Content

Timetable ............................................................................................... 2
General conference information + Compliance Rules ....................... 3
Supporters and sponsors ................................................................. 3
Welcome to the METEC and 4th ESTAD 2019 in Düsseldorf .......... 4
METEC and 4th ESTAD 2019 Chairman´ s address ...................... 5
Opening & Plenary sessions METEC & 4th ESTAD 2019 .......... 6
Workshop LowCarbonFuture ............................................................ 7
ESTAD technical topic sessions
Ironmaking .......................................................................................... 9
Steelmaking ....................................................................................... 25
Rolling and Forging ........................................................................... 45
Steel Materials and their Application, additive manufacturing,
Surface Technologies ........................................................................ 59
Industry 4.0 ....................................................................................... 65
Environmental and Energy Aspects .................................................. 69
Works visits ....................................................................................... 79
Compliance with cartel-law regulations ........................................ 82
Announcement of the 5th ESTAD 2021 ........................................... 84
Evening event/Conference dinner ..................................................... 85
Map of the trade fairs ........................................................................ 86
Registration and Get-together / Farewell event ................................. 87
Layout of CCD South/Ground Floor ............................................... 88
Layout of CCD South/First & Second Floor .................................... 89
Information ......................................................................................... 90
Registration / How to get to CCD South ......................................... 91

Timetable

24–28 June 2019

<table>
<thead>
<tr>
<th>Day</th>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday, 24 June</td>
<td>17:00 – 20:00</td>
<td>Early Congress registration</td>
</tr>
<tr>
<td></td>
<td>18:00 – 21:00</td>
<td>Get-together</td>
</tr>
<tr>
<td>Tuesday, 25 June</td>
<td>10:00 – 12:50</td>
<td>Opening/Plenary sessions</td>
</tr>
<tr>
<td></td>
<td>14:00 – 18:40</td>
<td>Technical sessions</td>
</tr>
<tr>
<td></td>
<td>18:30 – 23:00</td>
<td>Evening event</td>
</tr>
<tr>
<td>Wednesday, 26 June</td>
<td>9:00 – 18:00</td>
<td>Technical sessions</td>
</tr>
<tr>
<td>Thursday, 27 June</td>
<td>9:00 – 15:20</td>
<td>Technical sessions</td>
</tr>
<tr>
<td></td>
<td>15:30 – 17:00</td>
<td>Farewell event</td>
</tr>
<tr>
<td>Friday, 28 June</td>
<td>7:30 – 18:30</td>
<td>Works visits</td>
</tr>
</tbody>
</table>

Congress secretariat / Organization
TEMA Technologie Marketing AG | Mr. Carsten Scheele
Aachener-und-Münchener-Allee 9 | 52074 Aachen | Germany
Phone: +49 241 88970-300 | Fax: +49 241 88970-999
Email: news@metec-estad.com | www.tema.de

Conference office / Registration

<table>
<thead>
<tr>
<th>Day</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday, 24 June</td>
<td>17:00 – 20:00</td>
</tr>
<tr>
<td>Tuesday, 25 June</td>
<td>8:00 – 18:30</td>
</tr>
<tr>
<td>Wednesday, 26 June</td>
<td>8:00 – 18:30</td>
</tr>
<tr>
<td>Thursday, 27 June</td>
<td>8:00 – 18:00</td>
</tr>
</tbody>
</table>
General conference information

About METEC and 4th ESTAD
Only those who continue to develop their businesses remain competitive. The prerequisite for this development means being constantly informed about the latest and most sophisticated technological advances, exchanging ideas and initiating and expanding networks with clients, partners and suppliers. The 4th European Steel Technology and Application Days (ESTAD) 2019 run in parallel with the METEC Trade Fair.

The Steel Institute VDEh and its partners offer visitors the perfect opportunity to reach their objectives. At this event participants will acquire the latest information on new ideas and developments as well as on the state-of-the-art in metallurgical process technologies for iron and steel production, steel materials and steel application.

Get-together
On Monday evening 24 June 2019 the participants of the conference have the opportunity to meet each other in a relaxed atmosphere in the reception next to the Conference rooms and Conference office in the CCD South in Düsseldorf. There will also be entertainment and a finger buffet. Accompanying persons are also welcome.

Evening event
All conference participants and their companions have the opportunity to participate in the evening event on Tuesday, 25 June, 2019. The dinner will take place on the boat MS RheinEnergie. This extraordinary location offers a panorama view of Düsseldorf from the river Rhine. The conference participants can reach MS RheinEnergie with a short walk from CCD South.

Language
The conference language is English.

Cooperation
The conference is organised in close cooperation with the Austrian Society for Metallurgy and Materials (ASMET), the Swedish Steel Producers Association (Jernkontoret) and Associazione Italiana di Metallurgia (AIM).

Compliance Rules
The Steel Institute VDEh and all cooperating organizations are committed to adhering strictly to all applicable antitrust laws. Within the context of METEC & 4th ESTAD it is strictly prohibited to discuss competitively sensitive subjects such as price-fixing agreements or agreements on quantities. You will find the antitrust guidelines “Guidelines on Adherence to Cartel-Law Regulations” on the website www.metec-estad2019.com.

Supporters and sponsors
We thank all international institutes and societies for their support of the METEC and 4th ESTAD.

We thank the following companies for their sponsorship:

Gold sponsor:

ALPIQ
Welcome to the METEC and 4th ESTAD 2019 in Düsseldorf

Dear Madam/Sir,

The 10th edition of the major international trade fair for metallurgical plant supplier and manufacturing companies, METEC 2019, will take place in Düsseldorf from the 25 - 29 of June 2019. This outstanding event started back in 1979 and always takes place in Düsseldorf. Since the first METEC, the Steel Institute VDEh has organized, in close cooperation with Messe Düsseldorf, accompanying metallurgical steel congresses and conferences.

In 2013, the Steel Institute VDEh proposed a new event located in Europe, called the European Steel Technology and Application Days (ESTAD), which is open to steel producers, steel users, plant suppliers, research institutes, as well as universities from around the world. ESTAD is hosted in joint cooperation between the Austrian Society for Metallurgy and Materials (ASMET), the Swedish Steel Producers Association (Jernkontoret), Associazione Italiana di Metallurgia (AIM), and the German Steel Institute VDEh.

The 1st ESTAD took place in April 2014 in Paris, France, the 2nd together with METEC in June 2015 in Düsseldorf, Germany, and the 3rd in June 2017 in Vienna, Austria.

The 4th ESTAD will be held parallel to the METEC 2019, starting with a get-together in the evening of the 24 June and ending with plant visits on the 28 June. Between these dates, participants have the opportunity to attend numerous presentations covering the latest technical developments in the world of steel.

We are looking forward to welcoming you as a participant, especially during the opening and plenary sessions of METEC and 4th ESTAD, which will take place on the morning of the 25 June 2019.

Hans Jürgen Kerkhoff
Chairman Steel Institute VDEh
President German Steel Federation

Dr. Peter Dahlmann
Executive Member of the Managing Board Steel Institute VDEh
Dear Madam/Sir,

From the 24 - 28 of June 2019, the Steel Institute VDEh will host the 4th ESTAD 2019 as the accompanying conference to the metallurgical trade fair, METEC. ESTAD stands for “European Steel Technology and Application Days”, an event located in Europe with worldwide participation. The 4th ESTAD 2019 offers participants the opportunity to learn about the most important state-of-the-art technologies and developments in iron and steel production as well as about steel materials and their applications. Approximately 670 technical presentations in 150 technical sessions within 3 days, from the 25 - 27 June 2019, will cover the following fields:

- Ironmaking
- Steelmaking
- Rolling and Forging
- Steel materials and their application, surface technologies, additive manufacturing
- Industry 4.0
- Environmental and energy aspects

Today, EU policies request drastically reduced CO$_2$ emission levels by the year 2050, which is a challenge for the steel industry to achieve with the existing iron and steelmaking processes. New technologies need to be developed. Steel, with its manifold applications, is a CO$_2$ mitigation enabler, but must also compete with other materials currently on the market or in development. The steel industry has to remain one step ahead and continuously needs to move forward. The METEC and 4th ESTAD will give answers to many of the pressing technical questions at hand and will therefore contribute to the further success of steel in Europe and in the world.

I would like to thank all the speakers and their co-authors at METEC and 4th ESTAD in advance for their efforts in preparing the papers for this outstanding event.

I am looking forward to meeting you in Düsseldorf between the 24 - 28 June 2019.

Prof. Dr. Wolfgang Bleck
Director, Institute of Ferrous Metallurgy,
RWTH Aachen University, Germany
## Tuesday, 25 June 2019

<table>
<thead>
<tr>
<th>Time</th>
<th>Room 1</th>
<th>Room 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:00</td>
<td><strong>Opening by the ESTAD 2019 Chairman</strong>&lt;br&gt;Prof. Dr. Wolfgang Bleck, Director Institute for Ferrous Metallurgy, RWTH Aachen University, Germany</td>
<td><strong>Plenary session 2</strong>&lt;br&gt;&lt;br&gt;<strong>Trends in Steel and Process Development</strong>&lt;br&gt;Chairman: Dr. Peter Dahlmann, Steel Institute VDEh</td>
</tr>
<tr>
<td>10:20</td>
<td><strong>Political challenges and technological perspectives for steel</strong>&lt;br&gt;Hans Jürgen Kerkhoff, Chairman Steel Institute VDEh, President German Steel Federation, Düsseldorf, Germany</td>
<td>How megatrends drive innovation, Dr. Franz Androsch, General Manager Research &amp; Development and Innovation, voestalpine Stahl GmbH, Linz, Austria</td>
</tr>
<tr>
<td>10:40</td>
<td><strong>Steel Roadmap for a Low Carbon Europe 2050 – Technical assessment of steelmaking routes</strong>&lt;br&gt;Dr. Peter Dahlmann, Executive Member of the Managing Board, Steel Institute VDEh, Düsseldorf, Germany</td>
<td>Materials and processes for third-generation advanced high strength steels, Prof. Dr. Wolfgang Bleck, Director Institute for Ferrous Metallurgy, RWTH Aachen University, Fritz Brühl, SMS group GmbH, Düsseldorf, Germany</td>
</tr>
<tr>
<td>11:00</td>
<td><strong>Steel Roadmap for a Low Carbon Europe 2050 – Economic Assessment</strong>&lt;br&gt;Dr. Mathias Kube, Navigant Consulting, Cologne, Germany</td>
<td>Solutions for a Changing Industry, Aashish Gupta, CSO, Primetals Technologies Austria GmbH, Linz, Austria</td>
</tr>
</tbody>
</table>

### Plenary session 1<br><br>**Trends in CO₂ Mitigation**<br>Chairman: Dr. Hans Bodo Lüngen, Steel Institute VDEh

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Speaker/Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:30</td>
<td><strong>SALCOS® - Sustainable, stepwise and flexible decarbonisation based on proven technology</strong>&lt;br&gt;Dr. Volker Hille, Head of Corporate Technology, Salzgitter AG, Germany</td>
<td></td>
</tr>
<tr>
<td>11:50</td>
<td><strong>Technology development hydrogen steelmaking</strong>&lt;br&gt;Thomas Buergler, Manager Research and Development Ironmaking, voestalpine Stahl GmbH, Linz, Austria</td>
<td></td>
</tr>
<tr>
<td>12:10</td>
<td><strong>Carbon2Chem: Reduce CO₂ emissions in a cross industrial network</strong>&lt;br&gt;Dr. Markus Oles, Head of Innovation Strategy &amp; Projects, thyssenkrupp AG, Essen, Germany</td>
<td></td>
</tr>
<tr>
<td>12:30</td>
<td><strong>Sustainable production of low carbon, renewable fuels by fermenting industrial process gases from the iron and steel industry</strong>&lt;br&gt;Wim van der Stricht, ArcelorMittal Belgium, Gent, Belgium</td>
<td></td>
</tr>
<tr>
<td>12:50</td>
<td><strong>Technological achievements and experience on H₂ use for DRI production in ENERGIRON Plants</strong>&lt;br&gt;Stefano Maggiolino, Tenova HYL, Mexico</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Grain Size Control in Process Chains of Cold and Hot Forged Drive Train Components</strong>&lt;br&gt;Dr. Isabell Ortlepp, ZF Friedrichshafen AG, Germany</td>
<td></td>
</tr>
</tbody>
</table>
LowCarbonFuture workshop

27 June, 13:00 – 15:00 Room 3

“Workshop – Requirements for realization of Low-Carbon steelmaking in Europe”

This workshop is dedicated to the current RFCS “LowCarbonFuture” project (“Exploitation of projects for Low-Carbon future steel industry”), which is coordinated by VDEh-Betriebsforschungs institut (BFI). The project “LowCarbonFuture” has the objective to collect, summarize and evaluate research projects and knowledge dealing with CO₂ mitigation in iron and steelmaking. “LowCarbonFuture” will generate a roadmap stating research needs, requirements and boundary conditions for a new CO₂ lean steel production to guide the EU steel industry towards the world’s climate contract and the EU climate goals (more information: www.lowcarbonfuture.eu).

The workshop will give a short overview on the scope of the “LowCarbonFuture” project, comprising the main CO₂ mitigation pathways “Carbon direct avoidance” and “Smart carbon usage”. Based on the topics and pathways, previously presented at the ESTAD conference, an open discussion will take place between the audience and representatives of the steel industry involved in the main CO₂ mitigation pathways. Scope of the discussion will be the future implementation of new CO₂ mitigation technologies within the steel industry including the following main aspects:

• Technological, administrative and financial barriers and demands
• Demands on infrastructure
• R&D activities needed

The results from the open discussion shall be evaluated afterwards within the “LowCarbonFuture” project, aided by questionnaires distributed to the audience during the workshop.

Coordinator of the Project:
Gerald Stubbe, VDEh-Betriebsforschungsinstitut GmbH, Germany

Moderator of the Podium Discussion:
Prof. Dr. Ralph Sievering, Consultant, Germany

Panelists:
Dr. Reinhold Achatz, thyssenkrupp AG, Germany
Johann Prammer, voestalpine Stahl GmbH, Austria
Carl de Maré, ArcelorMittal Belgium NV, Belgium
Dr. Volker Hille, Salzgitter Flachstahl GmbH, Germany
Koen Meijer, Tata Steel Europe, The Netherlands
Dr. Matthias Weinberg, thyssenkrupp Steel Europe AG, Germany
Real time energy forecasting for the heavy industry.

- Save up to 30% of your balancing energy cost
- Less exposure to volatile energy imbalance prices
- Fully automated system
- Achieve further savings with our solution for the reduction of peak power consumption

Alpiq Digital AG
Bahnhofquai 12
4601 Olten
energysolutions@alpiq.com
www.alpiq.com
• Industry 4.0 in Ironmaking
• Cokemaking
• Sintering and Pelletising
• Blast Furnace Ironmaking
• Direct Reduction and Smelting Reduction
<table>
<thead>
<tr>
<th>Time</th>
<th>Tuesday: 25 June</th>
<th>Wednesday: 26 June</th>
</tr>
</thead>
</table>
| 9:00   |                                   | **Session I.01.2** Blast furnace ironmaking: Injection of auxiliary reductants (coal, oil, gas, plastics) and oxygen II **Session I.01.2** Cokemaking: Coal blending practice; Fundamentals in coke making II **Session I.01.2** Sintering: DRI/HBI in blast furnace **Session I.01.2** Sintering: Sinter plant operation, automation and sinter quality | 9:00 – 10:20
| 10:00  | **Session 0.1** Opening Session   | **Session I.16.1** Blast furnace ironmaking: Fundamentals in blast furnace ironmaking I **Session I.18** Blast furnace ironmaking: Blast furnace operation **Session I.18** Blast furnace ironmaking: Blast furnace refractories and cooling I **Session I.18** Cokemaking: Coke plant operation | 9:00 – 10:20
| 10:00  | **Session 0.2** Trends in CO₂ Mitigation | **Session I.16.2** Blast furnace ironmaking: Fundamentals in blast furnace ironmaking II **Session I.22.1** Blast furnace ironmaking: Blast furnace refractories and cooling I | Coffee break
| 10:00  | 10:00 – 11:20                    | **Session I.16.2** Blast furnace ironmaking: Fundamentals in blast furnace ironmaking II | 9:00 – 10:20
| 11:00  | **Session 0.3** Trends in Steel and Process Development | **Session I.15** Blast furnace ironmaking: Overview on blast furnace operation **Session I.22.1** Blast furnace ironmaking: Blast furnace refractories and cooling I | Coffee break
| 11:00  | 10:00 – 11:20                    | **Session I.15** Blast furnace ironmaking: Overview on blast furnace operation | Coffee break
| 12:00  | **Session 0.4** Trends in CO₂ Mitigation | **Session I.17** Blast furnace ironmaking: Blast furnace process optimization and automation **Session I.22.1** Blast furnace ironmaking: Blast furnace refractories and cooling I | Lunch
| 12:00  | 11:30 – 13:10                    | **Session I.17** Blast furnace ironmaking: Blast furnace process optimization and automation | Lunch
| 13:00  | 11:30 – 13:10                    | **Session I.04** Cokemaking: Coke plant operation | Lunch
| 13:00  | Lunch                            | **Session I.04** Cokemaking: Coke plant operation | Lunch
| 14:00  | **Session I.17** Blast furnace ironmaking: Blast furnace construction and design | **Session I.02** Cokemaking: Latest developments in slot oven plant technology and design, coke oven repair techniques and life prolongation | 13:00 – 15:00
| 14:00  | 14:00 – 15:00                    | **Session I.02** Cokemaking: Latest developments in slot oven plant technology and design, coke oven repair techniques and life prolongation | 13:00 – 15:00
| 14:00  | **Session I.17** Blast furnace ironmaking: Blast furnace construction and design | **Session I.25.1** Blast furnace ironmaking: Injection of auxiliary reductants (coal, oil, gas, plastics) and oxygen I | 13:40 – 14:40
| 14:00  | 14:00 – 15:40                    | **Session I.25.1** Blast furnace ironmaking: Injection of auxiliary reductants (coal, oil, gas, plastics) and oxygen I | 13:40 – 14:40
| 15:00  | **Session I.25.1** Blast furnace ironmaking: Injection of auxiliary reductants (coal, oil, gas, plastics) and oxygen I | **Session I.25.2** Blast furnace ironmaking: Injection of auxiliary reductants (coal, oil, gas, plastics) and oxygen II | 15:20 – 16:40
| 15:00  | 14:00 – 15:40                    | **Session I.25.2** Blast furnace ironmaking: Injection of auxiliary reductants (coal, oil, gas, plastics) and oxygen II | 15:20 – 16:40
| 15:00  | **Session I.01.1** Blown dust blending practice | **Session I.25.2** Blast furnace ironmaking: Injection of auxiliary reductants (coal, oil, gas, plastics) and oxygen II | Coffee break
| 15:00  | Coffee break                     | **Session I.25.2** Blast furnace ironmaking: Injection of auxiliary reductants (coal, oil, gas, plastics) and oxygen II | Coffee break
| 16:00  | **Session I.16.1** Blast furnace ironmaking: Fundamentals in blast furnace ironmaking I | **Session I.05** Cokemaking: Coke oven gas cleaning, use of coke oven gas and utilization of by-products | 14:20 – 16:00
| 16:00  | 15:40 – 16:40                    | **Session I.05** Cokemaking: Coke oven gas cleaning, use of coke oven gas and utilization of by-products | 14:20 – 16:00
| 16:00  | **Session I.02** Cokemaking: Latest developments in slot oven plant technology and design, coke oven repair techniques and life prolongation | **Session I.05** Cokemaking: Coke oven gas cleaning, use of coke oven gas and utilization of by-products | Coffee break
| 16:00  | Coffee break                     | **Session I.05** Cokemaking: Coke oven gas cleaning, use of coke oven gas and utilization of by-products | Coffee break
| 17:00  | **Session I.02** Cokemaking: Latest developments in slot oven plant technology and design, coke oven repair techniques and life prolongation | **Session I.05** Cokemaking: Coke oven gas cleaning, use of coke oven gas and utilization of by-products | 9:00 – 10:20
| 17:00  | 14:00 – 15:00                    | **Session I.05** Cokemaking: Coke oven gas cleaning, use of coke oven gas and utilization of by-products | 9:00 – 10:20
| 18:00  | **Session I.16.1** Blast furnace ironmaking: Fundamentals in blast furnace ironmaking I | **Session I.07** Sintering: Fundamentals in sintering and chemical analysis and raw materials testing II | 9:00 – 10:40
| 18:00  | **Session I.16.1** Blast furnace ironmaking: Fundamentals in blast furnace ironmaking I | **Session I.07** Sintering: Fundamentals in sintering and chemical analysis and raw materials testing II | Coffee break
| 18:30  | **Session I.16.1** Blast furnace ironmaking: Fundamentals in blast furnace ironmaking I | **Session I.07** Sintering: Fundamentals in sintering and chemical analysis and raw materials testing II | Coffee break
| 18:30  | **Session I.16.1** Blast furnace ironmaking: Fundamentals in blast furnace ironmaking I | **Session I.07** Sintering: Fundamentals in sintering and chemical analysis and raw materials testing II | Coffee break

