

Steel Academy's
18th international seminar on

Electrical Engineering of Arc Furnaces

Power unit for CO₂ neutrality

18 - 20 February 2025,
Düsseldorf, Germany



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TARGET GROUP

The electric arc furnace is taking on a completely new importance in the CO₂ neutral, hydrogen-based process routes of steel production and will play a central role. This role also poses new metallurgical challenges. The aim of the seminar is therefore also to highlight these tasks and possible solutions – such as the OBF. However, the focus will be on the electrotechnical fundamentals of the electric arc furnace and the current state of automation technology. Presentations on the supply network, furnace transformers, energy balances and new energy supply concepts round off the programme.

CHAIRMAN

Prof. Dr.-Ing. Klaus Krüger

SPEAKERS

Dipl.-Ing. Markus Abel, tripleS, Durbach ■ Prof. Dr.-Ing. Detmar Arlt, University of Applied Sciences Düsseldorf ■ Dr.-Ing. Thomas Echterhof, RWTH Aachen University ■ Dipl.-Ing. Egon Kirchenmayer, Siemens Energy, Nürnberg ■ Prof. Dr.-Ing. Klaus Krüger, Office of engineering "Passion Steel" Klaus Krüger, Saalfeld-Surheim ■ Dr. Gerald Wimmer, Primetals Technologies Austria, Linz ■ Organisation: Peter Schmieding, Steel Academy, Steel Institute VDEh

PROGRAMME

Importance of the EAF in hydrogen concepts ■ Physics of AC and DC arcs ■ Design of the AC high-current system ■ Equivalent circuit diagram of AC-EAF & OBF ■ Short circuit and operating reactance ■ Design of the AC high-current system ■ Power supply for EAF and requirements for the supply network ■ Excursion: New energy supply concepts for the EAF ■ Furnace transformers ■ Circle and furnace power diagram of AC-EAF ■ Electrical layout of AC Furnaces ■ Melting of DRI and HBI in the EAF ■ Design and electrical system of the OBF (Smelter) ■ Comparison of CO₂ neutral routes: DR - EAF versus DR - OBF - Converter ■ Closed loop power control of AC-furnaces ■ Electric principles of DC-furnaces ■ Energy balance of the EA ■ Comparison EAF – OBF/Smelter

ORGANISATION / REGISTRATION

Steel Academy / Steel Institute VDEh
Mr Peter Schmieding
Sohnstraße 65 • 40237 Düsseldorf, Germany
Tel +49 (0)211 6707-458
training@vdeh.de, www.steel-academy.com

VENUE

NH Hotel Düsseldorf City North
Münsterstraße 230 – 238
40470 Düsseldorf – Germany
<https://www.nh-hotels.com/en/hotel/nh-duesseldorf-city-nord>

The Steel Academy automatically makes a room booking for the participants at the NH Hotel Düsseldorf North from 17 (evening prior to the seminar's beginning) to 20 February 2025 for a special rate of EUR 414,00 total for 3 nights incl. breakfast. The hotel room bill will be settled by you upon departure. Please advise at your registration, if you do not need a reservation or whether you would like to stay longer in the hotel.

SEMINAR FEE

EUR 1.090,00* registration fee VAT-free
plus EUR 319,50 conference package (total 1.409,50 EUR)

EUR 1.290,00 registration fee VAT-free
plus EUR 319,50 conference package (total 1.609,50 EUR)

* for employees of member companies and individual members of the Steel Institute VDEh. Scientific staff of universities gets a 50 % off.

+++ as part of the VDEh young talents promotion employees up to 35 years of VDEh member companies receive a 50% off +++

The conference package includes food & 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.

PROGRAMME

Tuesday, 18 February 2025

- 8.30 a.m. **Importance of the EAF in hydrogen concepts**
Peter Schmieding & Klaus Krüger
- 9.15 a.m. **Physics of AC and DC arcs**
Klaus Krüger
Arc length / Steel bath impression / Arc characteristic / Instantaneous voltage and current / Arc deflection
- 10.15 a.m. coffee break
- 10.45 a.m. **Construction and components of the EAF**
Markus Abel
- 11.15 a.m. **Equivalent circuit diagram of AC-EAF & OBF**
Klaus Krüger
Single phase and three phase circuit-diagram / Complex variables / Vector diagrams / Short circuit reactance
- 12.15 p.m. lunch
- 1.30 p.m. **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
- 2.30 p.m. **Design of the AC high-current system**
Markus Abel
Transformer pins / Flex-strips / Connection through transformer wall / Power cables / Electrode arms
- 3.30 p.m. coffee break
- 4.00 p.m. **Power supply for EAF and requirements for the supply network**
Detmar Arlt
Influence of the power supply network of arc furnaces / Network disturbances / Reactive power compensation
- Excursus: New energy supply concepts for the EAF**
Detmar Arlt / Klaus Krüger
- 6.00 a.m. end of first day => afterwards common dinner

Wednesday, 19 February 2025

- 8.30 a.m. **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
- 10.15 a.m. coffee break

- 10.45 a.m. **Circle and furnace power diagram of AC-EAF**
Klaus Krüger
Calculation of circle and furnace power diagram
- 12.15 p.m. **Electrical layout of AC Furnaces**
Markus Abel
Different electrical designs for various charge materials (scrap, hot metal, DRI) and for various grades of steel
- 1.15 p.m. lunch
- 2.30 p.m. **Melting of DRI and HBI in the EAF**
Markus Abel
DRI- and HBI-production and transport / Operation with the input of DRI / Equipment design for use of DRI
- 3.30 p.m. coffee break
- 4.00 p.m. **Design and electrical system of the OBF/Smelter**
Gerald Wimmer
Hot metal production in the OBF: Metallurgical process, furnace design, furnace operations, electrical system
- 5.15 p.m. **Comparison of CO₂ neutral routes: DR - EAF versus DR - OBF - Converter.**
Markus Abel
Comparison of the two concepts for CO₂-neutral steelmaking: H₂-based direct reduction followed by either classic EAF or OBF/smelter plus converter
- 5.45 p.m. **Open discussion "around the EAF"**
=> afterwards: common dinner

Thursday, 20 February 2025

- 8.30 a.m. **Closed loop 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 a.m. coffee break
- 10.30 a.m. **Electric principles of DC-furnaces**
Klaus Krüger
System design / Rectification / Power diagram / Closed-loop current and voltage control / Arc deflection / AC - DC
- 12.00 a.m. lunch
- 1.00 p.m. **Energy balance of the EAF**
Thomas Echterhof
Energy consumption / Efficiency / Sankey diagram of the EAF / Energy recovery / Scrap preheating
- 2.30 p.m. **Comparison EAF – OBF/Smelter**
- 3.00 p.m. end of the seminar