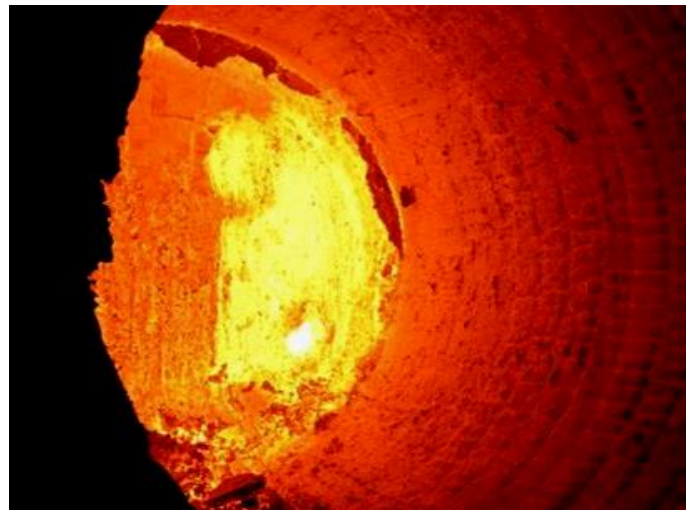


Online-Seminar / Live Stream

Refractory Technology

Applications, Wear Mechanism
and Failures

November 22nd to 24th, 2021
8:30 – 16:00 CET/Berlin time



TARGET GROUP

Maintenance and operating personnel, supervisors responsible for plant and unit operations, and managers responsible for decisions on refractory problems will learn about new materials and installation methods. Refractory installers, third party inspectors and contract maintenance personnel will particularly benefit from detailed discussions on new installation techniques and materials.

DIRECTED BY

Dr. Andreas Buhr, Frankfurt

ORGANISATION

Stahl-Akademie / Steel Academy • Stahlinstitut VDEh
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REGISTRATION FEE

EUR 640* seminar fee, VAT free
EUR 690 seminar fee, VAT-free

* for employees from member plants and personal members of the steel institute VDEh.

50% discount for:

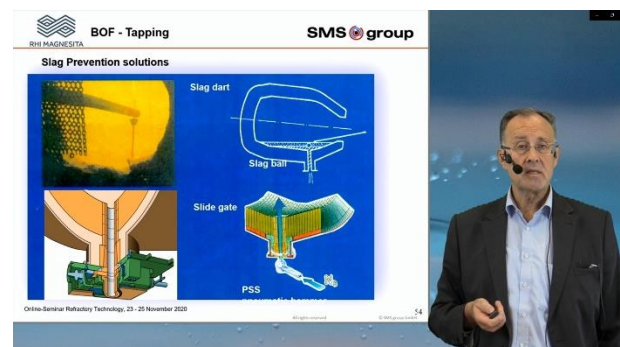
- each additional participant from the same company location.
- university staff and students
- young engineers (up to 35 years) of member companies (as part of the VDEh youth development sponsorship)

The seminar fee is VAT-free according to § 4, number 22 UStG,

Cancellation free of charge is not possible after receiving of the log-in data.

CONTENT

- Steel manufacturing process
- General overview of wear mechanisms
- Economics in refractory usage
- Failure case studies
- Laserprofile measurement
- Refractory lining concepts of the following aggregates: blast furnace, tap hole and runners, oxygen blowing converter, electric arc furnaces, steel teeming ladle, continuous casting machine



THE ONLINE SEMINAR

The seminar consists of two parts: the lectures and the exercises

The lectures are offered as a live stream via Vimeo.

The participant logs in with the password and can follow the presentations. A chat function gives you the chance to communicate with the speaker.

The exercises are done in a Teams chat. The entire group of participants is divided into subgroups. These subgroups discuss the failure cases independently in the afternoons. Andus Buhr will always “drop by” the individual groups and give assistance.

In the afternoon of the last day, all participants come together again in Teams and the groups present – under assistance of Andus Buhr - their results.

