
- 13:00-14:30 Session 40 Environmental & Energy aspects, D: Arkaden
Moderator: Gunnar Ruist
- 13:00-13:20 Integration of DRI plants into classical BOF production sites
Frank Ahrenhold, Matthias Weinberg, Julian Suer
- 13:20-13:40 Go Green: Energy and Environmental Solutions for the DR-EAF Route
Thomas Steinparzer, Paul Trunner, Andreas Steinwandter, Robert Millner
- 13:40-14:00 Performance of magnesia-carbon refractory and its interaction with slag under vacuum conditions
Xianfeng Hu, Johan Eriksson, Daniel Hedman, Magnus Heintz
- 14:00-14:20 Speed is the key - How Laser OES optimizes auxiliary processes in steel making
Alexander Schlemminger
- 14:20-14:30 Discussion
- 13:00-14:30 Session 41 Industry 4.0 Steelmaking, E: Poseidon
Moderator: Lena Sundqvist
- 13:00-13:20 A comprehensive investigation of inclusion particles dissolution in the metallurgical slag: an overview of experimental and theoretical study
Wangzhong Mu, Changji Xuan, Neslihan Dogan, Joo Hyun Park, Par G. Jönsson

13:20-13:40 Influence of calcination condition on the dissolution behaviour of lime in synthetic slags

Stefanie Lesiak, Elizaveta Cheremisina; Johannes Rieger; Johannes Schenk; Felix Firsbach; William Johnson; Thierry Chopin; Michael Nispel

13:40-14:00 Inclusion Evolution for LP Steels for Sour Service

Eloy Martinez Rehlaender

14:00-14:30 Discussion

13:00-14:30 **Session 42 The North Middle Sweden Regional Steel Innovation System, F: Pegasus**

13:00-13:01 Important information: This session is not synchronized with other sessions

13:01-13:16 Sustainable Steel Region - Introduction

Maria Swartling

13:16-13:31 "PIMAP Plus Project" - "Photonics for.."

Lars Ignberg (Project Manager)

13:31-13:46 Plasma Torch Technology

Mats Lindström (Sales Manager, ScanArc)

13:46-14:01 Radar Technology for Optimization of Steel Heating

Patrik Ottosson (Managing Director)

14:30-15:00 Break, *Steel Bar*

15:00-16:50 **Session 43 Ironmaking, Tornet**

Moderator: Jan Van der Stel

15:00-15:20 Reduction of hematite pellets with hydrogen gas heated with a plasma generator

Jonas Wennebra, Andreas Johansson; Henrik Wiinikka

- 15:20-15:40 Investigation of the Influence of Varied Oxygen Level on the Induration of an Iron Ore Pellet Bed
Anna Eriksson, Charlotte Andersson; Hesham Ahmed; Anders Dahlin; T. K. Sandeep Kumar; Pär Semberg
- 15:40-16:00 Deep learning for coke degradation recognition
Shungo Natsui, Hiroshi Nogami
- 16:00-16:20 The impacts of endothermic reaction and water content in the gas on the reduction of iron ore pellet by hydrogen gas.
Julia Brännberg Fogelström, Oscar Hessling; Johan Martinsson; Niklas Kojola
- 16:20-16:40 Operating Parameters for the transition of a Direct Reduction Plant toward 100% H₂ Usage
Christian Böhm, Robert Millner; Hanspeter Ofner; Wolfgang Sterrer; Johannes Rothberger; Vincent Chevrier
- 16:40-16:50 Discussion
- 15:00-16:50 Session 44 Steel materials (application and surface technologies),
B: Fogelström
Moderator: Irene Calliari
- 15:00-15:20 High performance advanced heat resistance austenitic stainless steel - Sanicro 25 material
Guocai Chai, Yanyan Bi; Magnus Brodin
- 15:20-15:40 High chromium effect on various con-casting and hot-rolled stainless steels controlled by δ-ferrite and grain-structure
K.Chandra Sekhar
- 15:40-16:00 BACKGROUND SUBTRACTION IN NEAR-SURFACE ANALYSIS WITH GD-OES - ADDING A NEW DIMENSION WITH THE HIGH- RESOLUTION CCD SPECTROMETER
Arne Bengtson, David Malmström

