Corrosion Management and Materials Selection Training Course



30 Nov - 04 Dec 2026

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4100 € (Per Person)

Ref: #ACE3936_296225

Course Introduction / Overview:

This course provides a comprehensive framework for understanding and managing corrosion in the process industries. Corrosion is a persistent challenge that can lead to catastrophic failures, significant financial losses, and severe safety and environmental incidents. Effective corrosion management is not merely a maintenance task but a critical component of asset integrity management and operational excellence. This program, offered by BIG BEN Training Center, delves into the fundamental principles of corrosion science, exploring the mechanisms behind various forms of material degradation. Drawing on the foundational work of experts like Pierre R. Roberge, author of "Corrosion Engineering: Principles and Practice", participants will learn to connect theoretical knowledge with practical application. The curriculum is designed to equip professionals with the skills to implement robust corrosion mitigation strategies, from advanced materials selection for corrosive environments to the application of protective coatings and cathodic protection systems. We will cover lifecycle cost analysis, risk-based inspection (RBI) methodologies, and failure analysis techniques, ensuring a holistic approach to preserving asset value and ensuring safe, reliable operations. This course is essential for anyone responsible for the design, operation, and maintenance of industrial assets.

Target Audience / This training course is suitable for:

- Corrosion and Materials Engineers.
- Process and Chemical Engineers.
- Mechanical and Piping Engineers.
- Inspection and NDT Engineers.
- Maintenance and Reliability Managers.
- Asset Integrity Managers.
- Project Engineers and Managers.
- Plant and Operations Managers.
- Technical and Laboratory Staff.
- HSE and Safety Professionals.

Target Sectors and Industries:

- Oil and Gas (Upstream, Midstream, and Downstream).
- Petrochemical and Refining Industries.
- Chemical Processing Plants.
- Power Generation (Fossil, Nuclear, and Geothermal).
- Water and Wastewater Treatment Facilities.
- Marine and Offshore Engineering.
- Pulp and Paper Manufacturing.
- Mining and Mineral Processing.
- Governmental bodies and regulatory agencies.

Target Organizations Departments:

- Engineering and Design.
- Maintenance and Reliability.
- Operations and Production.
- Asset Integrity Management.
- Inspection and Quality Assurance.
- Health, Safety, and Environment (HSE).
- Projects and Capital Projects.
- Procurement and Supply Chain.
- Research and Development.

Course Offerings:

By the end of this course, the participants will have able to:

- Identify and classify different forms of corrosion in process equipment.
- Understand the electrochemical principles governing corrosion processes.
- Select appropriate metallic and non-metallic materials for specific service environments.
- Develop and implement comprehensive corrosion control and mitigation strategies.
- Apply industry standards from NACE, API, and ISO for corrosion management.
- Design and evaluate the effectiveness of cathodic protection and coating systems.
- Implement advanced corrosion monitoring and inspection techniques.
- Conduct systematic root cause analysis (RCA) for corrosion-related failures.
- Integrate Risk-Based Inspection (RBI) principles into asset management plans.
- Evaluate the lifecycle cost of materials and corrosion control methods.

Course Methodology:

The training methodology at BIG BEN Training Center is designed to foster an immersive and practical learning environment. This course moves beyond traditional lectures to emphasize experiential learning and direct application of concepts. We utilize a blend of interactive presentations, expert-led discussions, and detailed case studies drawn from real-world industrial scenarios, particularly from the oil and gas and petrochemical sectors. Participants will engage in collaborative group exercises, such as materials selection workshops using industry-standard charts and failure analysis simulations. These activities are designed to build problem-solving skills and encourage the exchange of ideas and experiences among peers. The instructor will facilitate sessions that challenge participants to apply theoretical knowledge to solve complex corrosion problems. Continuous feedback and Q&A sessions are integrated throughout the course to ensure concepts are thoroughly understood. The focus is on providing practical tools and frameworks that attendees can immediately apply to enhance asset integrity and operational reliability within their organizations.

