



8th European Oxygen Steelmaking Conference

Taranto · Italy · 10-12 October 2018

FINAL PROGRAMME

Organised by



**ASSOCIAZIONE
ITALIANA
DI METALLURGIA**

With the support of



ArcelorMittal





**PIONEERS
AT
HEART**

Experience matters. We believe imagination matters too. Curious minds question everything to find groundbreaking solutions. There is still so much to discover. So many great opportunities.

We love the heat and we love the cold. We love the glow and we love the dust. We love the quantum leaps and the small steps. We love to innovate and we love to be challenged. We love metals and we will change the way you produce it.

We are pioneers at heart.

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SCOPE

The European Oxygen Steelmaking Conference (EOOSC) series is organised in turn by one of the European Metallurgical Societies and Associations. As such it represents the most comprehensive expert knowledge in steelmaking. After 21 years, the Conference will be organized once again in Italy in Taranto. The Conference will present the state of the art technologies and developments and discuss technology issues related to the specific requirements of oxygen steelmaking. The Conference will focus on the latest development in primary steelmaking, ladle metallurgy, plant operation experience, automotive and on-line process analyses, improving steel quality and environmental protection. Equipment suppliers will present their relevant products and latest technologies in the exhibition area.

EOOSC 2018 BACKGROUND

1993	Neuss	Germany	2006	Aachen	Germany
1997	Taranto	Italy	2011	Stockholm	Sweden
2000	Birmingham	United Kingdom	2014	Trinec	Czech Republic
2003	Graz	Austria			

COOPERATING ORGANIZATIONS

- Austrian Society for Metallurgy and Materials
- Brazilian Metals and Materials Association
- Centro Nacional de Investigaciones Metalúrgicas
- Centre de Recherches Métallurgiques
- The Chinese Society for Metals
- Croatian Metallurgical Society
- Hungarian Mining & Metallurgical Society
- The Institute of Materials, Minerals and Mining
- International Stainless Steel Forum
- The Iron and Steel Institute of Japan
- Jernkontoret
- Korean Institute of Metals and Materials
- The Minerals, Metals & Materials Society
- Société Française de Métallurgie et de Matériaux
- Steel Institute VDEh
- Czech Steel Federation
- DVM, German Association for Materials Research and Testing
- Fédération Française de l'Acier



CONFERENCE CHAIRMAN

Carlo Mapelli - Politecnico di Milano, Italy

TECHNICAL & STEERING COMMITTEE

Ralf Bruckhaus - AG der Dillinger Hüttenwerke, Germany

Jiří Cupek - Třinecké Železářny a.s., Czech Republic

Guy Denier - French Steel Federation, France

Reinhard Fandrich - Stahlinstitut VDEh, Germany

Bart Gommers - Arcelor Mittal, Belgium

Pär Jönsson - KTH Royal Institute of Technology, Sweden

Hans Bodo Lungen - Stahlinstitut VDEh, Germany

Mario Marcozzi - Tenova, Italy

Giorgio Mignone - SMS Innse, Italy

Seppo Ollila - SSAB Europe, Finland

Aart Overbosch - Tata Steel Europe, The Netherlands

Giancarlo Quaranta - ILVA, Italy

Johannes Spiess - Primetals Technologies GmbH, Austria

Marc Vereecke - Arcelor Mittal, Belgium

ORGANIZING COMMITTEE

Federica Bassani - AIM, Italy

Guido Capoferri - Consultant, Italy - President of AIM Plastic Deformation of Metals Technical Committee

Sabrina De Donato - AIM, Italy

Maurizio Fusato - Feralpi Siderurgica, Italy - President of AIM Safety & Environment Technical Committee

Carlo Mapelli - Politecnico di Milano, Italy - President of AIM Steelmaking Technical Committee

Gabriele Rampinini - Forgiatura A. Vienna, Italy - President of AIM Forge Technical Committee

WEDNESDAY, 10 OCTOBER 2018

ROOM LA BASILICA

10:00 Registration of the attendees

Opening session

11:30 **Welcome addresses**

Prof. Carlo Mapelli – Conference Chairman

Dr. Marc Vereecke – Arcelor Mittal Chief Technology Officer

12:00 **Disseminating results of RFCS supported research projects on secondary metallurgy technology**