- 16:00-16:20 Next Generation Galvanizing Technology – Improvement of Standard Zinc Coating Weights
Thomas Dipl. Ing. Narholz, Connor McMenamin; Brit Capizzano
- 16:20-16:40 surcon 2D Surface Inspection in Cold Rolling Mills
Christian Mittag
- 16:40-16:50 Discussion
- 15:00-16:30 Session 45 Electric Steelmaking, C: Galleriet
Moderator: Robert Eriksson
- 15:00-15:20 Multitool robotic cell for EAF sampling, measurement with steel and level detector and internal inspection camera
Gianluca Maccani
- 15:20-15:40 Development of the PyroLIBS Sensor: Direct and real-time measurement of molten material composition
Bijan Shahriari, Andre Moreau; Sa Ge; Tony Vaillancourt; Mitren Sukhram
- 15:40-16:00 An assessment of the State of the Art offgas sensor technology for process control in steel combustion furnaces and synergies with machine learning
Guillaume Tiffon, Ken Grieshaber; Eric Huelson
- 16:00-16:20 Continuous Hot metal temperature measurement by Multi-wave Pyrometer
Juraj Micak, Lijia Wu; Jean-Paul Simoes; Pierre Van Dorpe; Fabrice Hansen
- 16:20-16:30 Discussion

15:00-16:50 **Session 46 Environment and Energy aspects, D: Arkaden**

Moderator: Gunnar Ruist

15:00-15:20 Prevention of secondary dust emissions in process industry using dust suppressants

Kersten Marx, Thorsten Hauck; Stefan Wienströer; Ralf Schwalbe

15:20-15:40 Disintegration control of AOD Slags in Stainless Steelmaking

Olle Sundqvist, Pontus Myckelberg; Henrietta Isaksson

15:40-16:00 Catalytic Graphitization of Biochar to Produce Green Graphite Electrodes

Ziyi Shi, Tong Han; Kurt Sjöblom; Anders Tilliander; Weihong Yang

16:00-16:20 The pros and cons of LIBS based “in-situ” versus well established “post-mortem” slag analysis in secondary metallurgy

Amit Ahsan, Dr. Cassian Gottlieb

16:20-16:40 AUMUND Solutions for hot material handling. CO₂ reduction and improved heat balance with ecological effects

Frank Reddemann

16:40-16:50 Discussion

15:00-16:30 **Session 47 Ironmaking, E: Poseidon**

Moderator: Lena Sundqvist

15:00-15:20 Carbon dioxide emission free iron production by strongly ionized H⁺ ion plasma gases

K CHANDRA SEKHAR

15:20-15:40 ENERGIRON_ The leading technology for green steel

Ashton Hertrich Giraldo; Dario Pauluzzi; Alessandro Martinis

15:40-16:00 Top Gas Recycling Revisited to Reduced Blast Furnace CO₂ Emissions

Mitren Sukhram, Kyle Lefebvre; Ian Cameron; Ben Ellis; Xinliang Liu; Tom Honeyands

16:00-16:20 Technical and economic prospects for electrolysis-based direct reduction processes

Gregor Herz, Nils Müller; Eric Jacobasch; Erik Reichelt; Matthias Jahn

16:20-16:30 Discussion

15:00-16:30 Session 48 Local event, F: Pegasus

Thursday 02 September 2021

08:30-10:00 Session 49 Efficiency increase & CO2 mitigation, *Tornet*

Moderator: Wolfgang Volkhausen

08:30-08:50 Decarbonizing steel - a global perspective

Alexander Fleischandler, Thomas Steinparzer, Robert Millner

08:50-09:10 Mapping the future structure of a zero-emission primary steel industry: flexible, circular and at scale?