PROGRAMME



Monday, November 22nd, 2021

- 08:30 Log-In of the participants / soundcheck
- 08:45 **Introduction**
Andreas Buhr / Stefan Eigen
- 09:00 **Steel Manufacturing Process**
Andreas Buhr
- 09:45 **GENERAL OVERVIEW of Wear Mechanisms, Methods for Examination of the Refractory Material after Use**
Rinus Siebring
- Chemistry, physics, mineralogy, procedure and evaluation: wear mechanisms, types of damages, description of optional research methods to examine the wear mechanism, typical failures of refractory material after the operational application, evaluation of the samples
- 10:45 time for more questions or a coffee
- 11:00 **Refractory Lining and Wear Mechanism of BLAST FURNACE, Taphole, and Runners**
Stephan Clasen
- Lining concepts considering furnace dimensions, cooling and investment costs. Refractories for furnace shaft and hearth, wear mechanism. Intermediate repair techniques to extend furnace campaign. Development of taping technique, requirements on taphole mixes and materials used.
- 12:00 Time for questions
- 12:15 **ECONOMICS in Refractory Usage**
Rinus Siebring
- 13:15 **Failure Case Studies**
Andus Buhr
- Andus Buhr explains briefly how the failure case studies takes place in the afternoon
- 13:30 Break
- 14:15 **Failure case studies. Part 1**
- The first failure cases are presented. the participants are divided into groups and deal with the given cases independently. Microsoft teams is used for the work in groups
- 16:00 End of the day

Tuesday, November 23rd, 2021

- 08:30 **Refractory Lining Life and the Development of Refractory Materials Technology in OXYGEN BLOWING CONVERTERS, Part 1**
Jochen Schlüter and Michael Berger
- Development in the refractory materials sector, trends and philosophies. Process models and process sequences. Wear mechanism, development and adaptation of lining concepts, counteractions in the refractory materials area and detection of wear. Maintenance and care
- 09:30 Five-minute break
- 09:35 **Refractory Lining Life and the Development of Refractory Materials Technology in OXYGEN BLOWING CONVERTERS, Part 2**
Jochen Schlüter and Michael Berger

- 10:35 Time for questions
- 10:50 **STEEL TEEMING LADLE; Part 1**
Ladle Metallurgical Treatment / Refractory Stress
Hans Schröter and Andreas Viertauer
- Steel teeming ladle: relining concepts, wear mechanism, refractory lab tests, drying and heating, laser-based measurement to determine the residual thickness, ladle stirring, problem areas and safety precautions
- 11:35 Five-minute break
- 11:40 **STEEL TEEMING LADLE, Part 2**
Materials and Lining Concepts
Hans Schröter and Andreas Viertauer
- 12:25 Time for questions
- 12:40 Break
- 13:20 **Failure case studies. Part 2**
- The second part of the failure cases are presented. The participants go back into their groups and deal with the next cases
- 16:00 End of the day

Wednesday, November 24th, 2021

- 09:00 **Refractory Lining and Wear of AC and DC FURNACES**
Leandro Schöttler
- Influences on the wear, comparison AC and DC furnaces, different kinds of lining, relining hearth and sidewalls between the heats
- 10:00 Time for questions
- 10:15 **Challenges and Solutions for CONTINUOUS CASTING Refractories in Consideration of Clean Steel, Automation and Economy, Part 1**
Sven Karrasch and Georg Krumpel
- Exchangeable nozzles, ladle shrouds, subentry nozzles, stopper and tundish lining. Process- and quality- affecting factors. Re-oxidation of the steel. Steel flow in the tundish and in the mould. Damage of the casting system. Optimization of the refractory lining. Automation and economy. Influence of the refractory material on the product quality.
- 11:00 Five-minute break
- 11:05 **Challenges and Solutions for CONTINUOUS CASTING Refractories, Part 2**
Sven Karrasch and Georg Krumpel
- 11:50 Time for questions
- 12:05 **Inspection of refractory lining by means of 3D-laserprofile measurement**
Rolf Lamm
- 12:50 Time for questions
- 13:00 Break
- 13:45 **Failure case studies. Part 3: solutions.**
- Solutions: the groups present their solutions on the cases
- 16:00 End of the seminar.

SPEAKERS: Dipl.-Ing. Michael Berger, RHI Magnesita, Wien ■ Dr. rer. nat. Andreas Buhr, Almatis GmbH, Frankfurt ■ Dr. Stephan Clasen, Hüttenwerke Krupp Mannesmann GmbH, Duisburg ■ Dipl.-Ing. Sven Karrasch, thyssenkrupp Steel Europe AG, Duisburg ■ Georg Krumpel, RHI Magnesita, Leoben ■ Dipl.-Ing. Rolf Lamm, Minteq International GmbH, Duisburg ■ Dipl.-Ing. Jochen Schlüter, SMS group GmbH, Düsseldorf ■ Dipl.-Ing. Leandro Schöttler, Deutsche Edelstahlwerke GmbH, Siegen ■ Dipl.-Ing. Hans-Christian Schröter, Schröter GmbH, Blomberg ■ Ir. Rinus Siebring, Tata Steel Research and Development, IJmuiden ■ Ing. Andreas Viertauer, MAYERTON Refractories Ltd