EOISC 008

B. Kleimt – VDEh Betriebsforschungsinstitut -BFI, Germany

M. De Santis, F. Cirilli - Rina Consulting–Centro Sviluppo Materiali CSM, Italy

J. C. Pierret - Centre de Recherches Metallurgiques ASBL – CRM, Belgium

J. Bjorkvall - Swerea MEFOS, Sweden

S. Millman - Materials Processing Institute–MPI, United Kingdom

12:30 **Robotic applications continuously enhancing safety in melt shops**

EOISC 022

G. Gerstorfer, T. Keplinger, A. Priesner, C. Sedivy, H. Traxinger, B. Voraberger,

S. Watzinger - Primetals Technologies Austria GmbH, Austria

13:00 lunch



WEDNESDAY, 10 OCTOBER 2018

ROOM LA BASILICA

Environmental protection I

chairperson: **Marc Vereecke**

- 14:00** **BOF gas cleaning system upgrades for increased efficiency and off-gas quality**
EOSC 041 M. Meyn, P. Klut, R. Herold - Danieli Corus, The Netherlands
- 14:20** **Valorization of slags and dusts from converter steelmaking**
EOSC 056 G. Wimmer, H. Wulfert, W. Ruhkamp, A. Fleischanderl, K. Pastucha - Primetals Technologies Austria GmbH, Linz, Austria
- 14:40** **Carbon smart utilization of process gases for low carbon, renewable transport fuels**
EOSC 020 C. De Maré, W. Van der Stricht, B. Gommers - ArcelorMittal, Luxembourg
T. Plattner, A. Fleischanderl, M. Haselgruebler - Primetals Technologies, Austria
P. Nair, C. Wolf - Lanzatech, USA
- 15:00** **Application of AOD slag as binder component in metallurgical briquettes containing wastes from paper and steel industry**
EOSC 024 T. Jarnerud, A.V. Karasev, P.G. Jönsson - KTH Royal Institute of Technology, Stockholm, Sweden
- 15:20** **Forecasting of basic oxygen furnace gas production through echo state neural networks**
EOSC 016 I. Matino, S. Dettori, V. Colla - Scuola Superiore Sant'Anna - TeCIP Institute ICT-COISP, Pisa, Italy
N. Zapata, S. Bastida, J. Bartel - ArcelorMittal Bremen, Germany
- 15:40** **Improve energy efficiency with the right recuperator tubes**
EOSC 047 A. Spaghetti - Sandvik Materials Technology, Italy
- 16:00** coffee break

WEDNESDAY, 10 OCTOBER 2018

Room La Basilica

Environmental protection II

chairperson: **Martin Schlautmann**

- 16:30** **Advanced BOF gas cleaning – minimum emissions, maximum energy efficiency for a sustainable steelmaking**
EOSC 002 T. Steinparzer, H. Pasteiner, R. Fillafer, A. Fleischanderl - Primetals Technologies, Austria
- 16:50** **Binder-free compaction: a new technology to enhance efficient recycling of by-products**
EOSC 038 C. Coenraets, J. Banchet - Eurotab, France

Charge materials and their preparation

chairperson: **Martin Schlautmann**

- 17:10** **Effect of the slag composition on the behavior of slag foaming**
EOSC 003 M. Ohta, S. Mukawa - Nippon Steel, Japan
- 17:30** **Effect of co-injection of Mg with CaO or CaC₂ for desulfurization of hot metal**
EOSC 033 A. Karasev, P.G. Jönsson - KTH Royal Institute of Technology, Stockholm, Sweden
Y. Ahmad - KTH Royal Institute of Technology, Stockholm, and SSAB, Oxelösund, Sweden
L. Gustavsson - SSAB, Luleå, Sweden
M. Brämning - Swerea MEFOS, Luleå, Sweden
- 17:50** **Estimation of trace elements in unalloyed scrap**
EOSC 052 R. Ammer, P. Reisinger, M. Egger, R. Tober, G. Salzmann - voestalpine Stahl GmbH, Linz, Austria
- 18:10** **Effect of KAlF₄ on the efficiency of hot metal desulphurisation with magnesium**
EOSC 021 F.N.H. Schrama - Delft University of Technology, Netherlands and Tata Steel, The Netherlands
E.M. Beunder - Tata Steel, The Netherlands
F. Ji - Materials Processing Institute, United Kingdom
R. Woolf, C. Barnes - Tata Steel, United Kingdom
J. Sietsma, R. Boom, Y. Yang - Delft University of Technology, The Netherlands
- 18:30** **Evaluation of inclusions in ferroalloys using electrolytic extraction**
EOSC 051 Y. Wang, A. Karasev, P.G. Jönsson - KTH Royal Institute of Technology, Stockholm, Sweden