Olle Olsson

09:10-09:30 CO2 reduction through innovative ORC technology for capturing waste heat in a steel mill

Christoph Hiesgen, Sven Jensen

09:30-09:50 New technological approach for blast furnace plants to achieve important CO2 mitigation

Klaus Peter Kinzel, Jean-Paul Simoes, Rongshan Lin, Gilles Kass, Miriam Valerius

09:50-10:00 Discussion

08:30-10:00 Session 50 Steel materials (properties), *B: Fogelström*

Moderator: Magnus Andersson

08:30-08:50 An Integrated Computational Materials Engineering approach to the design of high-performance steels

Martin Walbrütt, Ida Berglund, Jiayi Yan, Jason Sebastian

08:50-09:10 High temperature phase equilibria of duplex stainless steels assessed with an in-situ confocal microscopy and calorimetric study

Wangzhong Mu, Niklas Holländer Pettersson, Sohei Sukenaga, Hiroyuki Shibata, Peter Hedström

- 09:10-09:30 Electroplastic effect in UNS S32750 Duplex Stainless Steel
Claudio Gennari, Irene Calliari; Enrico Simonetto; Renato Gobbo; Stefania Bruschi; Andrea Ghiootti; Michele Forzan
- 09:30-09:50 Hydrogen embrittlement study of duplex stainless steel
Birhan Sefer, Joacim Hagström; Fredrik Gustavsson; Jesper Flyg; Sten Wessman; David Lindell
- 09:50-10:00 Discussion
- 08:30-10:00 Session 51 Ironmaking, C: Galleriet
Moderator: Jarmo Lilja
- 08:30-08:50 Development of a fully transient plant simulation model for a new hydrogen based direct reduction technology
Roland Eist, Daniel Buchberger; Marlen Hochwimmer; Clemens Oppeneiger
- 08:50-09:10 Green Steelmaking – A New Hope
Tim Kleier, Paul Tockert; Christian Fröhling; Jörg Brinckmann; Cristiano Castagnola; Björn Kintsxher
- 09:10-09:30 Muon imaging technique applied to blast furnace: BLEMAB European project
Irene Calliari, F. Ambrosino; P. Andreetto; L. Bonechi; G. Bonomi; D. Borselli; S. Bottai; P. Checchia; T. Buhles; U. Chiarotti; C. Cialdai; S. Ciaranfi; L. Cimmino; V. Ciulli; R. D'Alessandro; M. D'Errico; R. Ferretti; F. Finke; A. Franzen; S. Gonzi; B. Glaser; Y. Liu; O. Nechyporuk; F. Masone; A. Lorenzon; L. Pezzato; B.V. Rangavittal; D. Ressegotti; G. Saracino; J. Sauerwald; M.L. Serafino; O. Starodubtsev; L. Viliani
- 09:30-09:35 The rebirth from Bloom lake: much less carbon and much higher iron grade for sintering and pelletizing
Maycon Athayde, François Lavoie; Marta Ruivo

09:35-09:40 Analysis of Clogging Behavior of Narrow Path with Powder-Fluid Flow in Blast Furnace

Daichi Tsukada, Shungo Natsui; Hiroshi Nogami

09:40-10:00 Discussion

08:30-10:00 Session 52 Rolling & Forging, D: Arkaden

Moderator: Ulrich Prahlf

08:30-08:50 2021 Technology and Operation of a Hot Rolling Mill

Dirk Vanderschueren

08:50-09:10 Cooling systems diagnostics for flatness control in cold rolling

Carl-Fredrik Lindberg, Christer Sjögren; Markus Lindgren

09:10-09:30 Shape Monitor - Contactless strip flatness measurement

Simon Hain, Jose Claudio Blanco de Souza

09:30-09:50 Analysis of Bending Moment in Single-drive Rolling of Thin Strip

Wataru Baba, Yukio Takashima; Masaru Miyake; Jun Yanagimoto

09:50-10:00 Discussion

08:30-10:00 Session 53 Industry 4.0 General, E: Poseidon

Moderator: Christopher Hulme-Smith

08:30-08:50 Use of smart software to prevent power train failures due to interdisciplinary causes

Achille Fabien Nkwitchoua Djangang

08:50-09:10 The ControllInSteel project: systematic analysis of advanced automation and control solutions in EU funded research projects of the last decades

Marcus Dr. Neuer, Francesca Marchiori; Valentina Colla; Joaquin Ordieres-Meré; Moritz Loos; Stefano Dettori

09:10-09:30 Automatic surveillance of hot rolling area against intentional attacks and faults (AutoSurveillance). First results of the project.