**Evening Event MS RheinEnergie**
### Thursday: 27 June

<table>
<thead>
<tr>
<th>Room 1</th>
<th>Room 2</th>
<th>Room 3</th>
<th>Room 8</th>
<th>Room 21</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Session I.20</strong>&lt;br&gt;Blast furnace ironmaking: Blast furnace campaign life extension</td>
<td><strong>Session I.19.1</strong>&lt;br&gt;Blast furnace ironmaking: Modern process control techniques and models I</td>
<td><strong>Session I.23</strong>&lt;br&gt;Blast furnace ironmaking: Blast furnace charging and gas cleaning</td>
<td><strong>Session I.32.1</strong>&lt;br&gt;Industry 4.0 in Ironmaking I</td>
<td><strong>Session I.31.1</strong>&lt;br&gt;Direct reduction and smelting reduction I</td>
</tr>
<tr>
<td>9:00 – 10:40</td>
<td>9:00 – 10:00</td>
<td>9:00 – 10:20</td>
<td>9:00 – 10:20</td>
<td>9:00 – 10:00</td>
</tr>
<tr>
<td><strong>Coffee break</strong></td>
<td><strong>Coffee break</strong></td>
<td><strong>Coffee break</strong></td>
<td></td>
<td><strong>Coffee break</strong></td>
</tr>
<tr>
<td><strong>Session I.21</strong>&lt;br&gt;Blast furnace ironmaking: Blast furnace campaign life extension</td>
<td><strong>Session I.19.2</strong>&lt;br&gt;Blast furnace ironmaking: Modern process control techniques and models II</td>
<td></td>
<td></td>
<td><strong>Session I.31.2</strong>&lt;br&gt;Direct reduction and smelting reduction II</td>
</tr>
<tr>
<td>11:00 – 12:20</td>
<td>11:00 – 12:00</td>
<td></td>
<td></td>
<td>11:00 – 12:00</td>
</tr>
<tr>
<td><strong>Lunch</strong></td>
<td><strong>Lunch</strong></td>
<td></td>
<td></td>
<td><strong>Lunch</strong></td>
</tr>
<tr>
<td><strong>Session I.29</strong>&lt;br&gt;Direct reduction and smelting reduction: Fundamentals in direct reduction and smelting reduction</td>
<td><strong>Session I.19.3</strong>&lt;br&gt;Blast furnace ironmaking: Modern process control techniques and models III</td>
<td><strong>Session I.24</strong>&lt;br&gt;Blast furnace ironmaking: Hot blast stoves and blowers</td>
<td><strong>Session I.28</strong>&lt;br&gt;Blast furnace ironmaking: Use of DRI/ HBI in blast furnace, injection of auxiliary reductions</td>
<td></td>
</tr>
<tr>
<td><strong>Workshop</strong>&lt;br&gt;LowCarbonFuture workshop</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>15:30 – 17:00 Farewell event, CCD South, First Floor</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Tuesday, 25 June 2019
14:00 – 15:00 | Room 17 | Session I.17
Blast furnace ironmaking: Blast furnace construction and design
Chair: M. Peters, thyssenkrupp Steel Europe AG, Germany

14:00 Hot blast system development: Technology, operations, campaign management, V. van Straaten, E. Engel, Danieli Corus BV, The Netherlands
14:20 One of the largest blast furnaces in India has started operation, E. Capra, Paul Wurth S.A., Luxembourg, P. Ghosh, D. Srivastava, Steel Authority of India Ltd., A. Chatterjee, Larsen & Toubro Ltd., India, A. Bajaj, R. Ghosh, A. Garg, F. Garbugino, M. Bassetti, L. Spadoni, Paul Wurth S.A., Luxembourg, K. Dutta, Larsen & Toubro Ltd., India
14:40 Compact blast furnace technology, plant engineering and modernization, R. van Laar, E. Engel, Danieli Corus BV, The Netherlands

Tuesday, 25 June 2019
14:00 – 15:40 | Room 18 | Session I.01.1
Cokemaking: Coal blending practise; Fundamentals in coke making I
Chair: P. Liszio, KBS Kokereibetriebsgesellschaft Schwelgern GmbH, Germany

14:00 A novel approach to quantify the effect of oxidized high fluidity coal on coke strength after reaction (CSR), K. Ko, J. Lee, J. Seo, S. Shin, K. Kim, Hyundai Steel Co., Ltd., Republic of Korea
14:20 Findings of inter laboratory study on coal dilatation under ISO/TC27 and importance of correcting experimental dilatation results to a reference coal mass, T. Todoschuk, ArcelorMittal Dofasco, Inc., Canada
14:40 Characterization of coal blends using CGA, an optical image analysis system, P. Hapugoda, Commonwealth Scientific and Industrial Research Organisation, Australia
15:00 Coal rheology – a practical approach for industry, T. Todoschuk, ArcelorMittal Dofasco, Inc., Canada
15:20 Characterization of coke surface using topographic and specific surface area measurement techniques, A. Bhattacharyya, Montanuniversität Leoben, Austria
Cokemaking: Latest developments in coke oven plant technology

Chair: M. Grimm, thyssenkrupp Steel Europe AG, Germany

16:00 Control methods to reduce cokes oven pressure variations, J. Schuurmans, DotX Control Solutions B.V., The E. ten Napel, J. Dekker, A. Besseling, P. de Jong, Tata Steel Europe, The Netherlands


16:40 Comparison between industrial and laboratory IGP measurements, M. Schulten, V. Stiskala, M. Grimm, thyssenkrupp Steel Europe AG, Germany

17:00 Reconstruction of Kurashiki No.2 coke oven battery, D. Imai, JFE Steel Corporation, Japan

17:20 Internal gas pressure in coke ovens, T. Rozhkova, CPM Group, France

Blast furnace ironmaking: Injection of auxiliary reductants (coal, oil, gas, plastics) and oxygen

Chair: A. Sormann, K1-MET GmbH, Austria

14:00 Intensifying the PC conversion by means of coke oven gas, A. Babich, J. Simoes, R. Lin, ROGESA Roheisengesellschaft Saar mbH, F. Hippe, D. Senk, RWTH Aachen University, Germany

14:20 Simulation of lance design and combustion behavior of pulverized coal in the blast furnace, R. Santos Ferreira, ArcelorMittal Maizières Research S.A., P. de Seta Cosentino, France, A. Daelman, Belgium, P. Negro, ArcelorMittal, Luxembourg

14:40 PCI upgrades from static to dynamic distribution in dilute phase by Paul Wurth IHI, D. Michels, P. Mahowald, E. Censi, Paul Wurth S.A., Luxembourg, S. Edamura, Y. Ueki, Paul Wurth IHI Co., Ltd., Japan
Tuesday, 25 June 2019
15:40 – 16:40 | Room 17 | Session I.16.1
Blast furnace ironmaking: Fundamentals in blast furnace ironmaking I
Chair: L. Hausemer, Paul Wurth S.A., Luxembourg

15:40 Carburisation and melting behaviour of iron ore pellet bed under nut coke mixed charge conditions, D. Gavel, Y. Yang, R. Boom, J. Sietsma, J. Stel, A. Adema, Tata Steel Europe, C. Kwakernaak, Delft University of Technology, The Netherlands
16:00 Evaluation technique of gas permeability in granulated slag particle bed using softening and melting simulator with micro CT scanning, K. Ohno, S. Natsui, Hokkaido University, S. Sukenaga, Tohoku University, K. Kunitomo, T. Maeda, Kyushu University, Japan
16:20 Reduction of iron ore pellets, sinter and lump ore under simulated blast furnace conditions, A. Heikkilä, H. Bartusch, VDEh-Betriebsforschungsinstitut GmbH, Germany, T. Fabritius, M. Iljana, University of Oulu, Finland

Wednesday, 26 June 2019
9:00 – 10:20 | Room 1 | Session I.16.2
Blast furnace ironmaking: Fundamentals in blast furnace ironmaking II
Chair: H. Bartusch, VDEh-Betriebsforschungsinstitut GmbH, Germany

9:00 Chemistry of alkalis under blast furnace conditions, G. Harp, Harp Process Chemistry Consulting, Germany
9:20 In-burden measurements for investigation of alkali compounds in the blast furnace, A. Spatzker, thyssenkrupp Steel Europe AG, H. Mittelstädt, A. Hirsch, J. Schenk, Montanuniversität Leoben, Austria, U. Jahnsen, R. Deike, University Duisburg-Essen, V. van Outvorst, M. Peters, thyssenkrupp Steel Europe, Germany
9:40 Blast furnace operation: on melting of the ferrous burden and prevention of upsets, M. Geerdes, Geerdes Advies, The Netherlands, P. Warren, Materials Processing Institute, United Kingdom, R. van Opbergen, Danieli Corus BV, O. Lingiardi, Ternium Argentina S.A., Argentina, R. Chaigneau, Rio Tinto Group, The Netherlands
10:00 Danieli Top Charging Unit: operational results at Zaporizhstal and design considerations for different scenarios, E. Tesselaar, E. Engel, Danieli Corus BV, The Netherlands, M. Zampa, Danieli Centro Metallics, Italy
Wednesday, 26 June 2019

9:00 – 10:40 | Room 2 | Session I.25.2
Blast furnace ironmaking: Injection of auxiliary reductants (coal, oil, gas, plastics) and oxygen II
Chair: J. Simoes, AG der Dillinger Hüttenwerke, Germany

9:00 Formation of char by coal injection and its behaviour outside the blast furnace raceway, A. Babich, C. Plancq, O. Ansseau, CRM Group, Belgium, D. Sert, ArcelorMittal Maizières Research S.A., France, H. Ho, J. van der Stel, S. Born, V. Pridhivi, Tata Steel Nederland Technology B.V., The Netherlands, D. Senk, R. Geyer, RWTH Aachen University, Germany

9:40 Improvement in blast furnace operation with co-injection injection of natural gas and PCI, S. Myasoedov, S. Filatov, V. Titov, NLMK, S. Zagainov, L. Gileva, Ural Federal University, Russia, Y. Gordon, Hatch Ltd., Canada

10:00 Reactive pulverized coal injection, R. Schott, Küttnner GmbH & Co. KG, Germany

10:20 Effect of coal properties on combustion behavior in pulverized coal injection, K. Ng, L. Jia, L. Giroux, K. NG, Natural Resources T. Todoschuk, ArcelorMittal Dofasco, Canada

Wednesday, 26 June 2019

9:00 – 10:20 | Room 18 | Session I.01.2
Cokemaking: Coal blending practise; Fundamentals in coke making II
Chair: T. Buergler, voestalpine Stahl GmbH, Austria

9:00 An application of coke microstructure and microtexture to indonesian coal briquette, Y. Chen, China Steel Corporation, Taiwan

9:20 Comprehensive model of coking coal pyrolysis, B. Mertas, Institute for Chemical Processing of Coal, Poland

9:40 Enlargement of the analysis output from a 10-kg carbonization retort, M. Grimm, V. Stiskala, M. Schulten, thyssenkrupp Steel Europe AG, Germany

10:00 Upgrading effect of aromatic amine on coal fluidity and coke strength, H. Otsuka, JFE Steel Corporation, Japan

Wednesday, 26 June 2019

10:20 – 12:00 | Room 19 | Session I.07
Sintering: Fundamentals in sintering and chemical analysis and raw materials testing
Chair: V. Ritz, Studiengesellschaft für Eisenerzaufbereitung GmbH & Co. KG, Germany

Wednesday, 26 June 2019
10:40 – 12:40 | Room 1 | Session I.15
Blast furnace ironmaking: Overview on blast furnace operation
Chair: P. Schmöle, thyssenkrupp Steel Europe AG, Germany

10:40 | Iron making in Russia, D. Tikhonov, DDG Technologies, LLC, A. Tretjak, International Union of Ironmakers, Russia, Y. Gordon, Hatch Ltd., Canada
11:00 | Development of strategy for sustaining, enhancement and cost reduction at Severstal’s primary end, E. Vinogradov, A. Kalko, S. Chikinov, A. Ivashov, D. Balahonov, M. Gurkin, E. Karunova, CherMK, Russia, Y. Gordon, Hatch Ltd., Canada
11:20 | Blast furnace fuels & oxygen consumption mapping, M. Grant, Air Liquide Global Management Services GmbH, Germany, P. Blostein, Air Liquide S.A., France

11:40 | Blast furnace modernisation technologies, R. Harvey, D. Osborne, Primetals Technologies Ltd., United Kingdom
12:00 | Large blast furnace technologies by NIPPON STEEL ENGINEERING, S. Tashima, Nippon Steel & Sumikin Engineering Co., Ltd., Japan
12:20 | Comparison of blast furnace operation modes, H. B. Lüngen, Steel Institute VDEh, P. Schmöle, thyssenkrupp Steel Europe AG, Germany

Wednesday, 26 June 2019
10:40 – 12:40 | Room 22 | Session I.11
Pelletising: Fundamentals, Pellet plant construction and operation
Chair: E. Mousa, Swerim AB, Sweden

10:40 | Importance of green pellet mixture properties – a new approach towards online monitoring and controlling, T. Stefan, S. Lang, Outotec GmbH & Co. KG, Germany
11:00 | Outotec Pelletizing Technology – Addressing today’s challenges in production of high quality steel making feedstock, S. Lang, Outotec GmbH & Co. KG, Germany
11:20 | Iron ore pelletising technology in Sino-steel China, W. Gao, Sinosteel Equipment & Engineering Co., Ltd., China
11:40 | Green ball plasticity – measurement, influences and downstream effects in iron ore pelletising, A. Firth, M. Buntsma, M. Martinez Pacheco, Tata Steel Europe Ltd., The Netherlands; A. Morón Barrios, Universidad Carlos III de Madrid, Spain
12:00 | Improving pellet plant performance and increase capacity, B. Salagundi, Outotec GmbH & Co. KG, Germany
12:20  **Triple Deck Roller Feeder**: A positive impact on pellet production, fire pellets quality and energy savings, S. Beaudin, Metal7 inc., Canada

**Wednesday, 26 June 2019**

**11:00 – 12:00 | Room 18 | Session I.04**

**Cokemaking: Coke plant operation**

Chair: T. Toduschuk, ArcelorMittal Dofasco G.P, Canada

11:00  **New coke making complex in Russia**, A. Filippov, O. Ryazanov, O. Vinogradov, E. Vinogradov, PAO Severstal, Russia, M. Hoffmann, Paul Wurth S.A., Luxembourg, F. Mura, A. Esposito, R. Loddo, Paul Wurth Italia S.p.A., Italy

11:20  **Advanced coke-making process to produce coke with high quality in Germany**, R. Lin, AG der Dillinger Hüttenwerke, Germany

11:40  **First top charging jumbo batteries erected in China designed by Paul Wurth**, S. Tognozzi, L. Qingsheng, Shandong Province Metallurgical Engineering Co., Ltd, M. Bisogno, A. Mariscotti, Paul Wurth Italia S.p.A., Italy

11:40  **Thermal cycling effects in blast furnace copper staves**, H. Ghorbani, M. Al-Dojayli, Hatch Ltd., Canada

12:00  **Fully armoring of row 1 copper staves at BF 5A of ArcelorMittal Eisenhüttenstadt, Germany**, C. Dratner, J. Hunger, T. Freude, ArcelorMittal Eisenhüttenstadt GmbH, F. Böert, KME Germany GmbH & Co. KG, Germany


12:40  **Blast furnace leak detection**, J. Janzen, Hatch Ltd., Canada

**Wednesday, 26 June 2019**

**12:20 – 14:00 | Room 19 | Session I.08**

**Sintering: Sinter plant operation, automation and sinter quality**

Chair: S. Haus, Outotec GmbH & Co. KG, Germany

12:20  **Characterisation of iron ore sinter phases by optical microscopy and Epma**, S. Hapugoda, Commonwealth Scientific and Industrial Research Organisation, Australia

12:40  **Enhancement of yield by improvement of iron ore sinter strength of weak layer in sinter bed**, C. Park, POSCO Co., Ltd., Republic of Korea

13:00  **First installation of a fully automated Sinter Raw Mix Analyzer**, J. Reidetschläger, E. Fehringer, Primetals Technologies Austria GmbH, Austria, D. Seiler, S. Muenkel, Maschinenfabrik Gustav Eirich GmbH & Co KG, Germany, S. Zeiler, D. Zirngast, voestalpine Stahl Donawitz GmbH, Austria
Wednesday, 26 June 2019
13:00 – 15:00 | Room 22 | Session I.13
Pelletising / Briquettes: Pellet qualities and Briquetting
Chair: L. Sundqvist-Öqvist, Swerim AB, Sweden

13:00  Evolution of pellet microstructure during reduction: a comparison between R180 and ISO DR90, G. Laforest, M. Dubé, O. Lacroix, COREM, Canada


13:40  Development of high strength carbon composite briquette(CC-BREX) as a third agglomerate for blast furnace, S. Hota, P. Mathur, A. Reddy, Tata Steel Limited, India

14:00  Swelling of olivine potfurnace pellets – standard tests vs basket samples in the LKAB-Experimental Blast Furnace, EBF, P. Semberg, LKAB AB, J. Wikström, LKAB, Sweden

Wednesday, 26 June 2019
13:40 – 15:00 | Room 1 | Session I.18
Blast furnace ironmaking: Blast furnace process optimization and automation
Chair: R. van Laar, Danieli Corus BV, The Netherlands

13:40  Operational assistance and process support: How to secure know-how and experience regarding special situations in blast furnace ironmaking?, R. van Opbergen, E. Engel, Danieli Corus BV, The Netherlands

14:00  Benefits of big data evaluation from casthouse machines and BF-probes, M. Moser, TMT Tapping Measuring Technology GmbH, Germany


14:40  Major challenges and improvement in process, hot metal production and fuel rate reduction in JSW- blast furnace 2, M. Nagarajan, M. Nagarajan, L. Singh, JSW Steel Ltd, India
Cokemaking: Coke oven gas cleaning, use of coke oven gas and utilization of by-products
Chair: P. Liszio, KBS Kokereibetriebsgesellschaft Schwelgern GmbH, Germany

13:40 Improving the efficiency of sulfur recovery unit using Aspen Plus Simulation, A. Roy, Tata Steel Ltd., India
14:00 Characterization of carbon deposits formed during targeted methane decomposition and their incorporation in the metallurgical coke structure, H. Liszio, P. Liszio, tkSE – Kokereibetriebsgesellschaft Schwelgern GmbH, V. Stiskala, M. Schulten, thyssenkrupp Steel Europe AG, Germany
14:20 Reduction of quinoline insoluble from coal tar produced in coke by-product plant by viscosity modification and centrifugation, V. Chandaliya, Tata Steel Ltd., India

Blast furnace ironmaking: Blast furnace refractories and cooling II
Chair: T. Hauck, VDEh-Betriebsforschungsinstitut GmbH, Germany

14:20 Technological parameters and blast furnace practice to achieve long blast furnace campaign, V. Listopadov, NLMK, N. Izumskiy, AIP (Association of Ion Producers), R. McNally, Saint-Gobain Savoie Réfractaires, France, S. Shalimov, Sojitz Ject Corporation, Russia, Y. Gordon, Hatch Ltd., Canada, G. Matveienko, AIP (Association if Ion Producers), O. Chaika, IFM (Institute of ferrous metals), Ukraine
15:00 Long Life Copper Stave for Blast Furnace Developed by Nippon Steel Engineering, M. Goto, Nippon Steel & Sumikin Engineering Co., Ltd., Japan
15:20 Extending blast furnace hearth life: novel Sialon-bonded refractory material, N. Boumahdi, Saint-Gobain S.A., France
15:40 Advancements in blast furnace cooling technology: redefining stave life, D. Rudge, J. Bolen, D. Rudge, Hatch Ltd., Canada

Sintering: Sinter cooling and waste gas cleaning
Chair: J. Buchwalder, Expertum GmbH, Germany

15:20 New off-gas cleaning system at the POSCO Sintering Plant, S. Jin, POSCO Co., Ltd., Republic of Korea
15:40 Dust emission reduction at sinter-cooler process, C. Polato, E. Izard, M. Moreau, ArcelorMittal Maizières Research S.A., France
16:00 A successful industrial application of selective waste gas recirculation for NOx mitigation without detrimental impact on productivity, L. Beira do Valle, S. Serre, C. Mathy, CRM Group, Belgium, O. Havelange, ArcelorMittal, France
16:20 Optimization of sinter cooler and development of raw material drying process, Y. Imai, M. Nakamoto, M. Yakabe, M. Kawarata, JFE Steel Corporation, Japan
### Thursday, 27 June 2019
#### Room 1 | Session I.20
**Blast furnace ironmaking: Blast furnace relinings and campaign life extension**  
*Chair: C. Dratner, KME Germany GmbH & Co. KG, Germany*

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00</td>
<td>Remarkable advancements in blast furnace hearth lining,</td>
<td>M. Bierod, E. Schnaub, V. Dulz, M. Engelmann, R. Hebel, Paul Wurth Deutschland GmbH, Germany</td>
</tr>
<tr>
<td>10:20</td>
<td>Smart modernization of existing blast furnace with substantial increase of production with limited changes to plant infrastructure: A Paul Wurth experience...,</td>
<td>M. Perato, R. Manoranjan, M. Bassetti, Paul Wurth Italia S.p.A., Italy, N. Kumar, S. Kataria, JSW Steel Ltd., India</td>
</tr>
</tbody>
</table>

