1st International Seminar

Hydrogen-based Reduction of Iron Ores

4 - 5 May 2020
Cologne, Germany

TARGET GROUP
- Supervisors responsible for decisions on metallurgy, energy, strategy, environmental protection
- Analysts, stakeholders and decision makers in energy transition, low carbon economy and decarbonization
- Blast Furnace staff
- R&D staff
- Raw material staff

The seminar places the emphasis on a wide overview on the subject: the first day covers the fundamentals and conditions for hydrogen-based iron ore reduction. The lectures of the second day round off the programme with practical approaches on different industrial plant concepts. Note: Both, during lectures and discussions as well as in the breaks of the seminar, our guidelines on adherence to cartel-law regulations must be followed.

DIRECTED BY
Dr.-Ing. Hans Bodo Lüngen / Prof. Dr.-Ing. Johannes Schenk

REGISTRATION FEE
EUR 910,00* registration fee VAT-free plus
EUR 140,00 conference package (total EUR 1050,00*)
EUR 1.110,00 registration fee VAT-free plus
EUR 140,00 conference package (total EUR 1250,00)

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

The conference package includes food and beverages during the seminar (incl. 19 % VAT).

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 seminar.

CONTENT
- CO₂-emissions and their mitigation in the steel industry
- Hydrogen – production and importance for the economic sector
- Thermodynamics and kinetics of hydrogen-based reduction
- Injection of carbon-hydrogen carriers into the blast furnace
- History, developments and processes of direct reduction
- Iron ores for hydrogen-based direct reduction
- Hydrogen-based direct reduction with Midrex
- Hydrogen-based direct reduction with HyU/Energiron
- Hydrogen-based direct reduction with Circored
- Hydrogen-based direct reduction for iron ore fines

ORGANISATION
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VENUE / SEMINAR HOTEL
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The Steel Academy will automatically make a room booking for the participants at the art’otel Cologne from May, 3rd to 5th, 2020 for a special rate of EUR 110,00 per night incl. breakfast. The hotel room bill will be settled by you upon departure. Please advise at registration, if you do not need a room or whether you would like to stay longer in the hotel.
Monday, 4th of May 2020

Chapter “Fundamentals and Conditions”

09:00 Introduction to the seminar
P. Schmieding, H.B. Lüngen, J. Schenk

09:30 CO₂-emissions and their mitigation in the steel industry
Hans Bodo Lüngen
Requirements of the EC / CO₂-emissions of steelmaking routes in use / CO₂-mitigation of the European steel industry 1990-2015 / Current projects in Europe to reduce CO₂ in steelmaking

10:15 coffee break

10:45 Hydrogen – its production and importance for the economic sector
Ilona Dickschas
Principles of hydrogen electrolysis / P2X and sector coupling / Overview of references and projects

11:45 History, developments, processes of direct reduction
Hans Bodo Lüngen
Development and plants of Midrex, HyL and Circored / Other developments without importance or realization

12:30 lunch

13:45 Thermodynamics and kinetic fundamentals of hydrogen-based reduction
Karl-Hermann Tacke
Phases, reactions, equilibria / Kinetic effects: temperature, ore, particle size, porosity, gas properties and other parameters / Morphology / Modelling approaches

15:00 Injection of carbon-hydrogen carriers into the blast furnace
Peter Schmöle
Use of different auxiliary reducing agents / Hydrogen input with hot blast, coke and auxiliary reducing agents / Effects on blast furnace operations (Raceway adiabatic flame temperature, oxygen addition, reduction rates by C and H₂, top gas composition)

15:45 coffee break

16:15 Hydrogen-based direct steelmaking with hydrogen plasma
Dipl.-Ing. Michael Zarl
Direct steelmaking / Hydrogen plasma / Smelting reduction / Kinetics and thermodynamics of hydrogen atom and ions

17:00 Iron ores for direct reduction
Rénard Chaigneau
Pellets are the natural choice for conventional DR. Also for efficient hydrogen-based reduction?

18:00 end of 1st day, afterwards common dinner

Tuesday, 5th of May 2020

Chapter “Shaft Furnace”

09:00 Hydrogen-based direct reduction with Midrex
Johannes Schenk
Process Diagram / Core Equipment / Options for hydrogen enrichment / Process limitations

10:15 coffee break

10:45 Hydrogen-based direct reduction with HyL/Energiron
Markus Dorndorf
ENERGIRON-ZR process / Principles of design / Process schemes/ CO₂ removal unit / High-C DRI – link to EAF process / Final products (DRI, HBI, Hot Metal) / Hydrogen utilization in ENERGIRON process

12:00 lunch

Chapter “Fluidized Bed Process”

13:15 Hydrogen-based direct reduction with Circored
Tobias Stefan
Basic principles of fluidized beds / Sticking in fluidized bed based direct reduction / Process Principles Circored / History Circored plant Trinidad / Process options for ultrafines

14:30 Hydrogen-based direct reduction for iron ore fines
Christian Böhm
FINORED and “Breakthrough Technology” / Status of technologies / Flowsheets / Principles of the design / Raw materials / Products / Further use of products / Reductants / Limits of the process

15:45 end of seminar