Andreas Wolff, Marcus Neuer; Norbert Holzknecht; Jean Christophe Deprez; Stephane Mouton; Valentina Colla; Vincenzo Iannino; Claudio Bottazzi; Francesco Ferraris; Joaquin Ordieres; Asier Arteaga

09:30-09:50 From machine learning towards autonomous, explainable artificial intelligence in industrial automation for steel processing

Marcus Dr. Neuer, Moritz Loos

09:50-10:00 Discussion

08:30-10:00 Session 54 Electric Steelmaking, F: Pegasus

Moderator: Lotta Sörlin

08:30-08:56 No men around! - New safety concepts and tools for steel mills

Christian Redt, Andreas Dulzky; Christian Buchmaier; Martin Pavlis; Antonello Valoppi

08:56-09:22 Safety increase and Power-off reduction at the EAF at Hoeganaes with the introduction of the Piccardi Automatic Electrode Jointer + accessories

Thomas Piccardi, Markus Abel; Mikhail Lukin; Tommy Svensson

09:22-09:50 EAF and steelmaking processes monitoring through self-learning systems based on KPI's approach and model based guidelines for process improvement

Francesco Fredi, Piero Frittella; Lorenzo Angelini; Maurizio Fusato; Gianpaolo Foglio; Mattia Tellaroli; Cosmo Di Cecca; Daniele Conforti; Fabio Morandini; Ganna Tsymokh; Biagio Cinquegrana; Alessio Ventura; Davide Ressegotti

09:50-10:00 Discussion

10:00-10:30 Break, *Steel Bar*

- 10:30-12:00 Session 55 Efficiency increase & CO2 mitigation, *Tornet*
Moderator: Wolfgang Volkhausen
- 10:30-10:50 Approaching the CO2 transformation: A strategic opportunity for steel players to systematically transform their industry ecosystem
Nicole Voigt, Patrick Herhold; Jens Burchardt; Franziska Eberl
- 10:50-11:10 CO2 neutral steel production route by high-powered induction furnaces
Markus Hagedorn; Gerald Wimmer, Markus Hagedorn; Marco Rische; Thomas Steinparzer; Alexander Fleischhanderl; Gerald Wimmer
- 11:10-11:30 Use of flameless oxyfuel with hydrogen as fuel to reduce energy use and CO2 emissions in steel reheating
David Muren, Joachim von Scheele; Ola Ritzen
- 11:30-11:50 Development and application of model-based software tools for raw material and energy optimisation at Cast Steel production – MORSE project
Gert Gassner, Peter Fuchs; Martin Schlautmann; Gerald Stubbe; Udo Jendryssek; Philipp Niehues; Carlos Leyva; Álvaro Ojeda
- 11:50-12:00 Discussion
- 10:30-12:00 Session 56 Steel materials (properties), *B: Fogelström*
Moderator: Magnus Andersson
- 10:30-10:50 Influence of non-metallic inclusions on HIC susceptibility of low carbon bainitic steels
Markus Schürmann, Rosa Peter; Georgi Genchev; Thomas Haase
- 10:50-11:10 A study of heat treatment effects on low-alloyed martensitic Q&T steel
Gunnar Broberg, Jonas Svantesson; Nima Safara; Diana Orrling

11:10-11:30 Computational design, process simulation and hydrogen trapping ability of V-added high strength steels

Birhan Sefer, Erik Claesson; Nuria Fuertes; Aaron Middleton; Rolf Schmidt

11:30-11:40 Discussion

10:30-12:00 Session 57 Ironmaking, C: Galleriet

Moderator: Jarmo Lilja

10:30-10:50 Blast Furnace Refractory Wear Trend Monitoring

Afshin Sadri

10:50-11:10 DEM modelling of mixed ferrous burden charges using parallel and in-line blast furnace charging systems

Deside Chibwe, Tom Honeyands; Geoffrey Evans; Damien O'Dea; Xinliang Liu

11:10-12:00 Discussion

10:30-12:00 Session 58 Rolling & Forging, D: Arkaden

Moderator: Ulrich Prahlf

10:30-10:50 Measuring Thickness with Laser Gauges in Heavy Plate Applications

Achim Sonntag, Pär Kierkegaard

10:50-11:10 Quantum EAF & Arvedi ESP are setting a new environmental benchmark for mini mills flat