THURSDAY, 11 OCTOBER 2018

Room La Basilica

Physical and mathematical modeling of the process I

chairperson: Bart Gommers

- 8:50** **A new approach for modelling and control of dephosphorization in BOF converter**
EO5C 015 S. Khadhraoui, H-J. Odenthal - SMS group GmbH, Germany
S. Das - SMS India Pvt. Ltd, India
M. Schlautmann - VDEh-Betriebsforschungsinstitut GmbH, Germany
K. Hack - GTT Technologies, Germany
B. Glaser - Royal Institute of Technology, Sweden
R. Woolf - Tata Steel Europe, United Kingdom
- 9:10** **Effect of top and bottom blowing conditions on spitting phenomenon in converter**
EO5C 029 S. Amago, S. Sato, Y. Takahashi, N. Kikuchi - JFE Steel Corporation, Japan
- 9:30** **Steel and slag analysis during converter blowing compared to model calculations**
EO5C 023 E.M. Beunder, A. Overbosch, F.N.H. Schrama, H.J. Visser - Tata Steel, The Netherlands
K. Gu, N. Dogan, K.S. Coley - McMaster University, Canada
- 9:50** **Design and modelling of final steel decarburation procedure through self-bubbling effect**
EO5C 045 S. Barella, C. Mapelli, D. Mombelli, A. Gruttadauria - Politecnico di Milano, Italy
E. Laghi - Università La Sapienza, Roma, Italy
V. Ancona, G. Valentino - Ilva spa in AS, Taranto, Italy
- 10:10** **Effect of bath oscillation by jet blowing on spitting generation behavior**
EO5C 018 S. Ono, T. Tamura - Nippon Steel & Sumitomo Metal Corporation, Japan
- 10:50** coffee break

THURSDAY, 11 OCTOBER 2018

Room La Basilica

Ladle Metallurgy

chairperson: Jiří Cupek

11:20 Sulphur control in special steel production at Saarstahl AG, Völklingen, Germany
EO5C 059 A. Heinen, M. Hötzel, M. Brill - Saarstahl AG, Germany

11:40 Applicability of the Ladle Furnace process model to plant operation
EO5C 030 M-A. Van Ende, I-H. Jung - Seoul National University, Korea
E. Harbers - Tata Steel, IJmuiden, The Netherlands

12:00 Towards quality in BOF steel refining – Trends and innovative plant concepts for ladle treatment
EO5C 054 C. Redl, C. Buchmaier, M. Pfennig, A. Weigl, M. Luven, R. Gottardi, H. Holzgruber - Inteco Melting and Casting Technologies GmbH, Austria

Waste Management

chairpersons: Jiří Cupek - Ralf Bruckhaus

12:20 The use of recycled stainless steel slags to replace lime for neutralization of acid baths
EO5C 049 M. De Colle, P.G. Jönsson, A. Gauffin, A. Karasev - KTH Royal Institute of Technology, Sweden

12:40 The Hybrid-Ladle: A proposition for a cost-conscious steel production referring to the application of refractory linings
EO5C 060 M. Mix, M. Gestal - Intocast AG, Ratingen, Germany
M. Knoll, J. Angelkort - Intocast AG, Krefeld, Germany

13:00 lunch



THURSDAY, 11 OCTOBER 2018

Room La Basilica

Plant operation experience

chairperson: Ralf Bruckhaus

14:00 Project highlights from recent converter revamps at AM Poland

EOISC 043

G. Wimmer, B. Voraberger - Primetals Technologies Linz, Austria
B. Zorychta - AM Poland, Dabrova Gornica, Poland

14:20 BOF process improvements by enlarged gas purging portfolio from moderate to very high gas flow rates