### Thursday, 27 June 2019
#### Room 2 | Session I.19.1
**Blast furnace ironmaking: Modern process control techniques and models I**  
*Chair: M. Geerdes, Geerdes Advies, The Netherlands*

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00</td>
<td>Development of longlife blast furnace tuyeres,</td>
<td>J. Adam, VDEh-Betriebsforschungsinstitut GmbH, W. Konrad, C. Neinhuis, Technische Universität Dresden, S. Konietzko, lebronze alloys Germany GmbH – Hundt &amp; Weber, Germany</td>
</tr>
<tr>
<td>9:20</td>
<td>Computerized blast furnace training system,</td>
<td>S. Zagainov, S. Filatov, L. Gileva, Ural Federal University, S. Myasoedov, A. Sorokin, NLMK, Russia, Y. Gordon, Hatch Ltd., Canada</td>
</tr>
<tr>
<td>9:40</td>
<td>Consistent hot metal quality at the blast furnace by machine supported decisions,</td>
<td>T. Hauck, S. Böhnisch, VDEh-Betriebsforschungsinstitut GmbH, C. Hillmann, DK Recycling und Roheisen GmbH, U. Paul, M. Kannappel, R. Klock, thyssenkrupp Steel Europe AG, Germany</td>
</tr>
</tbody>
</table>

### Thursday, 27 June 2019
#### Room 3 | Session I.23
**Blast furnace ironmaking: Blast furnace charging and gas cleaning**  
*Chair: C. Böhm, Primetals Technologies Austria GmbH, Austria*

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00</td>
<td>Soft sensors for blast furnace stack monitoring,</td>
<td>H. Bartusch, VDEh-Betriebsforschungsinstitut GmbH, J. Pethke, T. Mirkovic, Salzgitter Flachstahl GmbH, T. Hauck, Y. Kaymak, VDEh-Betriebsforschungsinstitut GmbH, Germany</td>
</tr>
</tbody>
</table>
Thursday, 27 June 2019
9:00 – 10:00 | Room 21 | Session I.31.1
Direct reduction and smelting reduction I
Chair: P. Dahlmann, Steel Institute VDEh, Germany

9:00 MATMOR – development of an innovative DRI technology, A. Tarafadar, M. N. Dastur & Co. Pvt. Ltd., India
9:40 HBI: The benefits and sourcing of steel's most versatile metallic, V. Chevrier, J. Kopfle, R. Hunter, Midrex Technologies, Inc., United States

Thursday, 27 June 2019
10:40 – 12:20 | Room 21 | Session I.31.2
Direct reduction and smelting reduction II
Chair: R. Schott, Küttner GmbH & Co. KG, Germany

10:40 Various roads to CO₂ reduction with the HIsarna technology, K. Meijer, Tata Steel Europe Ltd., The Netherlands
11:00 Sustainable decrease of CO₂ emissions in the steelmaking industry by means of the ENERGIRON direct reduction technology, D. Pauluzzi, A. Martinis, Danieli & C. Officine Meccaniche S.p.A., Italy
11:20 Improve operation and productivity of your Midrex® plant, R. Millner, H. Ofner, D. Bettinger, J. Rothberger, Primetals Technologies Austria GmbH, Austria
Thursday, 27 June 2019

11:40 MIDREX H₂™: Ultra Low CO₂ Ironmaking in the transition to the hydrogen economy, V. Chevrier, Midrex Technologies, Inc., United States

12:00 LeafIron – an innovative contribution to eliminate CO₂ emissions from steel production, S. Potter, Leaf Iron, Brazil

Thursday, 27 June 2019

11:00 – 12:20 | Room 1 | Session I.21
Blast furnace ironmaking: Blast furnace campaign life extension
Chair: S. Köhler, Paul Wurth S.A., Luxembourg

11:00 Fit for service assessment of aging ironmaking facilities, K. Chomyn, Hatch Ltd., K. Chomyn, M. Al-Dojayli, J. Busser, Hatch Ltd, Canada

11:20 Historical data from long-term blast furnace refractory monitoring for campaign life extension using Acousto Ultrasonic-Echo, A. Sadri, S. Kumar, Y. Gordon, W. Ying, M. Henstock, Hatch Ltd., Canada

11:40 30+ year campaign of IJmuiden Blast Furnace No. 6, F. Kerkhoven, G. Tijhuis, J. Stuurwold, B. Nugteren, Tata Steel Europe Ltd., R. van Laar, Danieli Corus BV, The Netherlands

12:00 Blast furnaces campaign extension at JSW, A. Srinavas Rao, R. Anand, L. Mallikarjun, L. Singh, JSW Steel Ltd., India, M. Henstock, Y. Gordon, A. Sadri, W. Ying, S. Kumar, Hatch Ltd., Canada

Thursday, 27 June 2019

11:00 – 12:00 | Room 2 | Session I.19.2
Blast furnace ironmaking: Modern process control techniques and models II
Chair: H. Bartusch, VDEh-Betriebsforschungsinstitut GmbH, Germany

11:00 Successful deployment of a tuyere leak soft-ensor at USS Blast Furnace No. 14, Y. Ghobara, R. Albanese, J. Grindey, United States Steel Corporation, United States, J. Busser, M. Sukhram, I. Cameron, R. Pula, M. Bodley, Hatch Ltd., Canada

11:20 Raceway instrumentation, C. Plancq, F. Van Loo, O. Ansseau, G. Moreas, CRM Group, Belgium

11:40 Wind rate control amongst blast furnace tuyeres, N. Spirin, O. Onorin, Ural Federal University, A. Polionov, A. Pavlov, PJSC Magnitogorsk Iron and Steel Works, Russia, Y. Gordon, Hatch Ltd., Canada

Thursday, 27 June 2019

11:00 – 12:20 | Room 8 | Session I.32.2
Industry 4.0 in Ironmaking II
Chair: J. Mauhart, voestalpine Stahl GmbH, Austria

11:00 The benefits of integrated decisions over sulphur content along the process chain production of pig iron and steel, E. Marchal, Cassotis Consulting, E. Marchal, F. Silva, G. Martino, Cassotis Consulting and Solutions LTDA, Brazil
Thursday, 27 June 2019
11:20 Advanced BFXpert with artificial intelligence at ROGESA, J. Simoes, AG der Dillinger Hütttenwerke, Germany, A. Agrawal, F. Hansen, Y. Reuter, C. Schockaert, F. Girolidini, P. Bermes, Paul Wurth S.A., Luxembourg, R. Lin, ROGESA, Germany

11:40 Improving production process with digital solutions for iron ore pelletizing, S. Haus, M. Missalla, Outotec Tecnologia Brasil Ltda, Brazil, M. Bergmann, L. Emich, Outotec GmbH & Co. KG, Germany

12:00 Smart and safe – the digital heart of ironmaking, D. Bettinger, H. Fritschek, N. Laister, R. Lamplmayr, M. Lehner, H. Lindbichler, B. Schwarzbauer, D. Ulrich, W. Braunschmid, Primetals Technologies Austria GmbH, Austria

Thursday, 27 June 2019
13:00 – 14:40 | Room 8 | Session I.24
Blast furnace ironmaking: Hot blast stoves and blowers
Chair: J. Curilla, U. S. Steel Košice, Ltd., Slovakia

13:00 Paul Wurth top fired stoves – from paper to industrial implementation, E. Schaub, R. Allmannsdoerfer, M. Bierod, S. Kessler, S. Thaler, Paul Wurth Deutschland GmbH, J. Simoes, AG der Dillinger Hütttenwerke, Germany

13:20 Sequential repair of stove plants considering different stove technologies, R. Allmannsdoerfer, M. Bierod, E. Schaub, Paul Wurth Deutschland GmbH, Germany

13:40 Improved energy efficiency of innovative design of Kalugin top combustion stoves, S. Ivlev, M. Aksyushin, A. Subbotin, Y. Murzin, M. Kalugina, B. Prokofiev, Kalugin JSC, Russia

14:00 Performance and recently orders of top combustion type hot stove with metallic burners, N. Hashimoto, Nippon Steel Engineering Co., Ltd., Japan

14:20 Reducing carbon dioxide through improving operation of hot stove efficiency, S. Kang, POSCO Co., Ltd., Republic of Korea

Thursday, 27 June 2019
13:20 – 14:40 | Room 1 | Session I.29
Direct reduction and smelting reduction: Fundamentals in direct reduction and smelting reduction
Chair: T. Ariyama, Tohoku University, Japan

13:20 Factors influencing the quality of hot briquetted iron, C. Harris, voestalpine Stahl GmbH, Austria, V. Romo, voestalpine Texas LLC, United States, K. Gruber, Montanuniversität Leoben, Austria, E. De Moor, Advanced Steel Processing and Products Research Center -Colorado School of Mines, United States

13:40 Reaction behavior between CO-CO₂ gas mixture and carbon fiber deposited during metal dusting process, K. Nishihiro, T. Maeda, K. Ohno, K. Kunitomo, Kyushu University, Japan

14:00 Size optimization of pellet for DRI process, C.S. Verma, Jindal Steel & Power Ltd., India
14:20 Experimental study of DRI carburization, M. Farahani, J. Barros Lorenzo, ArcelorMittal Global R&D, United States

Thursday, 27 June 2019
13:20 – 14:20 | Room 2 | Session I.19.3
Blast furnace ironmaking: Modern process control techniques and models III
Chair: Y. Gordon, Hatch Ltd., Canada

13:20 Development of a simplified process tool for blast furnace inner conditions mapping, M. Lima, ArcelorMittal Maizières Research S.A., France

13:40 Autonomous operation with artificial intelligence in blast furnace, J. Kim, S. Son, K. Son, S. Choi, POSCO Co., Ltd., Republic of Korea

14:00 Blast furnace heat balances usage to control heat losses, N. Spirin, O. Onorin, Ural Federal University, A. Polinov, A. Pavlov, PJSC Magnitogorsk Iron and Steel Works, Russia, Y. Gordon, Hatch Ltd., Canada

Thursday, 27 June 2019
13:20 – 14:20 | Room 21 | Session I.28
Blast furnace ironmaking: Use of DRI/ HBI in blast furnace, injection of auxiliary reductions
Chair: R.-J. Gerlach, Venator Germany GmbH, Germany

13:20 Effect of H₂-rich carbonaceous materials' ash on physico-chemical properties of raceway slag and coke reactivity, H. Ahmed, Lulea University of Technology, Sweden


14:00 Use of plasma torches to overcome top temperature limits when adding DRI or HBI to blast furnaces, J. Bolen, Hatch Ltd., Canada
• Oxygen Steelmaking
• Electric Steelmaking
• Continuous Casting, Near-net Shape Casting and Ingot Casting
• Industry 4.0 in Steelmaking
### Tuesday: 25 June

<table>
<thead>
<tr>
<th>Time</th>
<th>Room 1</th>
<th>Room 2</th>
<th>Room 14</th>
<th>Room 15</th>
<th>Room 16</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:00</td>
<td>Session 0.1 Opening Session</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11:00</td>
<td>11:00 – 11:20 Coffee break</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:00</td>
<td>11:30 – 13:10 Lunch</td>
<td>11:30 – 13:10 Lunch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13:00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15:00</td>
<td>14:00 – 15:40 Coffee break</td>
<td>14:00 – 15:20 Coffee break</td>
<td>14:00 – 15:40 Coffee break</td>
<td>14:00 – 15:40 Coffee break</td>
<td>14:00 – 15:20 Coffee break</td>
</tr>
<tr>
<td>17:00</td>
<td>16:00 – 17:40</td>
<td>16:00 – 17:40</td>
<td>16:00 – 17:40</td>
<td>16:00 – 17:40</td>
<td>16:00 – 17:40</td>
</tr>
<tr>
<td>18:00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Wednesday: 26 June

<table>
<thead>
<tr>
<th>Time</th>
<th>Room 12</th>
<th>Room 16</th>
<th>Room 17</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00</td>
<td>Session S.35.1 Industry 4.0 in Steelmaking I</td>
<td>Session S.05.1 Oxygen steelmaking: Ladle metallurgy I</td>
<td>Session S.25 Casting: Quality control and special technologies for high performance steels 9:00 – 11:00</td>
</tr>
<tr>
<td>13:40</td>
<td>Session S.05.2 Oxygen steelmaking: Ladle metallurgy II</td>
<td>Session S.21.2 Casting: Mould lubrication, performance and initial solidification II 13:40 – 14:40</td>
<td></td>
</tr>
<tr>
<td>16:00</td>
<td>Session S.33 Casting: Remelting</td>
<td>Session S.20 Casting: Continuous casting technology 16:00 – 17:20</td>
<td>16:00 – 17:20</td>
</tr>
<tr>
<td>17:00</td>
<td>16:00 – 17:20</td>
<td>16:00 – 17:20</td>
<td>15:20 – 17:20</td>
</tr>
</tbody>
</table>

**Evening Event MS RheinEnergie**
<table>
<thead>
<tr>
<th>Time</th>
<th>Room 20</th>
<th>Room 21</th>
<th>Room 14</th>
<th>Room 15</th>
<th>Room 16</th>
<th>Room 17</th>
<th>Room 20</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:20 – 11:40</td>
<td>Session S.26</td>
<td>Casting: Process development and optimization</td>
<td>9:00 – 10:40</td>
<td>Session S.13</td>
<td>Electric steelmaking: metallurgy and operation of electric arc furnaces and new plants</td>
<td>9:00 – 10:20</td>
<td>Coffee break</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lunch</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lunch</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13:40 – 15:40</td>
<td>Session S.19</td>
<td>Casting: Tundish lining &amp; flow controls</td>
<td>11:00 – 12:40</td>
<td>Session S.12.1</td>
<td>Electric steelmaking: Process control, automation and modelling</td>
<td>13:00 – 15:00</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coffee break</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15:30 – 17:00 Farewell event, CCD South, First Floor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The complete program on your mobile, just scan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
14:00 – 15:00 | Room 1 | Session S.01
Oxygen steelmaking: Hot metal pretreatment
Chair: C. Chigwedu, HT-PEACS LLC, United States

14:00  Effect of graphite on hot metal desulphurisation, F. Schrama, E. Beunder, H. Visser, Tata Steel Europe Ltd., R. Boom, J. Sietsma, Y. Yang, TU Delft, The Netherlands

14:20  Energy efficient steel production with the Primary Energy Melter (PEM), C. Thiede, I. Infante, ArcelorMittal Belgium NV, Belgium, P. Starke, J. Bader, A. Frankenberger, SMS group GmbH, Germany

14:40  Successful start-up of 1st movable KR in India at JSW steel Vijayanagar works, M. Nawafune, Nippon Steel & Sumikin Engineering Co., Ltd., Japan

14:00 – 15:40 | Room 2 | Session S.07.1
Oxygen steelmaking: Automation and on-line process analyses I
Chair: M. Schlautmann, VDEh-Betriebsforschungsinstitut GmbH, Germany

14:00  A customizable robotic cell for maintaining the ladle sliding gate, V. Colla, Scuola Superiore Sant’Anna, M. Vezzola, BM S.p.A., Italy

14:20  New automation concept for operation of a BOF steelmaking process, J. Thomasberger, J. Gebert, P. Pietzka, SMS group GmbH, Germany

14:40  In situ continuous measurement of melt temperature for advanced control of liquid steelmaking processes, T. Lamp, B. Kleimt, T. Kordel, VDEh-Betriebsforschungsinstitut GmbH, M. Potter, Minkon GmbH, Poland, S. Petry, thyssenkrupp Steel Europe AG, Germany

15:00  Direct Tapping Model based on artificial neural network, M. Antônio Viana Júnior, Ternium Brasil Ltda., Brazil

15:20  The Efficient Control of the BOF Process Under Conditions of Permanent Changing of Technological Parameters, A. Kharchenko, Zaporizhzhya National University, Ukraine, R. Sinyakov, Ming Xing Technology Company, China

Tuesday, 25 June 2019
14:00 – 15:20 | Room 14 | Session S.09
Oxygen steelmaking: Slag treatment
Chair: P. Schmieding, Steel Institute VDEh, Germany

14:00  Digitalization drives performance of next generation slag retention system, B. Voraberger, G. Wimmer, P. Oberhumer, S. Ollila, T. Palovaara, SSAB Europe, Finland, J. Rosner, Primetals Technologies Austria GmbH, Austria

14:20  Modeling on secondary refining process of steel, D. You, Montanuniversität Leoben, Austria


15:20 Mathematical modelling of the effect of reagent particle size distribution on the efficiency of hot metal desulphurisation, V. Visuri, P. Sulasalmi, T. Vuolio, University of Oulu, T. Paananen, SSAB Europe, Finland, T. Haas, H. Pfeifer, RWTH Aachen University, Germany, T. Fabritius, University of Oulu, Finland

Tuesday, 25 June 2019
14:00 – 15:40 | Room 15 | Session S.04
Oxygen steelmaking: Fundamentals, Converter charge materials and their preparation
Chair: D. Schöne, AG der Dillinger Hüttenwerke, Germany

14:00 Value creation of dolime compared to MgO alternatives for BOF application, M. Nispel, E. Perrin, Lhoist Recherche et Developpement S.A., Belgium

14:20 The new highly efficient primary melter CONPRO, A. Frankenberger, SMS group GmbH, Germany

14:40 Evaluation of mixing and mass transfer at Ternium Brazil’s BOF through cold model experiments, M. Ribeiro, UFMG/ D. Carvalho, J. Schenk, Montanuniversität Leoben, Austria, B. T. Maia, Lumar Metals, R. S. Salgado, Ternium Brasil Ltda., D. C.O. Silveira, UFMG, Brazil

15:00 Material monitoring by acoustic fingerprint analysis, A. Rohrhofer, F. Hartl, A. Husakovic, A. Mayrhofer, Primetals Technologies Austria GmbH, Austria

Tuesday, 25 June 2019
14:00 – 15:20 | Room 16 | Session S.10
Electric steelmaking: Equipment
Chair: R. Vikman, Jernkontoret, Sweden

14:00 Increasing the safety and reliability of the EAF: Installation of the EAF roof designed and manufactured with Spray-Cooled™ technology, M. Abel, tripleS GbR, Germany, L. Wilson, S. Ferguson, Systems Spray-Cooled, Inc., United States, F. Boman, Ovako Sweden AB, Sweden

14:20 Development of burner and injector systems for the steel and non-ferrous metals industry, E. Islamoglu, M. Niekamp, SMS group GmbH, Germany

14:40 Development of pulverized coal burners for electric arc furnace, Y. Miwa, JFE Steel Corporation, Japan

15:00 Development and operation experience of HTT Oxymo TM burner / oxygen injector with moving flame and moving supersonic oxygen jet in two modern electric arc furnaces, J. Brhel, HTT Engineering spol. s r.o., Czech Republic, S. Lui, A. Viotto, Ferriere Nord S.p.A, Italy, M. Teuber, M. Fennert, ESF Elbe-Stahlwerke Feralpi GmbH, Germany
Tuesday, 25 June 2019
15:10 – 16:10 | Room 1 | Session S.02.1
Oxygen steelmaking: Current status and new developments in converter technology and shopfloor management I
Chair: J. Schlüter, SMS Mevac GmbH, Germany

15:10 Slag splashing: Proposal of blow parameters equationing, B. Totti Maia, Lumar Metals, Brazil
15:30 Danieli Converter Technology: Joint know-how creating unique opportunities, G. Staudinger, M. Skorianz, U. Bezerra de Oliveira, E. Engel, Danieli Corus BV, The Netherlands
15:50 Oxygen lance – multiple functions during tap to tap, B. Totti Maia, Lumar Metals, Brazil

Tuesday, 25 June 2019
16:00 – 17:40 | Room 14 | Session S.06
Oxygen steelmaking: Plant operation experiences
Chair: J. Kempken, SMS group GmbH, Germany

16:00 The 5 mtpy Project for Ternium Brazil BOF – "Challenges & Results", H. Gomes, D. Carvalho, L. Demuner, H. Castro, M. Viana, H. Gomes, Ternium Brasil Ltda., Brazil
16:20 Combined development of high performing ladle slide gate refractory and new generation ladle slide gate mechanism to maximize benefits to customers, S. Sen, Vesuvius plc, United States
16:40 Influence on cleanness level during the ladle opening with immersed shroud in liquid steel for one-strand tundish during continuous casting process, M. Alharbi, Hadeed Pvt., Ltd., Saudi Arabia
17:00 BOF gas cleaning system upgrades for increased efficiency and off-gas quality, M. Meyn, R. Herold, P. Klut, E. Engel, Danieli Corus BV, The Netherlands

16:45 Operation technology – process analytics across the steel lifecycle to improve performance, A. Adak, A. Mukherjee, A. Das, M. N. Dastur & Co. Pvt. Ltd., India
17:05 Sublance improvements at Ternium Brazil, H. Gomes, D. Carvalho, Ternium Brasil Ltda., P. Sasso, F. Cipriani, Ecil Met Tec/Vesuvius, R. Salgado, P. R. Neves, G. P. Marques, Ternium Brasil Ltda., D. Soares, Ecil Met Tec/Vesuvius, Brazil

Tuesday, 25 June 2019
16:00 – 17:20 | Room 15 | Session S.11
Electric steelmaking: Current status and new developments in EAF technology
Chair: M. Abel, tripleS GbR, Germany