Thomas Lengauer, Andreas Jungbauer; Lukas Preuler

11:10-11:30 New Direct flame technologies for 3G carbon steel grades and for Semi-finished Electrical steel

CAMILLE MOUKARZEL; CAMILLE MOUKARZEL

- 11:30-11:35 Development of Varying Thickness Control System of steel strips during Hot Rolling
Jinwoo Jung, Haksoo Han; Yonghee Lee
- 11:35-12:00 Discussion
- 10:30-12:00 Session 59 Industry 4.0 General, E: Poseidon
Moderator: Christopher Hulme-Smith
- 10:30-10:50 Software-as-a-Service for a caster level-2-system – challenges and opportunities of e success story
Reinhold Leitner, Daniel Fuchshuber; Christoph Stangl
- 10:50-11:10 Realising horizontal integration of quality information in steel production chain
Jens Brandenburger, Christoph Schirm; Josef Melcher; Edgar Hancke; Annick Majchrowski; Rami Sellami; Sebastien Dupont; Marco Vannucci; Antonio Ritacco; Ruben Matino; Valentina Colla; Asier Arteaga
- 11:10-11:30 Challenges of Practical Machine Learning and Artificial Intelligence in the Steel Industry – A Study Based on Recent Research and Practice
Leo Carlsson
- 11:30-11:50 The Next Level in Vibration Monitoring and Analysis: Machine Learning for Root Cause Analysis
Klaus Stohl, Borui Li; Jonathan Davis; Andrew Lauden
- 11:50-12:00 Discussion

- 10:30-12:00 Session 60 Electric Steelmaking, *F: Pegasus*
Moderator: Lotta Sörlin
- 10:30-10:50 Optimisation of the chemical energy input in EAF steelmaking by direct monitoring of the melt temperature
Bernd Kleimt, Marc Köster; Torsten Lamp; Marek Cichonski; Loris Bianco; Daniele Gaspardo; Björn Glaser; Yu Liu; Herbert Köchner
- 10:50-11:10 EAF Process Optimization through the Mathematical Prediction of Ideal Oxygen and CH₄ Gas Flow Rates
Yu Liu, Mikael Ersson; Björn Glaser
- 11:10-11:30 Bypassing Problems related to Water Cooling – Concepts for ILTEC cooled side walls
Martina Hanet, Andreas Filzwieser; Hans-Jörg Krassnig
- 11:30-11:35 Modeling of a molten oxide electrolysis-based process for low-carbon steelmaking
Saskia Lengning, Gregor Herz; Erik Reichelt; Matthias Jahn
- 11:35-12:00 Discussion
- 12:00-13:00 Lunch, *Steel Bar*
- 13:00-14:30 Session 61 Efficiency increase & CO₂ mitigation, *Tornet*
Moderator: Christian Böhm
- 13:00-13:20 Making steel plants fit for today's and tomorrow's challenges. Optimal CO₂ and energy configuration by using the Plant Assessment Tool
Marco Perato, Silvia Ilacqua; Stefano Magnani; Philipp Bermes; Klaus-Peter Kinzel; Miriam Valerius

- 13:20-13:40 Advanced Control and Supervision systems for the management of hydrogen intensified methane and methanol syntheses from steelworks process off-gases
Vincenzo Iannino; Stefano Dettori; Ismael Matino; Valentina Colla; Sebastian Kolb; Michael Bampaou; Alexandros Kafetzis; Alexios Kyriakides; Kyriakos Panopoulos; Philipp Wolf-Zoellner
- 13:40-14:00 Gas to Electric – for sustainable heating processes within steel production
Dilip Chandrasekaran; Roger Berglund; Marcus Andersson; Jonas Ekström; Krister Wickman
- 14:00-14:20 Decarbonization of industry by thermal energy storage
Magnus Mörtingberg
- 14:20-14:30 Discussion
- 13:00-14:30 Session 62 Steel Materials (properties), *B: Fogelström*
Moderator: Robert Vikman
- 13:00-13:20 Influence of cold rolling on corrosion, electrochemical response and microstructure of the duplex stainless steel LDX 2101
Nuria Fuertes, Rachel Pettersson
- 13:20-13:40 Reduced Nitridation by Using a Silica-forming Alloy
Tommy Sand, Alessandra Spaghetti; Mats Hättestrand
- 13:40-14:00 A friendly tool for mass amount of in-situ diffraction data analysis – MassDiff
Tuerdi Maimaitiyili, Shirin Nouhi; Johannes Brask; Amer Malik; Jan Y. Jonsson; David Lindell; Fredrik Lindberg
- 14:00-14:30 Discussion