EOISC 063

M. Kirschen, K-M. Zettl, R. Ude - RHIMAGNESITA, Austria

14:40 BOP operation HBIS Serbia in April and May 2018

EOISC 058

G. Gijić, G. Jevtić - HBIS Serbia

15:00 Advanced data mining and machine learning for smart refractory control

EOISC 062

G. Lammer, K-M. Zettl - RHI Magnesita, Austria

15:20 ILVA plant visit - *Confirmation and details at the registration desk in Taranto*

SOCIAL EVENT

19.30 meeting point at Relais Histó reception and departure of the bus transfer

20.00 Conference dinner at **Masseria Saraceno AL FARO** - Via della Pineta 5, Taranto

THURSDAY, 11 OCTOBER 2018

Room La Palma

Automation and on-line process analyses

chairpersons: Vittorio Scipolo - Cosmo Di Cecca

- 8:50** Improving gas control and end-point prediction by BOF off gas modelling
EO5C 034 K. Premanand, A. Hofmann, V. Trappman, B. Weber - SMS group GmbH, Germany
- 9:10** Minimizing production costs with Tenova's enhanced iBOF® optimization technology
EO5C 044 V. Scipolo, D. Zuliani - Tenova, Italy
I. Todorovic - Tenova Goodfellow Inc.
- 9:30** BOF L2 process improvements at Ternium Brazil - Optimized process control and increased productivity
EO5C 042 B. Voraberger, H. Kuehboeck, R. Hubmer, S. Dimitrov - Primetals Technologies, Austria
D. Carvalho, M. Viana, H. Castro - Ternium, Brazil
- 9:50** A robotic workstation for the maintenance of the ladle sliding gate
EO5C 009 V. Colla, A. Buzzelli, R. Matino - Scuola Superiore Sant'Anna / TeCIP Institute
ICT-COISP Center, Pisa, Italy
A. Faes, M. Schivalocchi - BM Automation, Borgo Chiese, Italy
R. Pal - PSC Automatizari si Instalatii srl, Cluj Napoca, Romania
L. Romaniello - ILVA spa, Taranto, Italy
A. Schroeder - Technische Universität Dortmund, Sozialforschungsstelle, Germany
- 10:10** QuiK-Spec Multi-Lance Probe for inblow and endblow application: Your critical link to a fast converter sample analysis
EO5C 032 J. Cuypers, M. Vergauwens - Heraeus Electro-Nite, Houthalen, Belgium
- 10:30** Experience on automatic BOF tapping in an European Steel plant
EO5C 035 J. Thomasberger, K. Premanand, R. Kuczora, W. Linden - SMS group GmbH, Germany
- 10:50** coffee break



THURSDAY, 11 OCTOBER 2018

Room La Palma

Physical and mathematical modeling of the process II

chairperson: Reinhard Fandrich

11:20 Solution of the steelmaking process to prepare the increase in the phosphorus content of iron ore

EOSC 005

S-y. Kitamura - Tohoku University, Japan

11:40 Applied numerical simulation for safe and efficient process conditions of metallurgical plants

EOSC 037

H-J. Odenthal, J. Alken, A. Kemminger, F. Krause, N. Vogl - SMS group GmbH, Germany
S. Rühl - Paul Wurth S.A., Luxembourg

12:00 Design and modelling of a new valuable operative practice for phosphorus removal in LD converter

EOSC 046

D. Mombelli, C. Mapelli, S. Barella, A. Gruttadauria, R. Sosio - Politecnico di Milano, Italy
G. Valentino, V. Ancona - Ilva spa in AS, Taranto, Italy

12:20 Kinetic assessment of decarburization of stainless steelmaking process using hot metal by coupled reaction model with oxygen blowing

EOSC 031

J-I. Kim, S-J. Kim - Chosun University, Gwangju, Korea
M.O. Seok - POSCO, Gwangyang, Korea
S-y. Kitamura - Tohoku University, Sendai, Japan