Course Agenda (Course Units):

Unit One: Fundamentals of Corrosion Science and Engineering

- Introduction to Corrosion and its Economic Impact.
- Principles of Electrochemistry and Corrosion Cells.
- Thermodynamics of Corrosion: Pourbaix Diagrams.
- Kinetics of Corrosion: Polarization and Corrosion Rates.
- Major Forms of Corrosion: Uniform, Galvanic, Pitting, and Crevice.
- Environmentally-Induced Cracking (SCC, HIC, SOHIC).
- Microbiologically Influenced Corrosion (MIC).

Unit Two: Materials Selection for Corrosion Resistance

- Properties and Performance of Carbon and Low-Alloy Steels.
- Corrosion Resistance of Stainless Steels (Austenitic, Ferritic, Duplex).
- High-Performance Nickel, Cobalt, and Titanium Alloys.
- Selection of Non-Metallic Materials: Polymers, Composites, and Ceramics.
- Materials for High-Temperature Service and Oxidation Resistance.
- Understanding Materials Selection Diagrams and Charts.
- Case Studies in Materials Selection for Aggressive Environments.

Unit Three: Corrosion Control and Prevention Strategies

- Protective Coatings: Selection, Application, and Inspection.
- Principles and Design of Cathodic Protection Systems.
- Anodic Protection for Specific Environments.
- Application and Selection of Corrosion Inhibitors.
- Process Control and Environmental Modification.
- Corrosion Resistant Design Principles.
- Materials Treatment and Surface Modification.

Unit Four: Corrosion Inspection and Monitoring Techniques

- Overview of Non-Destructive Testing (NDT) for Corrosion Detection.
- Visual Inspection (VT) and Ultrasonic Testing (UT).
- Radiographic Testing (RT) and Magnetic Particle Inspection (MPI).
- Advanced Inspection Methods: Guided Wave, Acoustic Emission.
- Online and Real-Time Corrosion Monitoring Systems.
- Use of Corrosion Coupons and Probes.
- Data Analysis and Trending for Predictive Maintenance.

Unit Five: Advanced Corrosion Management and Failure Analysis

- Introduction to Asset Integrity Management Systems.
- Risk-Based Inspection (RBI) Methodology (API 580/581).
- Fitness-For-Service (FFS) Assessment (API 579).
- Systematic Failure Analysis and Root Cause Analysis (RCA).
- Techniques for Sample Collection and Laboratory Analysis.
- Developing a Comprehensive Corrosion Management Plan (CMP).
- Review of Key Industry Codes and Standards (NACE, API, ISO).

FAQ:

Qualifications required for registering to this course?

There are no requirements.

How long is each daily session, and what is the total number of training hours for the course?

This training course spans five days, with daily sessions ranging between 4 to 5 hours, including breaks and interactive activities, bringing the total duration to 20 - 25 training hours.

Something to think about:

Considering the rising cost of high-performance alloys and the push for sustainable operations, how can engineers balance the initial capital expenditure of corrosion-resistant materials against the long-term operational risks and lifecycle costs?

What unique qualities does this course offer compared to other courses?

This course distinguishes itself by providing a holistic and integrated perspective on corrosion, bridging the gap between materials science, engineering design, and strategic asset management. While many courses focus narrowly on either the theoretical science or specific mitigation techniques, this program synthesizes these elements into a cohesive management framework. We emphasize the financial and operational implications of materials selection and corrosion control, teaching participants how to perform lifecycle cost analysis and justify decisions to non-technical stakeholders. The curriculum is heavily case-study-driven, using real-world examples of failures and successes to illustrate key principles. This practical approach ensures that learning is not just academic but directly applicable to the challenges participants face in their daily roles. Furthermore, the course content is continuously updated to reflect the latest industry standards, such as API 580 for Risk-Based Inspection, and emerging challenges like managing aging infrastructure and corrosion under insulation (CUI). The focus is on developing a proactive mindset, moving from a reactive "fix-on-fail" approach to a predictive and strategic management of asset integrity.