13:00-14:30 **Session 63 Ironmaking, C: Galleriet**

Moderator: Lena Sundqvist

13:00-13:20 Combination of Direct Reduction, Submerged-Arc Furnace and slag granulation for alternative pig iron production

Fabio Muscolino, Fabio Cravino; Stefano Magnani; Joe Bartholme; Zak van der Westhuizen

13:20-13:40 HIsarna for improving circularity: reclaiming iron and zinc from waste materials

Hans Hage

13:40-14:00 Direct Reduction in the Gradual Transition to CO₂-free steelmaking

William Dempsey, Vincent Chevrier, Ph.D.

14:00-14:20 Digitizing valuable process and maintenance know-how: A fundamental step for future optimizations

Cédric Schockaert, Cédric Schockaert; Alexander Schmitz

14:20-14:30 Discussion

13:00-14:30 **Session 64 Rolling & Forging, D: Arkaden**

Moderator: Jonas Lagergren

13:00-13:20 Enhancing Steel Grade portfolio by Direct Quenching of Abrasion Resistant Steel Plates

John Hinton

13:20-13:40 Cold Rolling Mill Technologies for harder and thinner Electrical Steel

Akihiro Yamamoto, Konrad Krimpelstaetter

13:40-14:00 Accelerated material identification for rolling mills and wholesalers with Laser OES

Alexander Schlemminger

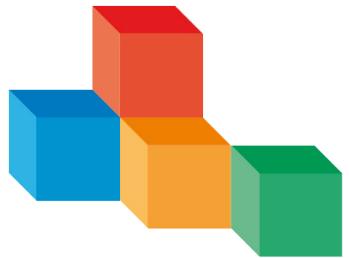
14:00-14:10 Discussion

- 13:00-14:30 **Session 65 Industry 4.0 Ironmaking, E: Poseidon**
Moderator: Harald Peters
- 13:00-13:20 Evaluation of inclusion characteristics to monitor the efficiency of calcium-treatment in low-alloyed liquid steels
Sudhanshu Kuthe; Andrey Karasev; Björn Glaser
- 13:20-13:40 Usage of exchangeable carbon-bonded alumina filter systems for continuous casting of slabs
Sven Karrasch; Helmut Schnitzer; Andreas Baaske; Tony Wetzig; Christos G. Aneziris
- 13:40-14:00 A digital approach to optimize pelletizing plant operation via advanced automation and process modelling
Robert Schiemann; Sebastian Lang
- 14:00-14:30 Discussion
- 13:00-14:30 **Session 66 Free, F: Pegasus**
- 15:00-16:30 **Session 67 Energy & Environment (Short orals), Tornet**
- 15:00-15:05 Hydrogen gas storage in lined rock caverns for fossil-free steelmaking
Davi Rodrigues Damasceno; Johan Spross; Fredrik Johansson
- 15:05-15:10 Perspectives of using biomass to reduce fossil CO₂ emission in the Swedish steel industry
Chuan Wang; Chinedu Nwachukwu; Erik Sandberg; Joakim Lundgren; Elisabeth Wetterlund
- 15:10-15:15 Site level models for process off-gas dynamic prediction in integrated steelworks in view of their exploitation for methane and methanol synthesis
Stefano Dettori; Ismael Matino; Vincenzo Iannino; Valentina Colla; Katharina Rechberger; Nina Kieberger

