



**Construction, Civil Engineering  
& Asset Management**



**SCANDINAVIAN ACADEMY**  
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# Course: Advanced Insulation and Refractory Materials and Work Execution

| Code | City                    | hotel              | Start      | End        | price  | Hours |
|------|-------------------------|--------------------|------------|------------|--------|-------|
| 391  | Geneva<br>(Switzerland) | Hotel Meeting Room | 2024-09-16 | 2024-09-20 | 5450 € | 25    |

## Course Description

This training course is designed to give a detailed discussion of the subject of refractory technology as related to high-temperature requirements for different industries. The course will emphasize on the practical aspects of refractory selection, installation, and repair techniques in a number of industrial applications. In order for the course material to suit participants with or without formal training and/or scientific background in the subject, the course will be delivered such that most of technical terms and concepts will be clarified by both scientific definition and examples. The course material will be prepared so that easy follow-up of the lectures and subject in general is achieved. The course is divided into nine main areas: Principles of hot processes and their requirements, Properties of refractory materials (mechanical, thermal and corrosion resistance), Refractory compositions and structures and their relation to property and performance, Refractory selection criteria, Refractory manufacturing methods, Configurations and installations techniques, Refractory system design, Performance in service, Quality and Reliability considerations. The course is designed such that no previous background in metallurgy is necessary. The course can, also, be tailored for specific needs if required by certain participants.

## Course Objective

- To familiarize participants with the main concepts and technical terms of industrial refractory materials.
- To explain to participants the different types of hot processes and their requirements.
- To explain to participants the different types of industrial refractories
- To explain to participants how to relate process requirements to refractory properties (mechanical, thermal, electrical and chemical/corrosion).
- To provide participants with the basic knowledge and skills for selection of different refractory materials based on process requirements.
- To introduce participants to different manufacturing methods applied to refractory materials and their installation techniques.
- To explain to participants how refractory materials respond to different service conditions and issues related to their quality and reliability.

## Who Should attend?

Design engineers, process engineers, maintenance engineers and personnel, refractory supervisors and refractory



personnel, product development engineers and managers, mechanical engineers, metallurgists, Inspection people, quality control engineers and technicians and people involved buying and installing refractories.

## Course Outline

### Introduction

- Technical Perspectives
- Historical Perspectives

### Foundations of Hot Processing

- Computational Quantities and Conversion Factors
- Hot Processing Temperatures and Their Measurement
- Process Chemistry and Environments

### Foundations of Refractory Application

- Contemporary Hot Processing Equipment
- Continuous Types - Vertical
- Continuous Types - Horizontal
- Batch Types - Circular
- Batch Types - Rectangular
- Other Refractory Applications

### Principles of Thermal Stability

- Melting Points of Substances
- Melting of Oxide Mixtures
- Microstructural Integrity

### Principles of Corrosion Resistance: Oxidation-Reduction

- Importance of Corrosion
- Gibbs Free Energies
- Refractory Alteration by Oxidation-Reduction

### Principles of Corrosion Resistance: Hot Liquids

- Liquid Penetration and Dissolution-Corrosion
- Factors Governing Penetration
- Factors Governing Dissolution



### **Principles of Corrosion Resistance: Hot Gases and Dusts**

- Atmospheric Penetration and Condensation
- Dusts: Deposition and Abrasion
- Conclusion: Principles of Working Refractory Construction

### **The Working Refractory Product Line**

- Classification of Working Refractories
- Maximum Service Temperatures
- Maximum Service Temperatures
- Corrosion Resistance
- Qualifications for Working Refractory Service

### **The Insulating Refractory Product Line**

- Applications and Application Criteria
- Classification of Insulating Refractories
- Physical Form and Installation of Linings

### **Refractory Practice**

- Refractory Qualifications in Review
- Refractory Practice from Qualifications
- Catalogue of Refractory Practice

### **Design Properties: Thermal and Electrical**

- Reversible Thermal Expansion
- Permanent Deformation
- Specific Heat
- Thermal Conductivity
- Electrical Conductivity

### **Design Properties: Mechanical**

- Elasticity and Plasticity
- Mechanical Characterization of Refractories
- Illustrative Mechanical Properties of Refractories

### **Refractory Manufacture**

- Consolidated Flow Diagram for Refractories
- From Raw Materials to Forming
- Forming of Masonry and Special Shapes



- Agglomeration for Sintered Grain
- Drying and Firing of Refractories
- Quality Assurance in Manufacture

#### **Refractory Installation and Maintenance**

- Structural Engineering
- Masonry Construction
- Installation of Monolithics



**The Scandinavian Academy employs modern methods in training and skills development, enhancing the efficiency of human resource development. We follow these practices:**

- **Theoretical Lectures:**
  - We deliver knowledge through advanced presentations such as PowerPoint and visual materials, including videos and short films.
- **Scientific Assessment:**
  - We evaluate trainees skills before and after the course to ensure their progress.
- **Brainstorming and Interaction:**
  - We encourage active participation through brainstorming sessions and applying concepts through role play.
- **Practical Cases:**
  - We provide practical cases that align with the scientific content and the participants specific needs.
- **Examinations:**
  - Tests are conducted at the end of the program to assess knowledge retention.
- **Educational Materials:**
  - We provide both printed and digital scientific and practical materials to participants.
- **Attendance and Final Result Reports:**
  - We prepare detailed attendance reports for participants and offer a comprehensive program evaluation.
- **Professionals and Experts:**
  - The programs scientific content is prepared by the best professors and trainers in various fields.
- **Professional Completion Certificate:**
  - Participants receive a professional completion certificate issued by the Scandinavian Academy for Training and Development in the Kingdom of Sweden, with the option for international authentication.
- **Program Timings:**
  - Training programs are held from 10:00 AM to 2:00 PM and include buffet sessions for light meals during lectures.