12:40 BHood: a comprehensive mathematical model for BOF hood design

EOSC 057

A. Dallasta - Area GenoVeSE srl, Genova, Italy

13:00 lunch

THURSDAY, 11 OCTOBER 2018

Room La Palma

Fundamentals of oxygen steelmaking process

chairperson: Reinhard Fandrich

14:00 Study of the saturation and solid fraction of BOF slags: Thermodynamic study and interpolation equations

EOOSC 019

M. Sanchez-Brusset, G. Brosse, R. Thiounn, P. Mabelly - ArcelorMittal, France

14:20 Dynamic modeling of dephosphorization kinetics in the BOF process by using bloated droplet mechanism

EOOSC 017

B. Rout - Swinburne University of Technology, Australia and Tata Steel, Netherlands

G. Brooks, M.A. Rhamdhani - Swinburne University of Technology, Australia

Z. Li - University of Warwick, United Kingdom

F.N.H. Schrama, W. van der Knoop - Tata Steel, Netherlands

14:40 Research on the heat transfer mode of tuyere and surrounding brick applied in oxygen bottom blowing converter

EOOSC 004

S. Hu, R. Zhu, R. Liu, K. Dong, Z. Li - University of Science and Technology Beijing, China

15:20 ILVA plant visit - *Confirmation and details at the registration desk in Taranto*

SOCIAL EVENT

19:30 meeting point at Relais Histó reception and departure of the bus transfer

20:00 Conference dinner at **Masseria Saraceno AL FARO** - Via della Pineta 5, Taranto



FRIDAY, 12 OCTOBER 2018

Room La Basilica

Technologies of the primary steelmaking I

chairperson: Johannes Spiess

8:50 Conventional steelmaking route being subject to transformation

EOISC 026

P. Argenta, M. Marcozzi - Tenova spa, Castellanza, Italy
M. Dorndorf - Tenova Metals Deutschland, Essen, Germany
P. Duarte, S. Maggiolino - Tenova HYL, Mexico
O. Demir - Tenova Pyromet, Johannesburg, South Africa

9:10 Early slopping detection based on data-driven methods

EOISC 040

N. Uebber, D. Beckers, F. Fanghänel, A. Krasilnikov, H-J. Odenthal - SMS group GmbH, Düsseldorf, Germany
R. Kromarek - Salzgitter Flachstahl GmbH, Salzgitter, Germany

9:30 Upgrades and improvements in substance sampling and measurement technology: adding 21st century BOF process control capability to existing systems

EOISC 028

R. Kloetstra, B. van den Berg, P. Gootjes, R. Imming, Y. Lytvyniyuk - Danieli Corus, The Netherlands

9:50 Improvement of De-Phosphorus in BOF process

EOISC 013

C.O. Lee, J.O. Jo, B.J. Song, C.H. Chang, Y.D. Jeon, T.I. Yoon, S.H. Kim, J.G. Won - HYUNDAI STEEL, Korea

10:10 Revamping of BOF converters – An overview of Danieli’s developments and references

EOISC 027

G. Staudinger, M. Skoriansz, R. Kloetstra - Danieli Corus, The Netherlands

10:30 A study on the supersonic jet behavior for soft blowing in converter process

EOISC 010

D-Y. Shin, C-S. Ha - POSCO, Pohang Korea
J-H. Kwon, K-W Lee, J-W. Han - Inha University, Incheon, Korea

10:50 coffee break

FRIDAY, 12 OCTOBER 2018

Room La Basilica

Technologies of the primary steelmaking II

chairperson: **Giorgio Mignone**

- 11:20** Flexibility in charge materials and low-emission production with CONPRO
EOSC 036 A. Frankenberger, T. Henkel, P. Starke - SMS group GmbH, Düsseldorf, Germany
- 11:40** Flexible Modular Furnace (FMF®) - Result and application in recent installation
EOSC 061 C. Cattalini, M. Marcozzi, P. Stagnoli - Tenova spa, Castellanza, Italy
M. Dorndorf - Tenova Metals Deutschland, Essen, Germany