16:40  ILTEC – Revolutionary and safe cooling solution for the iron and steel industry, M. Hanel, Mettop GmbH, Austria
17:00  Integrated EAF safety concept of Badische Group, R. Schweikle, J. Blank, Badische Stahl-Engineering GmbH, M. Breithaupt, A. Haferkorn, Badische Stahlwerke GmbH, Germany

Tuesday, 25 June 2019
16:40 – 17:40 | Room 1 | Session S.02.2
Oxygen steelmaking: Current status and new developments in converter technology and shopfloor management II
Chair: F. Ahrenhold, Tata Steel Europe Ltd., The Netherlands

16:40  Vacuum converter provides superb stainless steel and ferroalloy refining power for highly demanding applications, T. Kleier, U. Thiedemann, M. Paluszak, SMS group GmbH, Germany
17:00  Connecting lean principles, operational and leadership excellence in the steel industry, J. Schmidt, T. Münzhardt, V. Hillen, I. Knopp, T. Brand, thyssenkrupp Steel Europe AG, Germany

17:20  Slagless Clean Up® solution to reduce tap to tap time, B. Totti Maia, Lumar Metals, Brazil

Wednesday, 26 June 2019
9:00 – 11:00 | Room 12 | Session S.35.1
Industry 4.0 in Steelmaking I
Chair: M. Barna, Johannes Kepler University Linz, Austria

9:00  A smart measuring system for intelligent data acquisition in steel plants, A. Stuhlsatz, SMS group GmbH, Germany

9:20  Closing the loop of digitalization: From data generation to optimization of maintenance and operations in the metals industry, M. Bergmann, A. Olck, Bilfinger SE, F. Mateja, Bilfinger Digital Next GmbH, Germany


10:00  Machine learning applications for steel production process optimization, G. Bavestrelli, Tenova S.p.A., Italy

10:20  Industry 4.0 applications in continuous casting, S. Feldhaus, B. Kündig, G. Michelon, SMS Innse S.p.A., Italy, P. Egge, SMS Concast AG, Switzerland

10:40  High-temperature equipment ing at voestalpine and Dillinger, A. Rohrhofer, S. Thazhath Johnce, Primetals Technologies Austria GmbH, Austria

Wednesday, 26 June 2019
9:00 – 10:40 | Room 16 | Session S.05.1
Oxygen steelmaking: Ladle metallurgy I
Chair: H. Lachmund, AG der Dillinger Hüttenwerke, Germany

9:00  An innovative technology for calcium treatment, A. Visser, A. Landström, L. Gustavsson, M. Andersson, SSAB AB, Sweden, W. Gross, J. Bezler, AlzChem Trostberg GmbH, Germany

9:20  Tata Steel continues to increase production of IF grades at Jamshedpur, as the duplex RH degasser passes two year operational milestone, S. Sinha, Tata Steel Ltd., M. Whitehead, SMS Mevac GmbH, Germany, A. Kumar, R. Srivastava, S. Kumar Singh, A. Khullar, Tata Steel Ltd., India

9:40  Monitoring and control of adequate gas stirring of ladles in secondary metallurgy, H. Köchner, B. Glaser, KTH Royal Institute of Technology, Sweden

10:00  The role of secondary metallurgy in the automated steel plant of the future: higher safety standard and improved steel quality, A. Pezza, Primetals Technologies Germany GmbH, Germany, J. Apfel, Primetals Technologies Austria GmbH, Austria

10:20  Combustion performance of nozzles with multiple gas orifices in large ladles for temperature uniformity, F. Yuan, University of Science and Technology Beijing, China
### Wednesday, 26 June 2019

#### Room 17 | Session S.25

**Casting: Quality control and special technologies for high performance steels**

Chair: K. Meder, AG der Dillinger Hüttenwerke, Germany

**9:00**  
*High precious phase diagrams – a roadmap for a successful casting processing,* P. Presoly, Montanuniversität Leoben, Austria

**9:20**  
*New developments of indicators in the algorithms to detect defects automatically on the slabs by utilising images taken from the hot slabs on line during continuous casting,* P. Hooli, Sapotech Oy, Finland

**9:40**  
*A major step forward in improving internal slab quality: development and first implementation of the SMART Single Roll DynaGap (SRD) Segment at Ternium Brasil,* V. Cunha Aranda, Ternium Brasil Ltda., P. Pennerstorfer, D. Burzic, Primetals Technologies Austria GmbH, Austria, L. Martins Demuner, F. Lourenço, V. Cunha Aranda, G. Romeu Trindade dos Santos, Ternium Brasil, Brazil

**10:00**  
*Evaluation of internal slab quality by an advanced ultrasonic testing system,* S. Rieß, thyssenkrupp Steel Europe AG, H. Herrmann, S. Pudovikov, U. Rabe, Fraunhofer-Institut für Zerstörungsfreie Prüfverfahren IZFP, S. Petry, W. Weber, thyssenkrupp Steel Europe AG, Germany

#### Room 21 | Session S.13

**Electric steelmaking: matallurgy and operation of electric arc furnaces and new plants**

Chair: T. Griessacher, Stahl- und Walzwerk Marienhütte GmbH, Austria

**9:00**  
*Modifying the EAF voltage tap profile for lowering electrode tip consumption and increased energy efficiency,* M. Aula, T. Fabritius, M. Jokinen, V. Visuri, University of Oulu, N. Hyttinen, Outokumpu Stainless Oy, T. Veijola, Luxmet Oy, Finland

**9:20**  

**9:40**  
*Comparative study and computer analysis of slag foaming in electric arc furnaces,* B. Totti Maia, Lumar Metals, T. Durante, J. Oliveira, A. Berger, Instituto Federal do Espírito Santo, Brazil, T. Avelar, RHI Magnesita GmbH, Germany

**10:00**  
*Development of melting process by optimizing the blowing pattern in the electric arc furnace,* M. Tseng, Dragon Steel Corporation, China

**10:20**  
*Production of NO and GO electrical steels at Big River Steel,* J. Kempken, SMS group GmbH, T. Eichert, J. Schlüter, SMS Mevac GmbH, Germany, T. Hill, D. Hennessy, Big River Steel, A. Beasley, SMS group GmbH, United States, J. Youngblood, R. Garrison, P. Padlan, Big River Steel, United States
Wednesday, 26 June

10:20 – 11:40 | Room 20 | Session S.26
Casting: Process development and optimization
Chair: P. Kaushik, ArcelorMittal Global R&D, United States

10:20 Thermodynamic modeling of refractory/mold slag/steel interactions concerning slag crawling,
E. Moosavi-Khoonsari, E. Zinngrebe, S. van der Laan,
R. Kalter, F. Mensonides, Tata Steel Europe Ltd.,
The Netherlands

10:40 Prevention of transverse corner cracks in continuous casting steel slabs by structural modification of secondary cooling nozzles,
E. Lee, S. Lim, T. Park, W. Cho,
Hyundai Steel Co., Ltd., Republic of Korea

11:00 Breakout prevention for billets and blooms through contactless mould thermal mapping: A new tool for metallurgists, quality control and productivity improvement,
S. Miani, G. Schiavon, S. Miani, S. Spagnul,
Ergolines Lab s.r.l., Italy

11:20 Secondary cooling in continuous casting: heat transfer measurement – comparison of different methods,
M. Javurek, Johannes Kepler University Linz, A. Mittermair,
Primetals Technologies Austria GmbH, Austria

11:20 Industry 4.0 – the evolution of intelligent EAF steelmaking,
D. Zuliani, Tenova Goodfellow Inc., Canada

11:40 Advanced service team: a new strategic partner on total asset management,
A. Viviani, Danieli & C. Officine Meccaniche S.p.A., E. Brusini, Danielli, Italy

12:00 m.connect – enabling digital services,
G. Hohenbichler, M. Sattler, A. Altendorfer, Primetals Technologies Austria GmbH, Austria,
M. Jerez, Primetals Technologies Germany GmbH, Germany,
E. Mikk, Primetals Technologies Austria GmbH, Austria

12:20 Technologies 4.0 applied to beam blank continuous casting machines,
G. Maccani, BMGroupUSA Corp., United States

Wednesday, 26 June

11:20 – 12:40 | Room 12 | Session S.35.3
Industry 4.0 in Steelmaking III
Chair: M. Schlautmann, VDEh-Betriebsforschungsinstitut GmbH, Germany

11:20 Consequent secondary cooling system optimisation results in productivity increase at TATA Steel Jamshedpur LD2 slab casters,
R. Wolff, Lechler GmbH, Germany,
A. Khullar, H. Shah, V. Mishra, R. Singh, Tata Steel Ltd.,
S. Chacko, Lechler India Private Limited, India
Wednesday, 26 June 2019
11:20 – 13:00 | Room 21 | Session S.31.1
Casting: Product quality (surface defects, internal quality) I
Chair: B. Larsson, Jernkontoret, Sweden

Wednesday, 26 June 2019
11:40 Modernization of six-strands billet caster at SIDENOR Basauri, U. Zanelli, Sarralle Equipos, Italy, D. Mier, Sidenor S.A./Investigación y Desarrollo, Spain
12:00 Development of the thickest cc slab caster and its operational results, K. Oh, POSCO Co., Ltd., Republic of Korea
12:20 Achieving highest quality levels on slab casters at Dillinger, K. Meder, D. Schönê, O. Bode, R. Bruckhaus, AG der Dillinger Hüttenwerke, Germany

Wednesday, 26 June 2019
11:20 – 12:40 | Room 17 | Session S.21.1
Casting: Mould lubrication, performance and initial solidification I
Chair: K. Kortzak, AG der Dillinger Hüttenwerke, Germany

11:20 Fluorine-free casting fluxes, an overview, H. Tavernier, Imerys Metalcasting France S.A.R.L., France, K. Schulz, Imerys Metalcasting Germany GmbH, Germany, M. Pereira, Imerys Steelcasting do Brasil Ltda, Brazil
11:40 PROIL™: Value Innovation for Mid American Steel & Wire Inc., A. Giacobbe, RHI Magnesita GmbH, Italy
12:00 Heat transfer control through dispersed metallic particles in glassy mold flux film with continuous steel casting, S. Hyun, J. Cho, Graduate Institute of Ferrous Technology, Pohang University of Science and Technology, Republic of Korea
12:20 Hybridization of lime for use in granulated mold fluxes, M. Alloni, Prosimet S.p.A., Italy
Wednesday, 26 June 2019
13:30 – 14:30 | Room 21 | Session S.31.2
Casting: Product quality (surface defects, internal quality) II
Chair: B. Larsson, Jernkontoret, Sweden

13:30 From slab to tinplate – metallurgical and process engineering requirements and measures to ensure an excellent degree of purity for packaging steel, C. Schwanke, W. Schulte, thyssenkrupp Steel Europe AG, S. Schiester, thyssenkrupp Rasselstein GmbH, S. Karrasch, C. Toulouse, A. Ploch, C. Schwanke, thyssenkrupp Steel Europe AG, Germany

13:50 Comparison and utilization of evaluation method for internal quality of slab, W. Choi, POSCO Co., Ltd., Republic of Korea

14:10 Improvement of hot ductility of low carbon alloy steel by thermal history, S-H. Kwon, J. Lee, Y. Heo, C. Yim, Graduate Institute of Ferrous Technology, Pohang University of Science and Technology, Repulic of Korea, S. Moon, J. Min, POSCO Co., Ltd, Republic of Korea, D. Kim, Dong-a University, Republic of Korea

Wednesday, 26 June 2019
13:40 – 14:40 | Room 17 | Session S.21.2
Casting: Mould lubrication, performance and initial solidification II
Chair: M. Alharbi, SABIC, Saudi Arabia

13:40 Conversion of slab casting mould to Bragg grating optical fibers, E. Castiaux, EBDS Engineering S.p.r.l., Belgium
14:00 Casting oil selection, effect on the open stream continous casting process, J. Linazasoro, Quaker Chemical S.A., Spain
14:20 Reduction of start-of-cast breakouts at the Direct Sheet Plant at Tata Steel in Ijmuiden, R. Kalter, Tata Steel Europe Ltd., The Netherlands

Wednesday, 26 June 2019
13:40 – 15:20 | Room 16 | Session S.05.2
Oxygen steelmaking: Ladle metallurgy II
Chair: C. Chigwedu, HT-PEACS LLC, United States

13:40 Desulphurization with ladle furnace slag, S. Panda, R. Kooter, A. Overbosch, E. Harbers, Tata Steel Europe Ltd., The Netherlands
14:00 Simultaneous treatment in the RH-twin vacuum degasser, B. Cerchiari, H. Segundo, F. Alexandre, P. Wojnar, L. Demuner, Ternium Brasil Ltda, Brazil
14:20 The first production results of a new ladle-furnace in Oxygen Steel Plant No.2, A. Ponamarenko, T. Brand, M. Löcken, M. Arns, S. Meiß, B. Dolle, thyssenkrupp Steel Europe AG, Germany
Wednesday, 26 June 2019

14:40 Optimization of AISI 443 stainless steel cleanliness during secondary steelmaking process using Factsage Thermo-dynamic, J. Li, University of Science and Technology Beijing, China

15:00 Study of formation behavior of CaO-Al2O3 inclusions in steel melts during an LF process, T. Yoshioka, T. Ideguchi, A. Karasev, Y. Ohba, Sanyo Special Steel Co., Ltd., Japan, P. Jönsson, KTH Royal Institute of Technology, Sweden

Wednesday, 26 June 2019

13:40 – 15:40 | Room 20 | Session S.19
Casting: tundish lining & flow controls
Chair: G. Nilson, Jernkontoret, Sweden

13:40 Level control – improvement at first sight, R. Wilmes, R. Heidemann, T. Wrobel, L. Schaps, SMS group GmbH, Germany

13:40 New corrosion test method for purging refractory ceramic, Q. Robinson, M. Snyder, P. Hunger, Vesuvius plc, United States

14:00 Analysis of fluid flow of liquid steel through clogged nozzles: thermodynamic analyses and flow simulations, R. Morales, University of Toronto, Canada

14:00 Optimizing tundish lining refractory by steel grade in continuous casting, Y. Park, T. Ha, W. Ki, S. Ryu, Hyundai Steel Co., Ltd., Republic of Korea

15:00 Microstructures of mould slag crawling at the SEN during thin slab casting, E. Zinngrebe, M. van Wijngaarden, F. Mensonides, R. Kalter, S. van der Laan, M. Rijnders, Tata Steel Europe, The Netherlands

15:20 Long steel casting with flexible system for open and shrouded stream, F. Fabri, Vesuvius plc, Brazil

Wednesday, 26 June 2019

14:00 – 15:20 | Room 12 | Session S.35.2
Industry 4.0 in Steelmaking II
Chair: D. Bettinger, Primetals Technologies Austria GmbH, Austria

14:00 Assessing the Bottleneck of a Steel Plant by means of Plant Simulation, S. Deng, University of Science and Technology Beijing, China

14:20 Optimization of maintenance costs through modular concepts, D. Strömme, A. Piccoli, Y. Olsen, Bilfinger SE, Germany

14:40 Next level maintenance services in the age of Industry 4.0, K. Frauenhuber, L. Reiter, F. Hollensteiner, Primetals Technologies China Ltd., China, M. Weinzierl, K. Mertens, Montanuniversität Leoben, K. Purkarthofer, Primetals Technologies Austria GmbH, Austria

15:00 Using interpretable machine learning to predict the electrical energy consumption of an electric arc furnace, L. Carlsson, P. Jönsson, P. Samuelsson, KTH Royal Institute of Technology, Sweden
Wednesday, 26 June 2019
15:20 – 17:20 | Room 17 | Session S.20
Casting: Continuous casting technology
Chair: H. Lachmund, AG der Dillinger Hüttenwerke, Germany

15:20 The sophisticated SMS group compact mold, L. Fischer, SMS group GmbH, Germany
15:40 Latest achievements in long product casting, D. Burzic, M. Hadler, F. Wimmer, Primetals Technologies Austria GmbH, Austria
16:00 Modernization of a secondary cooling system using a process model for quality improvement, R. Wilmes, SMS group GmbH, Germany
16:20 Construction design optimization of the secondary cooling zone for continuous casting, J. Stetina, Brno University of Technology, Czech Republic
16:40 CC plant concepts, L. Fischer, SMS group GmbH, Germany
17:00 Energy efficiency in secondary cooling – new generation of hydraulic nozzles with increased water turn down ratio and cooling efficiency for slab casting processes, R. Wolff, R. Conte, Danieli & C. Officine Meccaniche S.p.A., A. Carboni, Danieli Davy Distingtion, Italy, J. Frick, Lechler GmbH, Germany

Wednesday, 26 June 2019
15:20 – 17:20 | Room 21 | Session S.15
Electric steelmaking: Energy efficiency and energy recovery, ladle metallurgy
Chair: B. Kleimt, VDEh-Betriebsforschungsinstitut GmbH, Germany

15:40 First results of Q-ONE, innovative technology applied in the electric energy transfer to Electric Arc Furnace., A. Mordeglia, Danieli Automation S.p.A., M. Bianco, Danieli, Italy
16:00 Consterrer™ Technology: Getting the most out of the electric steelmaking process, P. Stagnoli, A. Grasselli, Tenova S.p.A., Italy
16:20 Mixing, ladle eye and shear stresses with a dual plug configuration using identical and non-identical bottom gas injection conditions in ladles, A. Conejo, University of Science and Technology Beijing, China
16:40 Quantum goes brownfield: How to integrate shaft furnace in existing plants, H. Beile, J. Apfel, Primetals Technologies Germany GmbH, Germany
17:00 Research on inclusion control in high grade gear steel, Z. Chen, G. Yang, X. Liu, Baoshan Iron & Steel Co., Ltd., China
### Thursday, 27 June 2019
#### 16:00 – 17:20 | Room 16 | Session S.33
Casting: Remelting
Chair: P. Kaushik, ArcelorMittal Global R&D, United States

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16:00</td>
<td>Transient simulation of the vacuum arc remelting process</td>
<td>M. Eickhoff, RWTH Aachen University, Germany</td>
</tr>
<tr>
<td>16:20</td>
<td>The-state-of-the-art of electroslag remelting technology</td>
<td>A. Mordeglia, Danieli Automation S.p.A., M. Bianco, Danieli, Italy</td>
</tr>
<tr>
<td>16:40</td>
<td>The effect of Interdendritic Segregation on Hot Ductility Behavior of Medium Carbon Steels</td>
<td>J. Jeong, B. Kim, S. Kwon, J. Lee, Y. Heo, C. Yim, Graduate Institute of Ferrous Technology, Pohang University of Science and Technology, Republic of Korea, M. Kang, POSCO Research Center, Republic of Korea, D. Kim, Dong-a University, Republic of Korea</td>
</tr>
<tr>
<td>17:00</td>
<td>New generation of the ESR (Electro Slag Remelting) furnace</td>
<td>C. Demirci, R. El-Rabati, C. Wissen, J. Schlüter, SMS Mevac GmbH, M. Schwenk, B. Friedrich, RWTH Aachen University, Germany</td>
</tr>
</tbody>
</table>

### Thursday, 27 June 2019
#### 9:00 – 10:20 | Room 14 | Session S.23.1
Casting: Control of solidification structures and management of defects I
Chair: H. Schliephake, Georgsmarienhütte GmbH, Germany

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00</td>
<td>DynaJet Flex secondary cooling for reduced corner cracks</td>
<td>P. Pennerstorfer, J. Park, S. Lim, Hyundai Steel Co., Ltd., Republic of Korea, A. Mittermair, Primetals Technologies Austria GmbH, Austria</td>
</tr>
<tr>
<td>9:20</td>
<td>Experimental study of the effect of mechanical vibration on steel ingot solidification</td>
<td>D. Senk, RWTH Aachen University, Germany</td>
</tr>
<tr>
<td>9:40</td>
<td>Effect of cooling strategy on hot ductility of micro-alloyed steels during continuous casting</td>
<td>H. Ibrahim, H. Palkowski, Technische Universität Clausthal, Germany</td>
</tr>
</tbody>
</table>

### Thursday, 27 June 2019
#### 9:00 – 10:40 | Room 15 | Session S.12.1
Electric steelmaking: Process control, automation and modelling I
Chair: K. Krüger, Max Aicher GmbH & Co. KG, Germany

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00</td>
<td>AMI SmartFurnace Off Gas Analysis for EAF optimization</td>
<td>F. Martinez, G. Fernandez, AMI Automation, Mexico</td>
</tr>
<tr>
<td>9:20</td>
<td>Multivariate statistical analysis of the scrap composition in electric steelmaking</td>
<td>M. Rojas Sánchez, RWTH Aachen University, Germany</td>
</tr>
<tr>
<td>9:40</td>
<td>Tenova Imelshop: the Integrated process manager for the coordination of the whole melt shops production line</td>
<td>D. Masoero, A. Grasselli, Tenova S.p.A., Italy</td>
</tr>
<tr>
<td>10:00</td>
<td>Computational Fluid Dynamics (CFD) analysis of capture efficiency of secondary off-gas in an electric arc furnace (EAF) shop</td>
<td>A. Senguttuvan, Dastur Innovation Labs, S. Chatterjee, M. N. Dastur &amp; Co. Pvt. Ltd., India</td>
</tr>
</tbody>
</table>

### Thursday, 27 June 2019
#### 9:00 – 10:20 | Room 15 | Session S.33
Casting: Remelting
Chair: P. Kaushik, ArcelorMittal Global R&D, United States

