12th International Seminar

Electrical Engineering of Arc Furnaces

19 to 21 May 2015, Düsseldorf, Germany

TARGET GROUP
Leading experts will present basic principles and new technologies of electric steelmaking for maintenance and operating personnel, supervisors responsible for plant and unit operations and managers. Steelshop installers, third party inspectors, and contract maintenance personnel will particularly benefit from detailed discussions on new developments and techniques.

CHAIRMAN
Prof. Dr.-Ing. Klaus Krüger,
Max Aicher GmbH & Co. KG

SPEAKERS
Dipl.-Ing. Markus Abel, Siemens VAI Metals Technologies, Willstätt • Prof. Dr.-Ing. Detmar Arlt, University of Applied Sciences Düsseldorf • Dipl.-Ing. Arne Arnold, SGL Carbon GmbH, Meitingen • Dipl.-Ing. Egon Kirchenmayer, Siemens AG, Nürnberg • Dr.-Ing. Bernd Kleimt, VDEh-Betriebsforschungsinstitut BFI, Düsseldorf • Prof. Dr.-Ing. Klaus Krüger, Max Aicher GmbH & Co. KG • Prof. Dr.-Ing. Herbert Pfeifer, RWTH Aachen University

PROGRAMME
Physics of Furnace-Arcs • Equivalent Circuit-Diagram of AC-Furnaces • Short Circuit and Operating Reactance • Circle Diagram of AC-Furnaces • Power Supply and Requirements of the Supply Network • Furnace Transformers • Design of the High-current System for AC-Furnaces • Electrical Layout of Electric Arc Furnaces • Energy Balance of the Electric Arc and the Arc Furnace • Graphite Electrodes for EAFs • Power Converters and Static Var Control • Power Control of AC Arc Furnaces • Electric Principles of DC-Furnaces • Energetic Modelling of the Electrical Arc Furnace Process • Foaming Slag Control

ORGANISATION / REGISTRATION
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VENUE
Courtyard by Marriot Seestern
Am Seestern 16, 40547 Düsseldorf, Germany
www.courtyard.com/duscy

Once we have confirmed your place on the seminar, the Steel Academy will automatically make a room booking for the participants at the Courtyard Marriot Seestern from 18 (evening prior to the seminar’s beginning) to 21 May 2015 for a special rate of € 110/night incl. breakfast. The hotel room bill will be settled by you upon departure. Please advise at registration, if you do not need a reservation or whether you would like to stay longer in the hotel.

PRICE
€ 1211* (€ 990* registration fee VAT-free plus € 221 conference package)
€ 1411 (€ 1190 registration fee VAT-free plus € 221 conference package)

* for employees of member companies and individual members of the Steel Institute VDEh

The conference package includes food and beverages during the seminar.

A free withdrawal from the seminar is possible until two weeks prior to the start. Then, 25% of the seminar fee must be paid. The total registration amount will be charged for no show or cancellation from the first day of the event. The participant also has to bear the cancellation costs of the seminar hotel.
**TUESDAY, 19 May 2015**

09:00  **Welcoming and Introduction**  
Peter Schmieding

09:30  **Physics of Furnace-Arcs**  
Klaus Krüger  
Arc length and diameter, steel bath impression, arc characteristic, instantaneous voltage and current, arc deflection

10:30  Coffee Break

11:00  **Equivalent Circuit-Diagram of AC-Furnaces**  
Klaus Krüger  
Single phase and three phase circuit-diagram, application of complex variables, vector diagrams, short circuit reactance

12:15  Common Lunch

13:30  **Short Circuit and Operating Reactance**  
Klaus Krüger  
Two and three phase short circuit test, shift of the neutral point, model and effect of the arc reactance

14:30  **Circle Diagram of AC-Furnaces**  
Klaus Krüger  
Calculation of circle and furnace power diagram

15:30  Coffee Break

16:00  **Power Supply of Electric Arc Furnaces and Requirements of the Supply Network**  
Detmar Arlt  
The influence of the power supply network of the operation of arc furnaces, network disturbances, reactive power compensation

at the same time:  **Tutorial: Calculation of Circle Diagrams of AC-Furnaces**  
Participants calculate circle diagrams of their AC-EAFs

19:00  Common Dinner

**WEDNESDAY, 20 May 2015**

09:00  **Furnace Transformers**  
Egon Kirchenmayer  
Basic principles of a transformer, furnace transformer with direct regulation, booster-transformer, voltage drop, influence of the transformer- and system-impedances, limits of voltage and power

10:30  Coffee Break

11:00  **Design of the High-current System for AC-Furnaces**  
Markus Abel  
Transformer pins, flex-strips, connection through transformer wall, power cables, electrode arms

12:00  **Electrical Layout of Electric Arc Furnaces**  
Markus Abel  
Different electrical designs for various charge materials (scrap, hot metal, DRI) and for various grades of steel (carbon or stainless)

13:00  Common Lunch

14:15  **Energy Balance of the Electric Arc**  
Herbert Pfeifer  
Electrical efficiency, heat transfer from the arc to the melt, energy balance of the electric arc, parameters of the heat transfer, foamy slag, fluid flow in slag and melt

15:15  Coffee Break

15:45  **Energy Balance of the Electric Arc Furnace**  
Herbert Pfeifer  
Energy consumption, efficiency, sankey diagram of the EAF, energy recovery, scrap preheating

16:45  **Power Converters and Static Var Control for Electric Arc Furnaces**  
Detmar Arlt  
Network disturbances of DC furnaces, latest developments of power converters

at the same time:  **Tutorial: Calculation of Circle Diagrams of DC-Furnaces**  
Participants calculate circle diagrams of their DC-EAFs

19:00  Common Dinner

**THURSDAY, 21 May 2015**

08:30  **Power Control of AC-Furnaces**  
Klaus Krüger  
Control variables and control strategies of electrode position controls, thermal based power control, closed-loop reactor control

10:00  **Graphite Electrodes for Electric Arc Furnaces**  
Arne Arnold  
Production, properties, current carrying capacity and handling of electrodes, recent and future developments

10:30  Coffee Break

11:00  **Electric Principles of DC-Furnaces**  
Klaus Krüger  
System design, rectification, power diagram, closed-loop current and voltage control, arc diversion

12:30  Common Lunch

13:30  **Energetic Modelling of the Electrical Arc Furnace Process**  
Bernd Kleimt  
Model-based analysis of the energetic efficiency of Electric Arc Furnaces, dynamic modelling of energy and mass balance, online calculation of the melt temperature

14:30  **Foaming Slag Control**  
Klaus Krüger  
Effect of foaming slag. Possibilities of automated foaming slag detection and control

15:30  End of the Seminar