Technologies of Stainless Steel

chairperson: **Giorgio Mignone**

- 12:00** Recent innovations and references in stainless steelmaking
EOSC 055 G. Wimmer, B. Voraberger, K. Pastucha - Primetals Technologies Austria GmbH, Linz, Austria
- 12:20** Modernization of 60t AOD converter at Tubacex Aceralava: design, start-up and operational results
EOSC 012 G. Zanella, L. Gottellini - SMS Innse, Italy
I. Ibarondo - Tubacex, Spain
- 12:40** On the heterogeneity of AOD slags in different stages of blowing
EOSC 007 E-P. Heikkinen, V-V. Visuri, T. Fabritius - University of Oulu, Finland
- 13:00** The electrohydraulic torque retainer at AOD converter is the innovative solution to reduce force on the gearbox
EOSC 039 A. Frankenberger, D. Beckers - SMS group GmbH, Düsseldorf, Germany
- 13:20** End of the Conference

**POSSIBLE CHANGES TO THE PROGRAMME WILL BE
COMMUNICATED DURING THE CONFERENCE**



TIMETABLE

WEDNESDAY, 10 OCTOBER 2018

10.00	Registration of the attendees	
	Room La Basilica	
11.30	Opening Session	
13.00	lunch	
14.00	Environmental protection I	
16.00	coffee break	
16.30	Environmental protection II	
	Charge materials and their preparation	

THURSDAY, 11 OCTOBER 2018

	Room La Basilica	Room La Palma
8.50	Physical and mathematical modeling of the process I	Automation and on-line process analyses
10.50	coffee break	
11.20	Ladle Metallurgy Waste management	Physical and mathematical modeling of the process II
13.00	lunch	
14.00	Plant operation experience	Fundamentals of oxygen steelmaking process
15.20	Ilva plant visit*	
19.30	Departure of the bus transfer for the Conference dinner	
20.00	Conference dinner	

FRIDAY, 12 OCTOBER 2018

	Room La Basilica
8.50	Technologies of the primary steelmaking I
10.50	coffee break
11.20	Technologies of the primary steelmaking II Technologies of stainless steel
13.20	End of the Conference

* Confirmation and details at the registration desk in Taranto

GENERAL INFORMATION

CONFERENCE VENUE

The Conference will be held at Relais Histò San Pietro sul Mar Piccolo in Taranto (Italy), Via Santandrea Circummarpiccolo (www.relaishisto.it).

LANGUAGE

The official language of the Conference will be English.

REGISTRATION INFORMATION

REGISTRATION FEES - Standard registration fees

	AIM MEMBER	NON MEMBER
SESSION CHAIRPERSON	€ 570	€ 670
COMMITTEE MEMBER		
PARTICIPANT (NON-PRESENTER)	€ 750	€ 850
EXHIBITOR / SPONSOR	€ 660	€ 760
STUDENT*		€ 450

Additional ticket for Social event for accompanying persons: € 122 (22% VAT included)
(includes only the social event on October 11)

*Students will have to provide valid proof of student status. AIM membership and the Social event on October 11 are not included in the student registration fee.

CONFERENCE REGISTRATION FEES INCLUDE

- Admittance to technical sessions and to the table-top exhibition
- Conference bag with electronic proceedings
- Social event on October 11
- Coffee breaks
- Lunches

For non-members the fee includes AIM Membership for the last quarter of 2018 and for the year 2019.



INSURANCE

The Organising Secretariat cannot assume any responsibility for personal accident, loss or damage to the private property of participants and accompanying persons, which may either occur during or arise from the Conference. Participants should therefore take whatever steps they consider necessary as regards insurance.

SOCIAL PROGRAMME

For the evening of October 11, AIM planned a Conference dinner, in order to give delegates the opportunity to meet informally:

19.30 meeting point at Relais Histó reception and departure of the bus transfer, which will serve also whom is staying in other hotels. More information will be given directly at the registration desk in Taranto.

20.00 Conference dinner at **Masseria Saraceno AL FARO** - Via della Pineta 5, Taranto

The dinner will be fish-based.

Dress code for men: closed-toe shoes, dress shirts and long trousers.

MOBILE/CELL PHONE

Mobiles must be kept turned off or in silent mode in all Conference rooms.

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Organising Secretariat



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