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16:00</td>
<td>Transient simulation of the vacuum arc remelting process</td>
<td>M. Eickhoff, RWTH Aachen University, Germany</td>
</tr>
<tr>
<td>16:20</td>
<td>The-state-of-the-art of electroslag remelting technology</td>
<td>A. Mordeglia, Danieli Automation S.p.A., M. Bianco, Danieli, Italy</td>
</tr>
<tr>
<td>16:40</td>
<td>The effect of Interdendritic Segregation on Hot Ductility Behavior of Medium Carbon Steels</td>
<td>J. Jeong, B. Kim, S. Kwon, J. Lee, Y. Heo, C. Yim, Graduate Institute of Ferrous Technology, Pohang University of Science and Technology, Republic of Korea, M. Kang, POSCO Research Center, Republic of Korea, D. Kim, Dong-a University, Republic of Korea</td>
</tr>
<tr>
<td>17:00</td>
<td>New generation of the ESR (Electro Slag Remelting) furnace</td>
<td>C. Demirci, R. El-Rabati, C. Wissen, J. Schlüter, SMS Mevac GmbH, M. Schwenk, B. Friedrich, RWTH Aachen University, Germany</td>
</tr>
</tbody>
</table>

### Thursday, 27 June 2019
#### 9:00 – 10:40 | Room 15 | Session S.12.1
Electric steelmaking: Process control, automation and modelling I
Chair: K. Krüger, Max Aicher GmbH & Co. KG, Germany

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00</td>
<td>AMI SmartFurnace Off Gas Analysis for EAF optimization</td>
<td>F. Martinez, G. Fernandez, AMI Automation, Mexico</td>
</tr>
<tr>
<td>9:20</td>
<td>Multivariate statistical analysis of the scrap composition in electric steelmaking</td>
<td>M. Rojas Sánchez, RWTH Aachen University, Germany</td>
</tr>
<tr>
<td>9:40</td>
<td>Tenova Imelshop: the Integrated process manager for the coordination of the whole melt shops production line</td>
<td>D. Masoero, A. Grasselli, Tenova S.p.A., Italy</td>
</tr>
<tr>
<td>10:00</td>
<td>Computational Fluid Dynamics (CFD) analysis of capture efficiency of secondary off-gas in an electric arc furnace (EAF) shop</td>
<td>A. Senguttuvan, Dastur Innovation Labs, S. Chatterjee, M. N. Dastur &amp; Co. Pvt. Ltd., India</td>
</tr>
</tbody>
</table>

### Thursday, 27 June 2019
#### 9:00 – 10:20 | Room 15 | Session S.33
Casting: Remelting
Chair: P. Kaushik, ArcelorMittal Global R&D, United States

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16:00</td>
<td>Transient simulation of the vacuum arc remelting process</td>
<td>M. Eickhoff, RWTH Aachen University, Germany</td>
</tr>
<tr>
<td>16:20</td>
<td>The-state-of-the-art of electroslag remelting technology</td>
<td>A. Mordeglia, Danieli Automation S.p.A., M. Bianco, Danieli, Italy</td>
</tr>
<tr>
<td>16:40</td>
<td>The effect of Interdendritic Segregation on Hot Ductility Behavior of Medium Carbon Steels</td>
<td>J. Jeong, B. Kim, S. Kwon, J. Lee, Y. Heo, C. Yim, Graduate Institute of Ferrous Technology, Pohang University of Science and Technology, Republic of Korea, M. Kang, POSCO Research Center, Republic of Korea, D. Kim, Dong-a University, Republic of Korea</td>
</tr>
<tr>
<td>17:00</td>
<td>New generation of the ESR (Electro Slag Remelting) furnace</td>
<td>C. Demirci, R. El-Rabati, C. Wissen, J. Schlüter, SMS Mevac GmbH, M. Schwenk, B. Friedrich, RWTH Aachen University, Germany</td>
</tr>
</tbody>
</table>

### Thursday, 27 June 2019
#### 9:00 – 10:40 | Room 15 | Session S.12.1
Electric steelmaking: Process control, automation and modelling I
Chair: K. Krüger, Max Aicher GmbH & Co. KG, Germany

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00</td>
<td>AMI SmartFurnace Off Gas Analysis for EAF optimization</td>
<td>F. Martinez, G. Fernandez, AMI Automation, Mexico</td>
</tr>
<tr>
<td>9:20</td>
<td>Multivariate statistical analysis of the scrap composition in electric steelmaking</td>
<td>M. Rojas Sánchez, RWTH Aachen University, Germany</td>
</tr>
<tr>
<td>9:40</td>
<td>Tenova Imelshop: the Integrated process manager for the coordination of the whole melt shops production line</td>
<td>D. Masoero, A. Grasselli, Tenova S.p.A., Italy</td>
</tr>
<tr>
<td>10:00</td>
<td>Computational Fluid Dynamics (CFD) analysis of capture efficiency of secondary off-gas in an electric arc furnace (EAF) shop</td>
<td>A. Senguttuvan, Dastur Innovation Labs, S. Chatterjee, M. N. Dastur &amp; Co. Pvt. Ltd., India</td>
</tr>
</tbody>
</table>
Thursday, 27 June 2019
9:00 – 10:40 | Room 17 | Session S.28.1
Casting: Automation, computer simulations and modelling I
Chair: M. Lundgren, Swerim AB, Sweden

9:00 Model to reduce bleeding breakout at thin slab caster,
A. Kumar, H. Shah, Tata Steel Ltd., India
9:20 Smart Maintenance – the digital continuous casting mould,
O. Wiens, SMS group GmbH, Germany
9:40 One step further in no man casting using advanced robot
technology in a semi collaborative environment,
M. Stiftinger, M. Hirth, G. Gerstorfer, Primetals Technologies
Austria GmbH, Austria
10:00 Autonomous Engineering to improve Ingot Quality,
S. Koldorf, MAGMA Gießereitechnologie GmbH, Germany
10:20 Sticker detection based on convolutional neural networks
during continuous casting, D. Lieftucht, SMS digital GmbH,
Germany

Thursday, 27 June 2019
9:00 – 10:20 | Room 20 | Session S.35.4
Industry 4.0 in Steelmaking IV
Chair: M. Fleischer, Primetals Technologies Germany GmbH,
Germany

9:00 Vision of an automated steel plant – use case: Ladle ing
and handling, J. Thomasberger, SMS group GmbH,
Germany

Thursday, 27 June 2019
10:20 Improving tap hole and ladle free opening rate through
customized grain size distribution and chemistry,
E. Ruisanchez, Pasek Minerales S.A., Spain

Thursday, 27 June 2019
9:00 – 10:00 | Room 16 | Session S.18
Casting: Metallurgy and flow control in the tundish
Chair: B. Hribernik, Austrian Society for Metallurgy and Materials,
Austria

9:00 Overcoming thermofluid challenges in purging air from
a preheated continuous casting tundish using argon,
T. Plikas, J. Woloshyn, D. Mysko, M. Del Gobbo, S. Kumar,
Hatch Ltd., Canada, G. Koenig, Hatch Ltd., United States
9:20 The effect of Zr on the internal oxidation behavior of
Al-containing high Mn steels, D. Lee, J. Lee, Y. Heo, C. Yim,
Graduate Institute of Ferrous Technology, Pohang University
of Science and Technology, Republic of Korea, M. Kang,
W. Cho, POSCO Reserch Center, Republic of Korea
9:40 Numerical modelling of liquid steel alloying by pulse-step
method in two strand slab tundish, A. Cwudzinski,
Czestochowa University of Technology, Poland
9:20  Maximizing profitability of an ISP through upstream operations optimization through data analytics, A. Maity, S. Ghosh, S. Chatterjee, Dastur Innovation Labs, Canada, A. Sarkar, A. Mukherjee, M. N. Dastur & Co. Pvt. Ltd., India

9:40  Simulation-based solution for a dynamic two-crane scheduling problem in a steelmaking shop: A case study, J. Li, University of Science and Technology Beijing, China

10:00  HD scan – the digital link between cast quality and process data, T. Gusarova, SMS group GmbH, Germany

Thursday, 27 June 2019
10:30 – 11:30  | Room 16 | Session S.17
Casting: Formation of non-metallic compounds in the solidification process
Chair: J. Kempken, SMS group GmbH, Germany

10:30  Microstructures and origin of inclusions leading to clogging during casting of a Ti-alloyed Al-killed steel, B. Karnasiewicz, Tata Steel Europe Ltd., Poland, E. Zinngrebe, Tata Steel Europe Ltd., The Netherlands

10:50  The role of FeTi-addition on micro-inclusions in the production of ULC steel grades via RH-process route, C. Bernhard, Montanuniversität Leoben, Austria

11:10  Failure analysis of clogging related defects in steel products integrated with computational thermodynamics for process optimization, E. Aivazoglou, ELKEME Hellenic Research Centre for Metals S.A., P. Sismanis, SIDENOR S.A., A. Vazdirvanidis, T. Tzevelekou, A. Antonopoulos, ELKEME S.A., Greece

Thursday, 27 June 2019
10:40 – 12:00  | Room 14 | Session S.23.2
Casting: Control of solidification structures and management of defects II
Chair: P. Presoly, Montanuniversität Leoben, Austria

10:40  New sensor technology gives a sharp view on initial solidification: Mold Expert Fiber, O. Lang, N. Oberschmiedleitner, C. Ortner, M. Schuster, F. Ramstorfer, Primetals Technologies Austria GmbH, Austria

11:00  Numeric simulation of the liquid steel flow in a slab caster with linear electromagnetic stirring positioned in the secondary cooling zone, M. Barna, Johannes Kepler University Linz, M. Javurek, Institute of Fluid Mechanics and Heat Transfer, P. Wimmer, Primetals Technologies Austria GmbH, Austria

11:20  Slab Casting in China 2025: Trends seen in Primetals Technologies Slab Casters fit for the “Made in China 2025” program, M. Hirschmanner, H. Willeit, Primetals Technologies Austria GmbH, Austria

11:40  Design of as-cast structures of continuously cast steel grades: Modelling and prediction, C. Fix, RWTH Aachen University, Germany
Thursday, 27 June 2019
10:50 – 12:10 | Room 15 | Session S.12.2
Electric steelmaking: Process control, automation and modelling II
Chair: B. Kleimt, VDEh-Betriebsforschungsinstitut GmbH, Germany

10:50  Numerical modelling of slag cooling, A. Kärnä, P. Sulasalmi, V. Visuri, E. Heikkinen, T. Fabritius, University of Oulu, P. Torvinen, J. Koskinen, Tapojärvi Oy, Finland
11:10  EAF optimization with AMI dynamic process models for special steel production, G. Fernandez, Martinez, AMI Automation, Mexico
11:30  Advancements in Tenova's NextGen® off-gas based process control technology, D. Zuliani, Tenova Goodfellow Inc., Canada
11:50  Optimization of EAF process control through application of self learning procedures based on process monitoring through KPI's, P. Frittella, Feralpi Siderurgica S.p.A., Italy

Thursday, 27 June 2019
11:00  Application of convolutional neural networks in steelmaking and research, T. Haas, RWTH Aachen University, Germany
11:40  Intelligent automation solutions on the road to digitalization, T. Kühas, R. Stadlmayr, R. Leitner, R. Aspetsberger, W. Oberaigner, Primetals Technologies Austria GmbH, Austria
12:00  Differential GPS – use case: Full automatic torpedo car ing, J. Thomasberger, M. Braam, SMS group GmbH, Germany

Thursday, 27 June 2019
10:40 – 12:20 | Room 20 | Session S.35.5
Industry 4.0 in Steelmaking V
Chair: B. Glaser, KTH Royal Institute of Technology, Sweden

10:40  Development status of intelligent manufacturing system for steelmaking in Hsc, H. Choi, South C. Eom, J. Hong, Hyundai Steel Co., Ltd., Republic of Korea
11:00  Development status of intelligent manufacturing system for steelmaking in Hsc, H. Choi, South C. Eom, J. Hong, Hyundai Steel Co., Ltd., Republic of Korea
11:20  Development status of intelligent manufacturing system for steelmaking in Hsc, H. Choi, South C. Eom, J. Hong, Hyundai Steel Co., Ltd., Republic of Korea
Thursday, 27 June 2019


12:00 HD LASr, M. Friedrich, SMS group GmbH, Germany


Thursday, 27 June 2019

13:00 – 15:00 | Room 15 | Session S.12.3
Electric steelmaking: Process control, automation and modelling III
Chair: M. Aula, Luxmet Oy, Finland

13:00 EU supported research projects on secondary metallurgy technology with focus on on-line measurement and control – evaluation of results and outlook to future developments, B. Kleimt, VDEh-Betriebsforschungsinstitut GmbH, Germany, M. Jemson, Materials processing Institute – MPI, United Kingdom, J. Pierret, CRM Group, Belgium, M. de Santis, Rina Consulting – CSM, Italy, R. Safavi Nick, Swerim AB, Sweden

13:20 EAF based melt shops: smart products, assistance tools and service solutions for digital production, J. Apfel, H. Beile, Primetals Technologies Germany GmbH, Germany, T. Reindl, B. Laimer, R. Stadlmayr, Primetals Technologies Austria GmbH, Austria

13:40 Development of process control for industrial electric arc furnaces with optical emission spectroscopy, H. Pauna, M. Aula, J. Seehausen, M. Hutula, T. Fabritius, University of Oulu, Finland, J. Klung, Deutsche Edelstahlwerke, Germany

14:00 EAF dynamic process optimization with AMI SmartFurnace modules, C. de los Santos, AMI Automation, Mexico, S. Jackson, Nucor Duferdofin, Italy

14:20 Towards a complete thermodynamic description of the steel making process from scrap to bar, A. Grundy, J. Jeppsson, A. Jansson, J. Bratberg, R. Rettig, L. Kjellqvist, Thermo-Calc Software AB, Sweden, M. Powell, Metallurgical &Associated Services, United Kingdom

14:40 Improvements of corrosion resistance and volume stability at Alumina-Spinel-Magnesia ladle castable, Sung-Hwan Kim, Chosun Refractories Co., Ltd., Republic of Korea

Thursday, 27 June 2019

13:20 – 14:40 | Room 17 | Session S.32
Casting: Near net shape casting
Chair: J. Schlüter, SMS Mevac GmbH, Germany

13:20 Semi-continuous casting VERSCON for big bloom sections, S. Feldhaus, F. Heini, T. Meier, S. Feldhaus, SMS Concast AG, Switzerland

13:40 A new numerical simulation tool to resolve 3D effects in continuous casting in real-time, F. Wietbüscher, RWTH Aachen University, F. Wietbüscher, T. Bui, M. Höning, M. Meinke, W. Kjos, SMS group GmbH, W. Schröder, RWTH Aachen University, Germany
Thursday, 27 June

14:00 Greatest flexibility in production – width adjust with DeltaSpeed technology at JSW, Dolvi, India, L. Schaps, S. Babu, P. Sappa, A. Ratnaprashad, G. Rathore, JSW Steel Ltd, India, K. Stieglitz, H. Beyer-Steinhauer, SMS group GmbH, Germany

14:20 Reduction in tundish loss in multistrand billet caster, D. Kumar, S. Manjini, R. K., R. K., T. Hosahali, JP. Tripathi, M. Manish, JSW Steel Ltd., India

Thursday, 27 June 2019
13:20 – 14:40 | Room 20 | Session S.35.6 Industry 4.0 in Steelmaking VI
Chair: Mergelkamp, Boston Consulting Group, Germany


13:40 Rotating equipment performance can help you impact profit!, D. do Vale, SKF AB, Belgium

14:00 Complex numerical flow simulation of industrial large-scale furnaces using Computational Fluid Dynamics, N. Wichmann, K. Hornig, ANDRITZ Maerz GmbH, Germany

14:20 Optimizing steel ladle logistics by predicting and understanding refractory wear, W. Tesselaar, Tata Steel Europe Ltd., The Netherlands
ROLLING AND FORGING

- Rolling of Long Products and Flat Products
- Forging
- Industry 4.0 in the forming technology
<table>
<thead>
<tr>
<th>Time</th>
<th>Room 1</th>
<th>Room 2</th>
<th>Room 12</th>
<th>Room 13</th>
<th>Room 26</th>
<th>Room 28</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:00</td>
<td>Session 0.1</td>
<td>Opening Session</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11:00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:00</td>
<td></td>
<td></td>
<td>Session 0.2</td>
<td>Plenary Session I</td>
<td>Trends in CO₂</td>
<td>Mitigation</td>
</tr>
<tr>
<td>13:00</td>
<td></td>
<td>11:30 – 13:10</td>
<td></td>
<td>11:30 – 13:10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14:00</td>
<td></td>
<td>14:00 – 15:00</td>
<td>Session R.02.1</td>
<td>Rolling: Cold strip rolling and processing lines I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15:00</td>
<td></td>
<td>14:00 – 15:00</td>
<td>Session R.17.1</td>
<td>Rolling: Maintenance: plant availability and condition monitoring I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16:00</td>
<td></td>
<td>14:00 – 15:00</td>
<td>Session R.02.2</td>
<td>Rolling: Cold strip rolling and processing lines II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17:00</td>
<td></td>
<td>15:00 – 17:10</td>
<td>Session R.17.2</td>
<td>Rolling: Hot strip rolling I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18:00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18:30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Evening Event MS RheinEnergie**
<table>
<thead>
<tr>
<th>Time</th>
<th>Room 27</th>
<th>Room 28</th>
<th>Room 3</th>
<th>Room 26</th>
<th>Room 27</th>
<th>Room 28</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00</td>
<td>Session R.05 Rolling of tubes, sections and rails</td>
<td>Session R.08.1 Rolling: Improved efficiency and product quality I</td>
<td>Session R.10 Rolling: Digitalization and Smart Factory-solutions for processing industry</td>
<td>Session R.15.1 Rolling: Process and production control, transportation and logistics I</td>
<td>Session R.16.1 Rolling: Plant upgrades and new equipment developments I</td>
<td></td>
</tr>
<tr>
<td>10:40</td>
<td>Coffee break</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:20</td>
<td>Session R.08.2 Rolling: Improved efficiency and product quality II</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11:20</td>
<td>Lunch</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13:00</td>
<td>Session R.09.1 Rolls for Rolling (Wear and lubrication, grinding, new materials, roll surface, roll inspection) I</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13:40</td>
<td>Coffee break</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14:00</td>
<td>Session R.09.2 Rolls for Rolling (Wear and lubrication, grinding, new materials, roll surface, roll inspection) II</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14:00 – 16:00</td>
<td>Workshop LowCarbonFuture workshop</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15:30 – 17:00</td>
<td>15:30 – 17:00 Farewell event, CCD South, First Floor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Please note that the complete program on your mobile, just scan the QR code.*
Tuesday, 25 June 2019
14:00 – 15:00 | Room 12 | Session R.02.1
Rolling: Cold strip rolling and processing lines I
Chair: M. Neuer, VDEh-Betriebsforschungsinstitut GmbH, Germany

14:00 Cold rolling strategies for improving the magnetic properties of non-grain-oriented electrical steel, A. Krämer, X. Wei, G.Hirt, RWTH Aachen University, Germany
14:40 Improvement of productivity based on DNN Set-up in cold rolling, G. Song, POSCO Co., Ltd., Republic of Korea

Tuesday, 25 June 2019
15:30 – 17:30 | Room 26 | Session R.01
Rolling: Hot strip rolling
Chair: F. Hippenstiel, BGH Edelstahl Siegen GmbH, Germany

15:50 Determination and implementation of requirements in hot rolling mill in order to produce high quality API steel strip, S. Mani, Mobarakeh Steel Company, Iran
16:10 Transfer bar cooling system significantly improves production capacity at Tata Steel Port Talbot's hot strip mill, L. Pichler, A. Seilinger, A. Rimnac, F. Lettner, Primetals Technologies Austria GmbH, Austria; K. Weinzierl, J. Milbredt, Primetals Technologies Germany GmbH, Germany
16:30 A study on width control head & tail ends of slab a hot rough rolling using learning method, J. Jung, Y. Lee, H. Han, H. Kim, Hyundai Steel Co., Ltd., Republic of Korea
16:50 Integrated temperature model, A. Sprock, C. Hassel, K. Grybel, H. Hof, W. Fuchs, SMS group GmbH, Germany

17:10 Advanced technologies of process control to hot strip rolling mill, N. Shimoda, H. Imanari, A. Suzuki, M. Sano, K. Ohara, Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan

Tuesday, 25 June 2019
15:30 – 16:50 | Room 28 | Session R.03
Rolling: Plate Rolling
Chair: G. Moreas, CRM Group, Belgium

15:30 Large-scale expansion of equipment and product range: Modernization of NLMK DanSteel's heavy plate mill, M. Breuer, SMS group GmbH, Germany

15:50 Application of the upgraded cooling system in CSC plate mill, W. Lo, China Steel Corporation, Taiwan

16:10 MultiFlex®-Quench: Setting new standards for plate cooling in heavy plate heat treatment lines, D. Schmidt, SMS group GmbH, Germany

16:30 Optimization of work roll change intervals through data-driven roll wear models, B. Wiegand, AG der Dillinger Hüttenwerke, Germany

Tuesday, 25 June 2019
15:50 – 17:10 | Room 12 | Session R.02.2
Rolling: Cold strip rolling and processing lines II
Chair: H. Imanari, Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan

15:50 steelytics® Hot Rolling – calculation of steel properties over strip length, T. Baron, A. Latz, S. Schreiber, thyssenkrupp Steel Europe AG, Germany

16:10 Recent developments in on-line setup and control of Tata Steel's cold mills, C. Hol, Tata Steel Europe Ltd., The Netherlands

16:30 Concept for contactless roll cleaning during skin-pass milling and first operating results, M. Blumenau, D. Roggenkämper, G. Faak, R. Nüssen, U. Zocher, O. Moll, thyssenkrupp Steel Europe AG, Germany

16:50 Advanced cold rolling for silicon and stainless steel (DMS EcoMill), A. Duchene, Fives DMS S.A., France

Tuesday, 25 June 2019
15:50 – 16:50 | Room 13 | Session R.17.2
Rolling: Maintenance: plant availability and condition monitoring II
Chair: M. Ackermann, RWTH Aachen University, Germany

15:50 Changing the reality of proactive maintenance, D. Phillips, Regal Beloit Corporation, United States

16:10 Evaluation of a vision technique to detect small motions in steel process machinery, J. Niemi, Swerim AB, Sweden
<table>
<thead>
<tr>
<th>Time</th>
<th>Session Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tuesday, 25 June</strong></td>
<td></td>
</tr>
<tr>
<td>16:30</td>
<td><strong>Chatter management at cold rolling mills today</strong>, S. Richard, M. Krüger, K. Rues, SMS group GmbH, Germany</td>
</tr>
</tbody>
</table>
| 17:00 – 18:00 | **Room 28 | Session R.04**  
Rolling: Rod and bar rolling  
Chair: S. Hardcastle, Hatch Ltd., United Kingdom |
| 17:00    | **Intelligent robotic coil trimming for wire rod mills**, R. Kirkwood-Azmat, S. Teegavarapu, Primetals Technologies USA LLC, United States       |
| 17:20    | **Interstand tension measuring technique for bar mill and its application**, S. Yanagi, M. Kobayashi, H. Nakamura, T. Taira,  
Kobe Steel, Ltd., Y. Morimoto, Kobelco Research Institute Inc., Japan                         |
| 17:40    | **Peak performance for billet and large bar rolling mills**, T. Maßmann, SMS group GmbH, Germany                                               |
| **Wednesday, 26 June**                                                                                                                                  |
| 9:00 – 10:40 | **Room 13 | Session R.12.1**  
Rolling: Sensors and control, online measurement technologies I  
Chair: S. Martens, PSI Metals GmbH, Germany                                                   |
| 9:00     | **Inline measurement using Camera Cluster Technology**, J. Blonski, IMS Messssysteme GmbH, Germany                                               |
| 9:20     | **Dynamic flatness control by interstand looper shape meter for hot strip mill in TATA Steel Kalinganagar**, T. Usugi,  
Primetals Technologies Japan Ltd., Japan                                                     |
| 10:00    | **Sensors and measurements towards industry 4.0 in CRM Group**, L. Gilon, G. Moreas, CRM Group, Belgium                                         |
| 10:00    | **New online inspections system for internal defects in thin steel strip**, J. Scharzmann, S. Fritsch, H. Krauthäuser,  
IMS Messysysteme GmbH, Germany                                                             |
| 10:20    | **Sectional strip tension meter – Shapemeter roll**, L. Huláková, Uvb Technik S.r.o., Czech Republic                                           |
| 9:00     | **Forming induced anisotropy of product properties in cold extrusion**, F. Kolpak, Technische Universität Dortmund,  
C. Dahnke, A. Tekkaya, Institute of Forming Technology and Lightweight Components, Germany |
| 9:20     | **A new high performance hot top insulation to improve quality of forging ingots**, F. Hippenstiel, BGH Edelstahl Siegen GmbH, Germany       |
| 9:40     | **Effect of the sulphur content on the fatigue strength of the forged steel 38MnVS6**, M. Scurria, Technische Universität Darmstadt, Germany   |
| 10:00    | **Application of fast models for equivalent strain, temperature and microstructure in open-die forging**, M. Wolfgarten,  
RWTH Aachen University, G. Hirt, F. Rudolph, RWTH Aachen University, Germany                |
Wednesday, 26 June 2019
9:00 – 10:40 | Room 27 | Session R.05
Rolling of tubes, sections and rails
Chair: A. Rimnac, Primetals Technologies Austria GmbH, Austria

10:20  Effect of forging processes on microstructure and properties of TC25 titanium alloy, M. Xinhua, Baosteel Co., Ltd., J. Cheng, China Baowu Steel Group Corporation Limited, China

10:40  Optimisation of blank weights and reduction of cost per cut at large diameter forging lines, P. Pirolt, Linsinger Maschinenbau GmbH, Austria

Wednesday, 26 June 2019
9:00 – 10:00 | Room 28 | Session R.08.1
Rolling: Improved efficiency and product quality I
Chair: F. Dumortier, CMI Industries, Inc., Belgium

9:00  Cold rolling mill technology for improved yield and enhanced operation stability, J. Sieghart, D. Böttner, W. Spies, SMS group GmbH, Germany

9:20  Influence of water quality on formation of scab in hot rolled strip, S. Roy, Tata Steel Ltd., India

9:40  State-of-the-art solutions for cutting, grinding and deburring of large-scale steel and special alloy products, G. Richter, BRAUN Maschinenfabrik GmbH, Austria

Wednesday, 26 June 2019
10:20 – 11:20 | Room 28 | Session R.08.2
Rolling: Improved efficiency and product quality II
Chair: M. Jurkovic, Met-Con GmbH & Co. KG, Germany

10:20  SMS group solutions of thin slab casting and rolling concepts for flexible and profitable hot strip production, K. Hoen, B. Kintscher, C. Klein, S. Krämer, C. Cecere, SMS group GmbH, Germany

10:40  The relation between microstructure of pure titanium and edge crack in cold rolling, K. Kimijima, Kobe Steel, Ltd., Japan

11:00  Experiences with press hardening furnaces and tailored tempering systems, P. Seemann, P. Seemann, Ebner Industrieöfenbau GmbH, Austria
Wednesday, 26 June 2019
11:00 – 12:40 | Room 27 | Session R.07
Rolling: Processing of new steel grades
Chair: J. Gnauk, PSI Metals GmbH, Germany

11:00 Pioneering across continents and cultures for the next welding technology breakthrough, S. Mauuary, Primetals Technologies France S.A.S., T. Yagi, S. Kaga, Primetals Technologies Ltd., Japan, S. Maillard, Primetals Technologies S.A.S., France

11:20 HYPER UC-MILL The advanced 6Hi UC-Mill for High Grade Non-Gain Oriented Electrical Sheet Production, T. Nakayama, Primetals Technologies Japan Ltd., H. Ke, Y. XingLiang, Y. Mingcheng, Maanshan Iron and Steel Co. Ltd., China, S. Yasunari, T. Tomino, Primetals Technologies Ltd., Japan

11:40 X-Pro® laser welder for of high strength steel grades, J. Szonn, C. Dornscheidt, J. Artel, C. Sasse, SMS group GmbH, Germany

12:00 Wet Flash Cooling®: a flexible and high performance quenching technology for Gen3 AHSS, S. Mehrain, Fives Stein S.A.S., France

12:20 State-of-the-art PL-TCM (pickling lines and tandem cold strip mills), T. Kikkawa, JP Steel Plantech Co., Japan

Wednesday, 26 June 2019
11:20 – 12:40 | Room 13 | Session R.12.2
Rolling: Sensors and control, online measurement technologies II
Chair: S. Martens, PSI Metals GmbH, Germany

11:20 Customized solutions for dimension control and surface analysis of hot rolled products ready for Industry 4.0, P. Schalk, TBK Automatisierung GmbH, Austria

11:40 Installation of flaw detector, T. Murayama, Godo Steel Ltd., Japan

12:00 Online tensile-structure properties evaluation by means of stress-strain analysis of skin pass process data, A. Ferraiuolo, Marcegaglia Ravenna S.p.A., Italy

12:20 Optical measurement of flatness changes during laminar cooling in SSAB’s hot strip mill, P. Kierkegaard, Shapeline AB, Sweden

Wednesday, 26 June 2019
11:20 – 12:20 | Room 26 | Session R.19
Rolling: New Developments
Chair: J. Frick, Lechler GmbH, Germany

11:20 DUE – The successful start-up of the first Danieli universal endless plant, M. Van Reimersdahl, Danieli Germany GmbH, Germany, M. Knigge, M. Bulfone, C. Bilgen, Danieli, Italy

11:40 Intelligent roll-gap lubrication improves strip surface cleanliness in thyssenkrupp Steel’s tandem cold rolling mill, M. Bergmann, K. Krimpelstätrer, Primetals Technologies
Austria GmbH, Austria, B. Nilsson, S. Karakavaf, R. Leffers, thyssenkrupp Steel Europe AG, Germany

12:00 New developments for heat treatment of AHSS strips, M. Pressler, M. Pressler, P. Seemann, Ebner Industrieofenbau GmbH, Austria

Wednesday, 26 June 2019
11:40 – 13:00 | Room 28 | Session R.09.1
Rolls for Rolling (Wear and lubrication, grinding, new materials, roll surface, roll inspection) I
Chair: N. N.

11:40 The digital roll shop for improved quality, performance and process monitoring, R. McWhirter, Tenova S.p.A., Italy

12:00 Work roll roughness topography and strip cleanliness during cold rolling automotive sheet, C. Gaspard, Union Electric Steel Corporation, Belgium

12:20 Optimization of Work Roll Cooling in Rolling, P. Kotrbacek, M. Pohanka, K. Schörkhuber, voestalpine Stahl GmbH, Austria, M. Zachar, Brno University of Technology, Czech Republic


Wednesday, 26 June 2019
13:40 – 15:20 | Room 27 | Session R.06
Rolling: Annealing, galvanizing and finishing
Chair: P. Kierkegaard, Shapeline AB, Sweden

13:40 Preoxidation technology dedicated to AHSS, M. Dubois, CMI Industry, Belgium

14:00 Danieli cold processing technology: Innovative approaches for new lines and upgrades, R. Holz, L. Vignolo, T. Settimo, Danieli & C. Officine Meccaniche S.p.A., Italy

14:20 Hot dip galvanizing at 240mpm, dream or reality, M. Dubois, CMI Industry, Belgium


15:00 Twisting towers in finishing lines, M. Dubois, CMI Industry, Belgium
### Wednesday, 26 June 2019

#### Room 13 | Session R.21

**Industry 4.0 – in forming technology**

Chair: N. Holzknecht, VDEh-Betriebsforschungsinstitut GmbH, Germany

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>14:00</td>
<td>The metals enterprise service bus</td>
<td>S. Martens, L. Van Nerom</td>
<td>PSI Metals GmbH, Germany</td>
</tr>
<tr>
<td>14:20</td>
<td>TPO pioneering: Digitalization of high efficiency high quality production</td>
<td>T. Pfatschbacher, J. Plaul, L. Pichler, B. Schürz, W. Oberaigner, N. Hübner, M. Kügel</td>
<td>Primetals Technologies Austria GmbH, Austria</td>
</tr>
<tr>
<td>14:40</td>
<td>Anomaly and causality analysis in process data streams using machine learning with specialised eigenspace topologies</td>
<td>M. Neuer, N. Link</td>
<td>VDEh-Betriebsforschungsinstitut GmbH, Germany</td>
</tr>
<tr>
<td>15:00</td>
<td>Machine learning based predictive quality</td>
<td>J. Coppe</td>
<td>PSI Metals GmbH, Germany, E. Dral, E. Samuylova, Mechanica AI, Anguilla</td>
</tr>
<tr>
<td>15:20</td>
<td>Innovations &amp; first application of the intelligent new energy pallet-car coil conveying system</td>
<td>F. Wei</td>
<td>Beijing Shougang Yunxiang Industrial Technology Co. Ltd., China</td>
</tr>
</tbody>
</table>

### Wednesday, 26 June 2019

#### Room 28 | Session R.09.2

**Rolls for Rolling (Wear and lubrication, grinding, new materials, roll surface, roll inspection) II**

Chair: G. Hohenbichler, Primetals Technologies Austria GmbH, Austria

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>14:00</td>
<td>Prevention of premature contact fatigue damages to roughing mill rolls</td>
<td>S. Flament, M. Sinnaeve, Marichal Ketin, O. Lemaire, G. Walmag</td>
<td>CRM Group, Belgium</td>
</tr>
<tr>
<td>14:40</td>
<td>Development and implementation of VICTURATM rolls in the late finishing stands of hot strip mills</td>
<td>Z. Zhang</td>
<td>Union Electric Åkers, Sweden</td>
</tr>
</tbody>
</table>

### Thursday, 27 June 2019

#### Room 26 | Session R.10

**Rolling: Digitalization and Smart Factory-solutions for processing industry**

Chair: N. Holzknecht, VDEh-Betriebsforschungsinstitut GmbH, Germany

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00</td>
<td>The ever increasing role of automation in the development of the &quot;Intelligent Plant&quot; of the future</td>
<td>E. Plazzogna</td>
<td>Danieli Automation S.p.A., Italy</td>
</tr>
</tbody>
</table>
Thursday, 27 June 2019
9:00 – 10:40 | Room 28 | Session R.16.1
Rolling: Plant upgrades and new equipment developments I
Chair: A. Rohe, thyssenkrupp Steel Europe AG, Germany

9:00  Technical solutions for safe handling of high-strength coils, C. Mengel, T. Holzhauer, SMS group GmbH, Germany
9:20  Arvedi ESP: Pioneering mature technology for endless casting and rolling, A. Jungbauer, S. Grosseiber, T. Lengauer, Primetals Technologies Austria GmbH, Austria
9:40  Development and application of POSCO's innovative endless rolling technology (CEM®) for various steel products, K. Cha, J. Kong, J. Chung, Y. Ko, M. Cho, POSCO Co., Ltd., Republic of Korea
10:00 Revamping of skin pass section for automotive products, F. Dumortier, CMI Industry, Belgium
Thursday, 27 June 2019
10:40 – 11:40 | Room 26 | Session R.11
Rolling: Virtualization and HMI* in rolling and finishing operations
Chair: U. Stellmacher, Krefeld, Germany


11:00 The digital twin – one solution for different tasks, M. Haverkamp, SMS group GmbH, Germany

11:20 Basic technologies to achieve smart rolling mills, H. Imanari, N. Shimoda, H. Inami, N. Kubo, Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan

Thursday, 27 June 2019
10:40 – 12:00 | Room 27 | Session R.15.2
Rolling: Process and production control, transportation and logistics II
Chair: T. Maßmann, SMS group GmbH, Germany

10:40 Modular coil shuttle system – the next generation for coil logistic system operating at ATIs hot strip mill, L. Pichler, C. Salzmann, R. Hofer, Primetals Technologies Austria GmbH, Austria, T. DeLuca, Allegheny Technologies Incorporated, United States

11:00 Ecological and economic optimisation of auxiliary aggregates in steel production, M. Loos, M. Neuer, J. Polzer, M. Feldges, VDEh-Betriebsforschungsinstitut GmbH, Germany

11:20 The integrated production management system – the platform for innovation, H. Wolf, PSI Metals GmbH, Germany

11:40 Online materialflow optimization for critical conveyance infrastructure, C. Grubert, Celano GmbH, Germany

Thursday, 27 June 2019
11:05 – 12:45 | Room 28 | Session R.16.2
Rolling: Plant upgrades and new equipment developments II
Chair: K. Krimpelstätter, Primetals Technologies Austria GmbH, Austria

11:05 QSP – the most advanced thin slab technology, M. Knigge, Danieli Germany GmbH, M. Bulfone, Danieli, Italy, C. Bilgen, Danieli Germany GmbH, Germany

11:25 Controlled Rolling and Cooling Technology for Rebar, Y. Chen, Sinosteel Equipment & Engineering Co., Ltd., China

11:45 FLEX-HI HOT – flexible finishing mill technology for hot rolled product mix extension, M. Hackl, A. Seilinger, S. Bragin, K. Krimpelstätter, Primetals Technologies Austria GmbH, Austria
EZDK’s comprehensive CSP® modernization – a master plan for competitive edge in a dynamic market, H. Fahmy, Ezz Steel Company, Egypt, K. Hoen, W. Spies, K. Pronold, SMS group GmbH, Germany

Zoom-Mill for reversible cold rolling, T. Kikkawa, JP Steel Plantech Co., Japan

Thursday, 27 June 2019
13:00 – 14:20 | Room 26 | Session R.18
Rolling: Reheating and descaling
Chair: M. Åhman, Lund University, Sweden

QHEAT: Induction heating system for long and flat products, E. Plazzogna, S. Barbanti, E. Gigante, Danielli Automation S.p.A., Italy

Maximizing impact force from descale headers using CFD analysis, M. Bodingbauer, Spraying Systems Austria GmbH, Austria, L. Peterson, Spraying Systems Co., United States

Transverse flux induction heater at Rizhao’s ESP line 4 boosts the efficiency, B. Linzer, T. Lengauer, S. Grosseiber, B. Linzer, A. Jungbauer, Primetals Technologies Austria GmbH, Austria, A. Umbrasko, A. Thus, ABP Induction Systems GmbH, Germany

Influence of injection distance on attenuation of water droplet velocity in high pressure descaling, Y. Tamura, JFE Steel Corporation, Japan

Thursday, 27 June 2019
13:20 – 14:40 | Room 27 | Session R.13
Rolling: Modelling and simulations
Chair: A. Sprock, SMS group GmbH, Germany

Advanced strip shaping by highly sophisticated mathematical modeling and optimization techniques – a way to contour control, A. Thekale, M. Kurz, M. Miele, A. Schmidt, Primetals Technologies Germany GmbH, J. Frenzel, C. Gusek, M. Vogt, thyssenkrupp Hohenlimburg GmbH, Germany

FE analysis of influence of roll bending on roller leveling effect of high strength thin plate, J. Negami, Nippon Steel & Sumitomo Metal Co., Ltd., Japan

Advanced control for continuous line furnaces to optimize performance and quality, J. Naveira, CMI Industry, Spain

Benchmark of resolution methods for the heat equation in Siderurgy L2 thermal modeling, M. Bentivegni, Vallourec S.A., France
Thursday, 27 June 2019
13:40 – 15:20 | Room 28 | Session R.16.3
Rolling: Plant upgrades and new equipment developments III
Chair: S. Mehrain, Fives Stein S.A.S., France


14:00  3rd generation carbon steel mechanical equipment for processing line, S. Decroix, Fives DMS S.A., France

14:20  Pert laser scanner technology for existing plants upgrade, M. Tomba, Pert S.r.l., Italy

14:40  Hot Skin Pass Mill & Tension Leveler Line for Ultra High-Strength Steel, H. Uematsu, JP Steel Plantech Co., Japan

15:00  Small streams make big rivers: Innovative design & operation of 2 stands reversible mill easily expandable to PLTCM., J. Peers, CMI Industry, Belgium
STEEL MATERIALS AND THEIR APPLICATION, ADDITIVE MANUFACTURING, SURFACE TECHNOLOGIES

- Steel Materials and their Application
- Additive Manufacturing
- Surface Technologies
<table>
<thead>
<tr>
<th>Tuesday: 25 June</th>
<th>Wednesday: 26 June</th>
<th>Thursday: 27 June</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room 1</td>
<td>Room 2</td>
<td>Room 27</td>
</tr>
<tr>
<td><strong>9:00</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>10:00</strong></td>
<td><strong>Session 0.1</strong></td>
<td><strong>Session 0.2</strong></td>
</tr>
<tr>
<td>Opening Session</td>
<td>Plenary Session I: Trends in CO₂ Mitigation</td>
<td>Plenary Session II: Trends in Steel and Process Development</td>
</tr>
<tr>
<td><strong>11:00</strong></td>
<td>10:00 – 11:20</td>
<td>Coffee break</td>
</tr>
<tr>
<td><strong>11:00</strong></td>
<td></td>
<td><strong>Session 0.2</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Plenary Session I: Trends in CO₂ Mitigation</td>
</tr>
<tr>
<td><strong>13:00</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>14:00</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>15:00</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>16:00</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>17:00</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>18:00</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evening Event MS RheinEnergie</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Tuesday, 25 June 2019
15:50 – 17:50 | Room 27 | Session ST.01
Steel materials and their application: High strength steels for flat products for the automotive industry
Chair: T. Schneiders, Deutsche Edelstahlwerke Specialty Steel GmbH & Co. KG, Germany

15:50 New quasi single-phase microalloyed bainitic precision strip qualities, M. Nagel, H. Bröker, A. Tomitz, M. Kaizik, S. Kovacs, G. Gevelmann, A. Höhne, thyssenkrupp Hohenlimburg GmbH, Germany
16:10 A component oriented method for the examination of toughness values of sheet metals, M. Henrich, M. Könemann, S. Münstermann, RWTH Aachen University, Germany
16:30 Effect of alloying elements on mechanical properties and microstructure of modified TRIP Steels, K. Yang, China, J. Tu, L. Chiang, W. Cheng, China Steel Corporation, Taiwan
16:50 CELES EcoTransFlux, E. Patard, Fives Celes S.A., Germany