- 15:15-15:20 Artificial intelligence approach for optimizing and visualizing the energy system of a steel plant coupling to a combined heat and power plant
Tomas Lundberg, Björn Ek; Sameer Prabhu; Martin Simonsson; Chuan Wang
- 15:20-15:30 Discussion
- 15:30-15:35 Future production of by-products in a low carbon steel industry and beneficial use of CO₂ gas and slag
David Algermissen
- 15:35-15:40 Innovative approaches to increase energy efficiency of electric arc furnaces
Christian Redt, Christian Buchmaier; Antonello Valoppi; Martin Leber; Adam Partyka
- 15:40-15:45 Future Shades of Green Steel
Lars Nilsson, Max Åhman; Valentin Vogl
- 15:45-15:50 Valorization of spent refractory as a secondary raw material in the steel making process: ReStoRe technology
Massimo Proietti Cerquoni, Marc Faverjon; Romina Ceccolini
- 15:50-16:30 Discussion
- 15:00-16:30 Session 68 Steel materials (Short orals), B: Fogelström
Moderator: Robert Vikman
- 15:00-15:05 Effect of ageing and work-hardening on the mechanical properties of cold formed S700 rectangular hollow
Antti Kaijalainen, Juho Mourujärvi; Juha Tulonen; Petteri Steen; Jukka Komi

- 15:05-15:10 Implementation of operando ambient-pressure X-ray spectroscopy for corrosion studies of stainless steels
Konstantin Simonov, Marie Långberg; Andrey Shavorskiy; Sara Munktell; Nuria Fuertes
- 15:10-15:15 Depth resolved residual stress measurement in additively manufactured stainless steel by Bragg Edge neutron imaging
Tuerdi Maimaitiyili, Sara Munktell; Genoveva Burca; Nuria Fuertes; Konstantin Simonov; James Shipley
- 15:15-16:30 Discussion
- 15:00-16:30 Session 69 Ironmaking, C: Galleriet
Moderator: Lena Sundqvist
- 15:00-15:20 Soft-sensor for the dead man properties and dynamics in the blast furnace
Hauke Bartusch, Yalcin Kaymak; Thorsten Hauck; Fatima Demirci; Andreas Janz
- 15:20-15:40 Artificial Intelligence and Data Driven Modelling in Ironmaking – Potential and Limitations
Dieter Bettinger, Harald Fritschek; Martin Schaler; Petra Krahwinkler; Adnan Husakovic; Sonja Straszer
- 15:40-16:00 Recycling of Blast Furnace Sludge – Best Available Technology
Thomas Baumann, Thibaut Richard
- 16:00-16:20 Modelling and optimisation of ironmaking processes: some recent developments
Yansong Shen
- 16:20-16:30 Discussion

- 15:00-16:30 **Session 70 Rolling & Forging (long products and forging), D: Arkaden**
Moderator: Jonas Lagergren
- 15:00-15:20 Development of a steady-state 3D Eulerian code for rolling simulation
Silvia Mancini, Luigi Langellotto; Daniele Fera
- 15:20-15:40 Hot rolling process optimization using numerical simulation
Benjamin Erzar, Joan Mas Colomer; Etienne Perchat
- 15:40-16:00 Virtual manufacturing of hot steel strips - From roughing to coil cooling
Joonas Ilmola, Oskari Seppälä; Joni Paananen; Aarne Pohjonen; Jari Larkiola; Juha Pyykkönen; Juha Jokisaari
- 16:00-16:20 An Artificial Neural Network Hybrid Approach for the optimization of open die ironing process
Silvia Mancini, Luigi Langellotto; Giovanni Zangari; Sandro Notargiacomo
- 16:20-16:30 Discussion
- 15:00-16:30 **Session 71 Industry 4.0 General, E: Poseidon**
Moderator: Harald Peters
- 15:00-15:20 Holistic production scheduling using network science
C. Andreas Klein, Klaus Ptasznyk; Wilfried Runde
- 15:20-15:25 Smart Safety Guard; Safe working conditions through Real-Time People Localization
Nicolas SCHLESSER, Fabrice Hansen; Yves REUTER; David JAKUBOWSKI
- 15:25-16:30 Discussion
- 15:00-16:30 **Session 72 Free, F: Pegasus**
- 16:30-17:00 Closure of Conference and hand over to the organizer of ESTAD 2023, A: Steel Bar



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