Wednesday, 26 June 2019
17:30 Development of alloying concepts and process strategies for the production of safety-relevant lightweight body components with increased residual formability in press hardened condition, Y. Sparrer, RWTH Aachen University, K. Bissa, A. Tenié, Mubea Tailor Rolled Blanks GmbH, Germany, J. Lian, Alto University, Finland, W. Bleck, RWTH Aachen University, Germany

Wednesday, 26 June 2019
9:00 – 10:40 | Room 14 | Session ST.04.1
Steel materials and their application: Advanced High strengths and special steels, characterization and modeling I
Chair: C. Keul, Forschungsvereinigung Stahlanwendung e. V., Germany

9:00 Numerical prediction of damage in punching process using shear modified Gurson model, H. Janarthanam, S. Sommer, F. Huberth, E. Carl, J. Preußner, Fraunhofer Institute for Mechanics of Materials, Germany
9:20 Development of API X60 pipeline steel for sour service with lower Manganese, Y. Al-Zain, Hadeed Pvt., Ltd., M. Patil, S. Rehman, Y. Al-Zain, Hadeed, Saudi Arabia
9:40 Influence of the alloy composition of an air-hardened, martensitic forging steel on the mechanical and cyclic material behavior, T. Schmiedl, Technische Universität Darmstadt, A. Gramlich, RWTH Aachen University, S. Schönborn, R. Wagener, Fraunhofer Institute for Structural Durability and System Reliability, T. Melz, Technische Universität Darmstadt, W. Bleck, RWTH Aachen University
Wednesday, 26 June 2019

9:00 – 10:40 | Room 15 | Session ST.03.1
Steel materials and their application: High strength steels for automotive and engineering industry I
Chair: J. Brandenburger, VDEh-Betriebsforschungsinstitut GmbH, Germany

9:00  Design of safety relevant steel components considering local damage evolution, M. Hell, Fraunhofer Institute for Structural Durability and System Reliability, Germany

9:20  Influence of patenting heat treatment process speed on high carbon steel wire microstructure and mechanical properties, S. Esen, M. Akar, A. Tiğci, C. Bilen, Çelik Halat ve Tel Sanayii A.Ş, Turkey

9:40  A modified carburizing heating pattern for enhancing the grain growth resistance of aluminum-killed steel bars, H. Jang, Taiwan, Y. Wang, China Steel Corporation, Taiwan

10:00 Fine-grained low carbon bainitic steels with improved properties, H. Roelofs, Swiss Steel AG, R. Kuziak, R. Rozmus, Instytut Metalurgii Zelaza, Poland, L. Oberli, Steeltec AG, Switzerland

10:20  Requirements for a digital twin for fatigue assessment with respect to the cyclic material behavior, R. Wagener, Fraunhofer Institute for Structural Durability and System Reliability, Germany

Wednesday, 26 June 2019  
11:20 – 13:00 | Room 14 | Session ST.04.2
Steel materials and their application: Advanced High strengths and special steels, characterization and modeling II
Chair: N. Voigt, Boston Consulting Group, Germany

11:20  Study of heat transfer distribution during plate heat treatment, P. Kotrbacek, M. Pohanka, M. Chabicovsky, Brno University of Technology, Czech Republic

11:40  Cleavage fracture modeling of a S355 construction steel using a modified Gurson-Tvergaard-Needleman model (GTN), J. Langenberg, S. Münstermann, K. Markus, RWTH Aachen University, Germany

12:00  Fatigue strength of laser welded butt joints made of high-strength fine-grained structural steels for the application in crane structures, B. Möller, B. Seyfried, R. Wagener, Fraunhofer Institute for Structural Durability and System Reliability, P. Knödel, T. Melz, Technische Universität Darmstadt, T. Ummenhofer, Karlsruhe Institute of Technology, Germany

12:20  Replacement of molybdenum by tungsten of Cr Mo V steel, H. El-Faramawy, S. Ghali, A. Ahmed, T. Mattar, Central Metallurgical Research & Development Institute, Egypt
12:40 Analytical and simulation-based description of separations in modern high-toughness steels, D. Lenz, S. Münstermann, M. Könemann, D. Li, RWTH Aachen University, Germany

Wednesday, 26 June 2019
11:20 – 13:00 | Room 15 | Session ST.03.2
Steel materials and their application: High strength steels for automotive and engineering industry II
Chair: T. Brune, SMS group GmbH, Germany

11:20 Influence of cooling schedule on microstructural heterogeneity in bainitic steel wires, M. Ackermann, RWTH Aachen University/Arcelor Mittal, B. Resiak, P. Buessler, ArcelorMittal R&D Bars and Wires, France, S. Gremme, ArcelorMittal Duisburg, Germany, W. Bleck, RWTH Aachen University, Germany

11:40 Lightweight design in agricultural machinery through the use of higher-strength steels, A. Siegrist, C. Schäfers, Hochschule Osnabrück, Germany

12:00 Application of numerical simulation to predict microstructure and hardness of Q&T steel forgings, E. Anelli, Franchini Acciai S.p.A., A. Chugaeva, M. Lucchesi, Franchini Acciai SpA, Italy

12:20 Use of self-learning technology software for high carbon steels, E. Martinez Rehlaender, SvMet Engineering S.A., Mexico

12:40 Development of high strength leaf spring steel, D. Kumar, S. Kumar, K. Ragu, V. Singh, P. Tripathi, JSW Steel Ltd., India

14:20 Sensitivity of high-strength fine-grained steel to hydrogen under consideration of the welding process, M. Christ, RWTH Aachen University, Z. Sheng, IEHK, RWTH Aachen, Germany

14:40 Resistance spot welding under external load for evaluation of LME susceptibility of zinc coated advanced high strength steel sheets, J. Frei, M. Rethmeier, Bundesanstalt für Materialforschung und -prüfung Berlin (BAM), M. Biegler, Fraunhofer Institute for Production Systems and Design Technology, Germany

15:00 Detection method for liquid metal embrittlement cracks inside the intermediate sheet zone of dissimilar resistance spot welds, S. Lindner, Outokumpu Nirosta GmbH, R. Deike, Universität Duisburg-Essen, Germany

Thursday, 27 June 2019
9:00 – 11:00 | Room 6 | Session ST.08
Surface technologies
Chair: S. Brockmann, Steel Institute VDEh, Germany

9:00 Industrial applications of on line and real time microscopy, G. Moreas, O. Herbiet, CRM Group, Belgium
9:20  Towards measuring surface quality by means of automatic surface inspection systems, J. Brandenburger, VDEh-Betriebsforschungsinstitut GmbH, Germany

9:40  Advanced technology for high quality and high productivity in hot dip continuous galvanizing line, H. Kakuno, Nippon Steel & Sumikin Engineering Co., Ltd., Japan

10:00  Influence of surface profile on rust resistance of IF Steel during interval of working processes, B. Fang, Baosteel-NSC Automotive Steel Sheets Co., Ltd., China

10:20  Influence of Surface Roughness of Full Hard Steel on Spangle of Galvanized Steel Used in Exposed Galvanized Steel, T. Park, S. Choi, Hyundai Steel Co., Ltd., Republic of Korea

10:40  Numerical evaluation of surface roughness influences on cold formability of DP steel, P. Wechsuanmanee, J. Lian, W. Liu, RWTH Aachen University, Germany


11:40  Production of high-grade metal powder for additive manufacturing by using the powder atomization plant of SMS group GmbH, T. Brune, P. Weiland, M. Hüllen, SMS group GmbH, J. Schlüter, SMS Mevac GmbH, Germany

12:00  Automated tool-path generation for rapid manufacturing and numerical simulation of additive manufacturing LMD geometries, M. Biegler, J. Wang, B. Graf, Fraunhofer Institute for Production Systems and Design Technology, M. Rethmeier, Federal Institute of Materials Research and Testing, Germany

Thursday, 27 June 2019

13:15 – 14:15 | Room 6 | Session ST.07.1
Additive manufacturing: Properties and quality of additive manufactured components I
Chair: R. Knobloch, Steel Institute VDEh, Germany

13:15  Physical and numerical modeling of close-coupled atomization processes for metal powder production, N. Vogl, SMS group GmbH, Germany

13:35  Hot isostatic pressing (HIP) and main applications, A. Altay, Saar Pulvermetall GmbH, Germany

13:55  Additive Manufacturing at SMS group – A key technology for future production processes, S. Hornickel, SMS group GmbH, Germany
<table>
<thead>
<tr>
<th>Time</th>
<th>Tuesday: 25 June</th>
<th>Thursday: 27 June</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:00</td>
<td>Session 0.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Opening Session</td>
<td></td>
</tr>
<tr>
<td>11:00</td>
<td>Coffee break</td>
<td></td>
</tr>
<tr>
<td>12:00</td>
<td>Session 0.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Plenary Session</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I: Trends in CO\textsubscript{2} Mitigation</td>
<td></td>
</tr>
<tr>
<td>13:00</td>
<td>11:30 – 13:10</td>
<td>11:30 – 13:10</td>
</tr>
<tr>
<td>14:00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15:00</td>
<td>14:00 – 15:20</td>
<td>13:00 – 15:00</td>
</tr>
<tr>
<td>16:00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17:00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18:00</td>
<td>Evening Event MS RheinEnergie</td>
<td>Farewell event, CCD South, First Floor</td>
</tr>
<tr>
<td>18:30</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Tuesday, 25 June 2019
14:00 – 15:20 | Room 01 | Session IN 4.0 – 1.1
Industry 4.0 – I
Chair: H. Peters, VDEh-Betriebsforschungsinstitut GmbH, Gemany

14:00 | Digitalization innovation in automotive strip production, K. Van Teutem, Fives DMS S.A., France
14:20 | Cyber-attacks for breakdown or intentional quality reduction – how secure is the European steel production in the era of digitalisation?, M. Neuer, A. Wolff, VDEh-Betriebsforschungsinstitut GmbH, Germany
14:40 | Digital twin of an integrated steel plant in m.simtop – strategic operations planning and cost optimization in the digitalization era, B. Weiss, Primetals Technologies Austria GmbH, A. Spanlang, K1-MET GmbH, W. Wukovits, Technische Universität Wien, Austria
15:00 | Application of advanced artificial intelligence in the manufacturing execution system for metals industry, A. Klein, W. Runde, T. Ohm, K. Ptaszky, I. Bleskov, M. Passon, SMS group GmbH, M. Hütt, Jacobs University Bremen, Germany

Tuesday, 25 June 2019
15:50 – 17:30 | Room 01 | Session IN 4.0 – 1.2
Industry 4.0 – II
Chair: H. Peters, VDEh-Betriebsforschungsinstitut GmbH, Gemany

15:50 | Capturing, analyzing and documenting big data for continuous process improvement, U. Lettau, IBA AG, Germany
16:20 | Smart Maintenance Solutions for the metallurgical industry, C. Häusler, SMS group GmbH, Germany
16:30 | Quo Vadis, automation? – From intelligent products and machines to machine learning control, M. Neuer, J. Kremeyer, M. Loos, A. Wolff, VDEh-Betriebsforschungsinstitut GmbH, Germany
16:50 | Advanced systems for future steel grade development, A. Rimnac, W. Hackl, N. Champion, T. Pfatschbacher, Primetals Technologies Austria GmbH, Austria
17:10 | Internet of Materials: verified origin and properties based on blockchain technology, S. Grüll, S1Seven GmbH, Austria
Seminare
für die Stahlindustrie
und verwandte Branchen

*seminars*
*for the steel industry
and related sectors*

- Metallurgy
  *metallurgy*
- Werkstofftechnik
  *material science*
- Umformtechnik
  *metal forming*
- Energie und Umwelt
  *energy and environment*
- Führungsseminare
  *management courses*

[www.stahl-akademie.de](http://www.stahl-akademie.de)
[www.steel-academy.com](http://www.steel-academy.com)
Environmental and Energy Aspects in Iron and Steelmaking

- Efficiency Increase and CO₂ Mitigation in Iron and Steelmaking
<table>
<thead>
<tr>
<th>Time</th>
<th>Tuesday: 25 June</th>
<th>Wednesday: 26 June</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:00</td>
<td><strong>Session 0.1</strong></td>
<td><strong>Session E.03</strong></td>
</tr>
<tr>
<td>Opening Session</td>
<td>EE aspects:</td>
<td>EE aspects:</td>
</tr>
<tr>
<td></td>
<td>T1: Opening Session</td>
<td>Alternative fuels</td>
</tr>
<tr>
<td></td>
<td>10:00 – 11:20</td>
<td>and reductants</td>
</tr>
<tr>
<td></td>
<td>Coffee break</td>
<td>in iron and</td>
</tr>
<tr>
<td>11:00</td>
<td><strong>Session 0.2</strong></td>
<td><strong>Session E.06</strong></td>
</tr>
<tr>
<td>Plenary Session I:</td>
<td>EE aspects:</td>
<td>EE aspects:</td>
</tr>
<tr>
<td></td>
<td>Trends in CO₂</td>
<td>By-product</td>
</tr>
<tr>
<td></td>
<td>Mitigation</td>
<td>management and</td>
</tr>
<tr>
<td></td>
<td>11:30 – 13:10</td>
<td>use of secondary</td>
</tr>
<tr>
<td></td>
<td>Coffee break</td>
<td>raw materials and</td>
</tr>
<tr>
<td>12:00</td>
<td><strong>Session 0.3</strong></td>
<td><strong>Session E.09</strong></td>
</tr>
<tr>
<td>Plenary Session II:</td>
<td>EE aspects:</td>
<td>EE aspects:</td>
</tr>
<tr>
<td></td>
<td>Trends in Steel</td>
<td>Trends in Steel</td>
</tr>
<tr>
<td></td>
<td>and Process</td>
<td>and Process</td>
</tr>
<tr>
<td></td>
<td>Development</td>
<td>Development</td>
</tr>
<tr>
<td>13:00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14:00</td>
<td><strong>Session E.01</strong></td>
<td><strong>Session E.11</strong></td>
</tr>
<tr>
<td>EE aspects:</td>
<td>EE aspects:</td>
<td>EE aspects:</td>
</tr>
<tr>
<td></td>
<td>Energy savings</td>
<td>New and alternative</td>
</tr>
<tr>
<td></td>
<td>and energy efficiency</td>
<td>technologies</td>
</tr>
<tr>
<td></td>
<td>optimization</td>
<td>optimization</td>
</tr>
<tr>
<td></td>
<td>Coffee break</td>
<td>14:00 – 16:00</td>
</tr>
<tr>
<td>15:00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16:00</td>
<td><strong>Session E.02</strong></td>
<td><strong>Session E.16.1</strong></td>
</tr>
<tr>
<td>EE aspects:</td>
<td>EE aspects:</td>
<td>Efficiency</td>
</tr>
<tr>
<td></td>
<td>Energy savings</td>
<td>Energy increase</td>
</tr>
<tr>
<td></td>
<td>and energy</td>
<td>management and</td>
</tr>
<tr>
<td></td>
<td>efficiency</td>
<td>use of secondary</td>
</tr>
<tr>
<td></td>
<td>optimization</td>
<td>raw materials and</td>
</tr>
<tr>
<td></td>
<td>16:00 – 17:20</td>
<td>wastes in iron and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>steelmaking</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17:00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18:00</td>
<td><strong>Evening Event MS RheinEnergie</strong></td>
<td></td>
</tr>
<tr>
<td>18:30</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Thursday: 27 June

<table>
<thead>
<tr>
<th>Room 3</th>
<th>Room 13</th>
<th>Room 01</th>
<th>Room 02</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Session E.15</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Efficiency increase and CO₂ mitigation in iron and steelmaking: Carbon direct avoidance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>9:00 – 10:20</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Coffee break</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Session E.13</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Efficiency increase and CO₂ mitigation in iron and steelmaking: Emission avoidance from iron and steelmaking processes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>11:20 – 12:20</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Workshop</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LowCarbonFuture workshop</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>13:00 – 15:00</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**15:30 – 17:00 Farewell event, CCD South, First Floor**

---

**Session E.07.1**  
Environmental and energy aspects in iron and steelmaking: Emission avoidance from iron and steelmaking I  
**9:00 – 10:40**

**Coffee break**  
**11:00 – 11:20**

**Session E.07.2**  
Environmental and energy aspects in iron and steelmaking: Emission avoidance from iron and steelmaking II  
**11:00 – 12:00**

---

The complete program on your mobile, just scan
Tuesday, 25 June 2019
14:00 – 15:40 | Room 21 | Session E.01
Environmental and energy aspects in iron and steelmaking: Energy savings and energy efficiency optimization
Chair: C. Rein, VDEh-Betriebsforschungsinstitut GmbH, Germany

14:00 The energy saving activities at JFE Steel Corporation West Japan Works (Fukuyama), A. Higuchi, JFE Steel Corporation, Japan

14:20 Development of innovative, regeneratively heated radiant tubes with low diameter for more flexibility in heat treatment furnaces for the press hardening process, L. Giesler, RWTH Aachen University, J. Wünning, E. Cresci, J. Schneider, WS Wärmetechnik GmbH, H. Pfeifer, C. Schwotzer, N. Schmitz, RWTH Aachen University, Germany

14:40 Verification of energy saving effect by introducing dilute oxygen combustion burners, Y. Kawaguchi, Goto Steel Ltd., K. Miyagawa, S. Taguchi, Goto steel Ltd, Japan

15:00 Combustion 4.0 for better environmental footprint, A. Genaud, Fives Stein S.A.S., France

15:20 Development of a mathematical temperature model for batch annealing of cold rolled steel coils, C. Chang, China Steel Corporation, China

Tuesday, 25 June 2019
14:00 – 16:00 | Room 22 | Session E.11
Environmental and energy aspects in iron and steelmaking: New and alternative technologies
Chair: M. Strelbisky, Tallman Technologies Inc., Canada

14:00 Zinc production from EAFD at Cape Gate with the EZINEX® Process. A case study, M. Maccagni, E. Guerrini, J. Nielsen, Engitec Technologies S.p.A., Italy, F. Picciolo, Cape Gate PTY Limited, South Africa

14:20 Energy flow network optimization model for steel plants based on linear programming, Z. Hu, University of Science and Technology Beijing, China

14:40 Improvement of environmental protection and energy savings by suitable material handling systems, F. Reddemann, Aumund Fördertechnik GmbH, Germany

15:00 What is green steel? – Towards a strategic decision tool for decarbonising EU steel, V. Vogl, M. Åhman, Lund University, Sweden

15:20 Model-based optimisation for efficient use of resources and energy, H. Helakoski, VTT Technical Research Centre of Finland Ltd., S. Ollila, SSAB Europe, Finland, S. Wasbø, T. Rotevatn, Cybernetica AS, Norway, S. Moreira, IDENER, Optimización orientada a la sostenibilidad S.L., Spain, M. Schlautmann, VDEh-Betriebsforschungsinstitut GmbH, Germany, J. Backman, VTT Technical Research Centre of Finland Ltd., Finland

15:40 Sustainable steelmaking toolbox: An LCA-based approach for increasing the sustainability of electric steelmaking, M. Klein, IFU Hamburg GmbH, Germany
Tuesday, 25 June 2019
16:20 – 17:20 | Room 21 | Session E.02
Environmental and energy aspects in iron and steelmaking: Energy savings and energy efficiency optimization
Chair: M. Marion, SHS Infrastruktur GmbH, Germany

16:20  Energy artificial intelligence for effective energy imbalance cost reduction in the steel industry, C. Zaugg, Alpiq Digital AG, Switzerland
16:40  Optimization of waking beam furnace by the advanced Oxipy®-Direct Heating System, M. Potesser, Messer Group GmbH, Austria

Wednesday, 26 June 2019
9:00 – 10:00 | Room 01 | Session E.03
Environmental and energy aspects in iron and steelmaking: Alternative fuels and reductants in iron and steelmaking
Chair: V. Hille, Salzgitter AG, Germany

9:00  Incorporation of biocarbon in blast furnace ironmaking, K. Ng, L. Jia, L. Giroux, Natural Resources Canada, T. Todoschuk, ArcelorMittal Dofasco, Canada
9:20  Biocoal as a carburizing agents in foundry processes in respect to improving the environmental balance, S. Freitas Seabra da Rocha, M. Borowycz, Hochschule Ruhr West, Germany
9:40  Effects of simultaneous carbonization and pulverization process of biomass via heat storage materials at high temperatures, D. Maruoka, H. Sumikawa, T. Murakami, E. Kasai, Tohoku University, Japan
<table>
<thead>
<tr>
<th>Time</th>
<th>Session E.09</th>
<th>Session E.06</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00</td>
<td>Last untapped potential in waste heat recovery – dry slag granulation, A. Fleischanderl, T. Fenzl, R. Neuhold, Primetals Technologies Austria GmbH, Austria</td>
<td>RECYRON®: Idea to Innovation to Technology in Zero-Waste Ironmaking, A. Bhattacharyya, RECYRON Engineering &amp; Consulting e.U., Austria</td>
</tr>
<tr>
<td>9:20</td>
<td>Activation of hydraulic properties in BOF slags by carbo-thermal reduction with simultaneous phosphorus removal, S. Windisch, Montanuniversität Leoben, Austria</td>
<td>Trace element modelling and optimisation of byproduct use in an integrated steelworks, C. McMahon, University of Queensland, Australia</td>
</tr>
<tr>
<td>9:40</td>
<td>Steel slag processing in MSC, S. Feghhi, Mobarakeh Steel Company, Iran</td>
<td>Synergistic use of by-products in the production of FeMn alloys, F. Blaffart, CRM Group, Belgium</td>
</tr>
<tr>
<td>10:20</td>
<td>Best practices in refractories waste management, A. Soto, Sidenor Investigación y Desarrollo S.A., D. Maza, Sidenor I+D, Spain</td>
<td></td>
</tr>
<tr>
<td>10:40</td>
<td>Binder-free compaction: a new technology to enable EAF by-products recycling, J. Banchet, Eurotab S.A., B. Bramaud Grattau, Gaura Consulting, FRANCE, J. Steiler, JMS CONSULT, C. Coenraets, Eurotab, France</td>
<td></td>
</tr>
</tbody>
</table>
Wednesday, 26 June 2019
10:20 – 12:00 | Room 02 | Session E.16.1
Efficiency increase and CO2 mitigation in iron and steelmaking: Energy management systems, energy and waste heat recovery I
Chair: O. Lingiardi, Ternium Argentina S.A., Argentina

10:20 Waste heat recovery potential in integrated steel plants in the steel industry in Germany, H. Rosemann, VDEh-Betriebsforschungsinstitut GmbH, M. Sprecher, German Steel Federation, Germany
10:40 All-in-one energy saving solution in steel plant, Z. Lu, Toshiba Mitsubishi-Electric Industrial Systems Corporation, S. Shinohara, Y. Osaka, H. Imanari, TMEIC, Japan
11:00 Operational results of new generation sinter shaft cooler, M. Böberl, J. Reidetschläger, M. Kastner, K. Zellinger, Primetals Technologies Austria GmbH, Austria
11:20 How to recover energy from a steel reheating furnace, L. Cioriciu, Cockerill Maintenance & Ingénierie S.A., Belgium
11:40 Recovery of high temperature waste gas heat by thermo-electric generators, F. Mintus, VDEh-Betriebsforschungsinstitut GmbH, Germany

Wednesday, 26 June 2019
13:30 – 15:10 | Room 02 | Session E.16.2
Efficiency increase and CO2 mitigation in iron and steelmaking: Energy management systems, energy and waste heat recovery II
Chair: M. Sprecher, German Steel Federation, Germany

13:30 Potential solutions to withstand highly corrosive conditions in heat recovery systems, A. Spaghetti, Sandvik AB, Italy
13:50 Residual heat valorization at Arvedi steel plant in Cremona, C. Milo, Acciaieria Arvedi S.p.A, Italy
14:10 Waste heat recovery for EAF steelmaking via calcium based energy storage, G. Hartfuß, University of Stuttgart, G. Scheffknecht, M. Schmid, Institute of Combustion and Power Plant Technology, Germany
14:30 Modelling thermal processes in the steel and iron industry, C. Rein, B. Stranzinger, E. Thienpont, VDEh-Betriebsforschungsinstitut GmbH, Germany
14:50 Roadmap towards carbon neutral steelmaking, R. Hekkens, A. Steeghs, C. Pietersen, B. van der Meulen, J. van der Stel, Tata Steel Europe Ltd., The Netherlands
Thursday, 27 June 2019
9:00 – 10:20 | Room 13 | Session E.15
Efficiency increase and CO₂ mitigation in iron and steelmaking: Carbon direct avoidance
Chair: J. Kempken, SMS group GmbH, Germany

9:00  ΣIDERWIN project: electrification of primary steel production for direct CO₂ emission avoidance., H. Lavelaine de Maubeuge, ArcelorMittal Maizières Research S.A., France
9:20  Techno-economic assessment of the transition from coal-based steelmaking to hydrogen-based steelmaking, E. Reichelt, Fraunhofer Institute for Ceramic Technologies and Systems, Germany
9:40  Transition technologies for an inevitable transformation process of integrated steelmaking route, M. Dorndorf, Tenova S.p.A., Germany
10:00 Green hydrogen for low-carbon steelmaking, K. Rechberger, A. Sasiain Conde, A. Spanlang, T. Buergler, I. Kofler, K1-MET GmbH, C. Harris, H. Wolfmeir, voestalpine Stahl GmbH, Austria

Thursday, 27 June 2019
9:00 – 10:40 | Room 01 | Session E.17
Efficiency increase and CO₂ mitigation in iron and steelmaking: Efficient and safe management and exploitation of off-gases in the steel sector
Chair: D. Algermissen, Building Materials Institute, Germany

9:00  Advanced modelling for forecasting off-gas, steam and electricity production and demand in integrated steelworks: the Gasnet Model Library, I. Matino, Scuola Superiore Sant’Anna, A. Wolff, VDEh-Betriebsforschungsinstitut GmbH, Germany, S. Salame, V. Weber, ArcelorMittal Maizières Research S.A., France, A. Petrucciani, A. Zaccara, V. Colla, S. Dettori, Scuola Superiore Sant’Anna/TeCIP, Italy
9:20  Economical Mixed-Integer Model Predictive Controller for optimizing the sub-network of the BOF gas, A. Wolff, V. Colla, S. Dettori, Scuola Superiore Sant’Anna-TeCIP Institute, Italy, S. Bialek, F. Mintus, VDEh-Betriebsforschungsinstitut GmbH, Germany
10:00 Advanced energy management system at Tata Steel in IJmuiden, R. Speets, Tata Steel Europe Ltd., D. Bernhuis, P. Pronk, Tata Steel, The Netherlands


Thursday, 27 June 2019
9:00 – 10:40 | Room 02 | Session E.07.1
Environmental and energy aspects in iron and steelmaking: Emission avoidance from iron and steelmaking I
Chair: A. Bhattacharyya, RECYRON Engineering & Consulting e.U., Austria

9:00 Adding intelligence to environmental plants – the digital gas-cleaning plant, T. Steinparzer, A. Fleischanderl, F. Hartl, Primetals Technologies Austria GmbH, R. Schmied, Kappa Filter Systems GmbH, Austria

9:20 The latest technology of CDQ (Coke Dry Quenching) system, K. Itakura, Nippon Steel & Sumikin Engineering Co., Ltd., Japan

9:40 Innovative solutions for diffuse dust monitoring in the steel Industry, P. Bourrier, Aloatec SARL, France

10:00 Application of wet-type electrostatic precipitators in BOF primary gas cleaning systems, experiences and operating results of the first hydro hybrid filter systems, T. Wübbels, SMS group GmbH, Germany

10:20 Comparison of emissions of conventional and shaft-based electric arc furnaces, H. Beile, Primetals Technologies Germany GmbH, Germany, T. Steinparzer, Primetals Technologies Austria GmbH, Austria

Thursday, 27 June 2019
11:00 – 12:00 | Room 02 | Session E.07.2
Environmental and energy aspects in iron and steelmaking: Emission avoidance from iron and steelmaking II
Chair: R. Lin, AG der Dillinger Hüttenwerke, Germany

11:00 CARLA®: CMI’s patented and "ready-to-install" small scale acid regeneration system to efficiently eliminate waste acid streams from galvanizing and pickling plants, D. Konlechner, Kon Chemical Solutions, Austria

11:20 Meeting local requirements with high performance environmental solutions, P. Trunner, T. Steinparzer, H. Pasteiner, A. Steinwandter, Primetals Technologies Austria GmbH, Austria

11:40 Improvement of work safety and reduction of environmental issues with fire resistant lubricants in steel plants, T. Mattern, R. Knecht, Quaker Chemical B.V., The Netherlands
Thursday, 27 June 2019
11:20 – 12:20 | Room 01 | Session E.13
Efficiency increase and CO₂ mitigation in iron and steelmaking: CO₂ capture in iron and steelmaking processes
Chair: J. van der Stel, Tata Steel Ltd., The Netherlands


11:40 Steel mills advantage for CO₂ lean methanol production – a brilliant example for symbiosis between chemistry and steel –, G. Harp, Harp Process Chemistry Consulting, Germany

12:00 CO₂ capture in combination with the Hilsarna process, S. Santos, Tata Steel Europe Ltd., The Netherlands
Works visits

Conference participants are offered works visits scheduled to take place directly after the Conference. Information and explanations during the plant tours will be provided in English. Transportation to the various plants will be by bus from the Congress Center Düsseldorf CCD South. Detailed information material will be distributed together with the Conference documents. Participation on these tours must be booked along with the registration for the Conference and the fees have to be paid together with the Conference fees. In required cases return via Rhein-Ruhr-Airport Düsseldorf will be offered, arrival times are due to the traffic situation.

Please note that the number of places for the works visits is limited and will be offered on a first come, first served basis.

Works visit No. 1: 24.06.2019
thyssenkrupp Steel Europe AG
Location: Kaiser-Wilhelm-Str. 100, 47166 Duisburg, Germany

Duisburg is Europe’s biggest steelmaking site. The thyssenkrupp site is almost five times as big as Monaco. The full steelmaking process can be experienced here first-hand. In the panorama cinema you will learn all about steel from different perspectives. On the site you will be given an insight into the world of blast furnaces, melt shops and rolling mills, and get an impression of steel’s innovation potential.

Schedule:
8:45  Departure by bus from CCD South
10:00 Welcome and introduction to thyssenkrupp Steel Europe
13:00 Departures
14:00 Arrival at CCD South

Number of participants: max. 45
Fee: 100 € per person

Works visit No. 2: 28.06.2019
Coke plant Schwelgern of Pruna on the site of thyssenkrupp Steel Europe AG
Location: Alsumer Steig 100, 47166 Duisburg, Germany

Start up 2003; 2 batteries with 140 coke ovens; oven dimension: 20.8 m length, 8.43 m height, 0.59 m width; capacity: 2.6 mill t coke/a

Schedule:
9:00  Departure by bus from CCD South
10:00 Welcome and introduction to coke plant Schwelgern

Plant tour to coke plant
Research-Center Coal&Coke
Quick lunch

13:30  Departure
14:00  Arrival at CCD South
(way via Düsseldorf Airport possible if requested)
Number of participants: max. 25
Fee: 70 € per person

Works visit No. 3: 28.06.2019
DK Recycling und Roheisen GmbH
Location: Werthauser Straße 182, 47053 Duisburg, Germany

This small plant is specialised in processing steel works recycling materials to produce foundry iron and zinc.

Sinter plant No. 1: Start-up 1981; last modernisation 1998; suction area 60 m²; capacity: 0.5 mill t sinter / a

Blast furnace No. 3: First blow-in 1974; last relining 2016; hearth diameter 5.5 m; working volume: 580 m³; capacity: 0.3 mill t foundry iron / a

Schedule:
9:00  Departure by bus from CCD South
10:00  Welcome and introduction to DK Recycling and Roheisen
10:15  Visit to sinter plant No. 1 and blast furnace No. 3
12:30  Light business lunch
13:30  Departure
14:30  Arrival at CCD South
(way via Düsseldorf Airport possible if requested)

Number of participants: max. 25
Fee: 50 € per person

Works visit No. 4: 28.06.2019
AG der Dillinger Hüttenwerke

Location: Gate 1, Werkstraße 1, 66763 Dillingen, Germany
Visit Schedule:
7:30  Departure by bus from CCD South
11:30  Arrival at the visitor center, introduction to Dillinger, production movie, Personal Protective Equipment will be distributed
- Drive to port, coke plant, blending yards
- Blast furnace 5 (observation of the casting hall from the visitor platform)
- Drive to the slabyard and the steelplant, rolling mill (observation of four-high stands 1 and 2)

Light lunch will be served during the visit

14:00  Departure
17:30  Arrival at CCD South
(way via Düsseldorf Airport possible if requested)
Number of participants: max. 25
Fee: 50 € per person
Works visit No. 5: 28.06.2019
Hüttenwerke Krupp Mannesmann GmbH
Location: Mannesmannstrasse 2, Tor 2, 47259 Duisburg-Huckinglen, Germany

Visit:
Coke plant: Start-up 1984 / 2014; 2 batteries; 140 coke ovens; oven dimension: 18 m length, 7.85 m height, 0.55 m width; capacity: 2.32 mill t coke / a

Sinter plant 1: Start-up 1972; last modernisation 2001; suction area 420 m²; capacity: 6.0 mill t sinter / a

Blast furnace A: First blow-in 1973; last relining 2009; 10.3 m hearth diameter; 2449 m³ working volume; coal injection; capacity: 2.5 mill t hot metal

Basic Oxygen Furnace Shop
First start 1966, last modernisation 1983, 2 BOF 275 t, capacity 5.67 mill t crude steel / a

Continuous casters:
Bloom caster 1: Start-up 1981; last modernisation 2002; 6 strands; bloom diameter: 180 – 240 mm; capacity: 1.4 mill t / a
Bloom caster 2: Start-up 1984; 5 strands; bloom diameter: 180 – 406 mm; capacity: 1.2 mill t / a Continuous slab caster:
Slab caster 1: Start-up 1967; last modernisation 2013; 4 strands; slab size: 260 mm thickness, 325 – 675 mm width; capacity: 0.96 mill t / a
Slab caster 2: Start-up 1967; last modernisation 2006; 2 strands; slab size: 260 mm thickness, 800 – 1200 mm width; capacity: 1.8 mill t / a
Slab caster 3: Start-up 2000; 2 strands; slab size: 260 mm thickness, 850 – 2100 mm width; capacity: 3.0 mill t / a

Schedule:
8:00  Departure by bus from CCD South
8:30  Welcome and introduction of Hüttenwerke Krupp Mannesmann GmbH
9:45  Visit to coke plant
10:45 Visit to blast furnace A and sinter plant 1
12:30 Light business lunch
13:35 Visit to continuous casting plant
15:00 Departure
16:30 Arrival at CCD South
(way via Düsseldorf Airport possible if requested)

Number of participants: max. 40
Fee: 100 € per person
Compliance with cartel-law regulations during association work

The work done by the joint organisations of the steel industry thrives on representatives from competing undertakings getting together and exchanging information on topics, experiences and objectives of mutual interest. However, this may not lead to a situation where competition between steel undertakings is restrained or excluded to the disadvantage of their customers or suppliers.

At all events, committee meetings and other get-togethers of the organisations, no matters inadmissible under cartel law or otherwise questionable may be dealt with.

Not only explicit agreements, e.g. on quantities, prices or capacities, but also all other forms of cooperation which lead to coordinated action in competition (concerted practices) are inadmissible.

The exchange, discussion or unilateral disclosure of what is referred to as strategic information or sensitive data is prohibited.

It is not a matter of what attendees hope to achieve by their conduct, but whether it is capable of restricting competition or does in fact have a restrictive effect on competition.

The Steel Institute VDEh Guidelines on Adherence to Cartel-Law Regulations shall be followed in all respects.
Deemed (but not exhaustively) to be **strategic information or sensitive topics** is, in particular, information that allows conclusions to be drawn about market behaviour:

- Prices, price components, price-related factors, price calculations and elements of calculation, price rises or price reductions, costs;

- Production quantities and delivery quantities, quotations, sales figures, turnover, market shares, customers & clients, suppliers, exports, destinations, contractual terms;

- Capacities, capacity utilisation, warehouse stocks and days of inventory, delivery times, closures, production stoppages, production restrictions, investments;

- Future developments of certain products, strategies.

If the meeting chairperson, an association member or another attendee should discover that a **breach** of cartel-law regulations is manifesting itself, that person must draw the attention of the other attendees to such inadmissibility and make efforts **to end the critical conduct**. Also in case of doubt as to admissibility under cartel law, the relevant work must cease without delay and **legal advice must be obtained**.
The Swedish Steel Producers’ Association Jernkontoret wants to welcome you to the 5th ESTAD Conference

Stockholm, 14–18 of June 2021

www.estad2021.com
Evening Event / Conference Dinner
Panorama view of Düsseldorf / Large-scale outdoor patio

Tuesday, 25 June 2019, 18:00 – 23:00

MS RheinEnergie: the superlative on the Rhine

All conference participants will have the opportunity to join the conference dinner on the river boat MS RheinEnergie. There is no doubt that MS RheinEnergie is the leading event ship in Europe, setting benchmarks in innovation. Many spectacular events have taken place on board. Even Pope Benedict XVI chose the ship in summer 2005 to greet from the sundeck the thousands of pilgrims gathered on the banks of the Rhine for World Youth Day. The event ship, built in 2004, surpasses with its central inside stage all expectations of a conventional ship and provides extraordinary possibilities.

The conference participants can reach MS RheinEnergie with a short walk from CCD South. Ship landing stage Schnellenburg, Rotterdamer Straße 120, 40474 Düsseldorf
Registration and Get-together
Monday evening, 24 June,
Registration: 17:00 – 21:00
Get-together: 18:00 – 21:00
Location: CCD South, Ground Floor
There will be entertainment and a finger buffet. Accompanying persons are also welcome free of charge.

Address
Congress Centre South
Stockumer Kirchstr. 61
40474 Düsseldorf, Germany

Farewell Event
Thursday, 27 June,
Time: 15:30 – 17:00

Location: CCD South, First Floor
Including announcement of the 5th ESTAD 2021
Ground floor

Ship Evening Event, 100m walk
Rotterdammer Straße 120,
40474 Düsseldorf
Layout of CCD South / First & Second Floor

First & Second Floor

Farewell Event
27.06.2019
15:30 – 17:00

Restaurant

Rooms

Speaker preparation

Room 1

Restaurants

2nd Floor

1st Floor

Foyer CCD Süd

Rooms 5 – 8

20
21
22

9
10
11

18
19
17

16

14

15

VIP

5
6
7
8

4
3

2

91011

12

13

14

15

16

17

18

19

20

21

22

26
27
28
Information

The registration fee includes:
- Admission to the sessions of METEC and 4th ESTAD
- Electronic Proceedings with all written manuscripts
- Lunch and all coffee breaks on booked conference days
- Invitation to the Get together and Evening event
- Permanent ticket for the METEC, GIFA, THERMPROCESS and NEWCAST trade fair exhibitions
- Ticket for all local transport systems for the greater Düsseldorf area

Program changes

Changes in the program are possible. The Steel Institute VDEh is not responsible for speaker cancelations and the content of the presentations and will not reimburse for any cancelations.

Important information concerning participation in the Conference
Your registration will be confirmed via e-mail. Please present your letter of confirmation or e-mail when registering at the Conference office. Please note that participation is only granted if payment has been received.

Services / Hotel services
We offer you special rates. Please look at the conference website www.metec-estad2019.com to benefit from the special contingent. Due to the limited number of rooms around Messe Düsseldorf, please book your room as early as possible.

Services / How to get there
The Congress Centre Düsseldorf CCD South at the Düsseldorf Exhibition Centre is easy to access by car, air and rail.

Conference office / Registration:
Monday, 24 June 17:00 – 20:00
Tuesday, 25 June 8:00 – 18:30
Wednesday, 26 June 8:00 – 18:30
Thursday, 27 June 8:00 – 18:00
Registration / How to get to CCD South

Registration

Registration at the conference office – office hours:
Monday, 24 June 17:00 – 20:00
Tuesday, 25 June – Thursday, 27 June starting 08:00

How to get to CCD South

By car
North Rhine-Westphalia has a closely-woven autobahn (freeway) network where almost all routes lead to Düsseldorf and the Trade Fair Centre. You can’t really go wrong – especially as Messe Düsseldorf is clearly signed wherever you look. Just follow the marked routes and in no time you’ll reach the two main car parks (P1 and P2). From there it’s just a short (and free) shuttle-bus ride to the entrances.

On the map you’ll find us on the right side of the Rhine, directly accessible via the A3 and A44 motorways.

By air
The airport is located just three kilometres from the Düsseldorf trade fair centre. You can reach our trade fairs in a matter of minutes by taking the no. 896 bus or a taxi. From the airport, you can also travel quickly and conveniently to Düsseldorf’s city centre and your hotel. Further information about Düsseldorf airport is also available on the website www.Düsseldorf-international.de.

Airport Information: +49 211-421-0
Airport Police: +49-211-421-2266
By train
The central railway station at Konrad-Adenauer-Platz is located right in Düsseldorf’s city centre and is one of the most cutting-edge facilities in Europe. There, you’ll find a Messe Düsseldorf information desk, open for business during most trade events. Our friendly staff will be happy to help with any questions you might have. During events, buses and subway trams travel between the station and the Trade Fair Centre at frequent intervals. The trip by subway tram lines U78 and U79 takes about 15 minutes.

More than 1,000 trains stop in Düsseldorf every day, so you’re sure to find your ideal connection. For information, please contact Deutsche Bahn AG on +49 180/599-6633 (across Germany) or consult its online schedule information service www.bahn.de

Parking
Visitor and participant parking is available at two main car parks (P1 and P2). From there it’s just a short (and free) shuttle-bus ride to the entrances.
Host
Steel Institute VDEh | Dr.-Ing. Hans Bodo Lüngen
Soehnstr. 65 | 40237 Düsseldorf | Germany
Phone: +49 211 6707-444 | Fax: +49 211 6707-440
Mobil: +49 172 2533468
www.stahl-online.de

Congress secretariat / Organization
TEMA Technologie Marketing AG | Mr. Carsten Scheele
Aachener-und-Münchener-Allee 9 | 52074 Aachen | Germany
Phone: +49 241 88970-300 | Fax: +49 241 88970-999
Mobil: +49 173 8578800
Email: info@metec-estad.com | www.tema.de

Venue
Congress Center Düsseldorf
Stockumer Kirchstraße 61 | 40474 Düsseldorf | Germany