Corrosion Control and Materials Selection for Oil and Gas Training Course



21 - 25 Dec 2026

Cairo

3700 € (Per Person)

Ref: #OG2112_274725

Course Introduction / Overview:

This comprehensive training course provides an in-depth exploration of corrosion control and materials selection, specifically tailored for the demanding environment of the oil and gas industry. Protecting the integrity of critical assets is paramount to ensuring operational safety, environmental responsibility, and economic viability. This course addresses the multifaceted challenges of corrosion, from fundamental electrochemical principles to advanced mitigation and management strategies. As detailed by the renowned academic Mars G. Fontana in his seminal work, "Corrosion Engineering," understanding the mechanisms of degradation is the first step toward effective prevention. Participants will delve into the practical application of these principles, analyzing how factors like H2S, CO2, and high temperatures impact material performance. BIG BEN Training Center has designed this program to bridge the gap between theoretical knowledge and real-world application, equipping professionals with the skills to make informed decisions on materials selection, implement robust corrosion monitoring programs, and develop comprehensive asset integrity management plans that extend the service life of vital infrastructure and prevent catastrophic failures.

Target Audience / This training course is suitable for:

- Corrosion and Materials Engineers.
- Asset Integrity Managers.
- Inspection and Maintenance Engineers.
- Pipeline and Piping Engineers.
- Process and Production Engineers.
- Facilities and Project Engineers.
- Metallurgists and Material Specialists.
- Production Chemists.
- Operations and Plant Managers.
- Technical staff involved in asset lifecycle management.

Target Sectors and Industries:

- Upstream Oil and Gas (Exploration and Production).
- Midstream Oil and Gas (Transportation and Storage).
- Downstream Oil and Gas (Refining and Petrochemicals).
- Chemical and Process Industries.
- Marine and Offshore Engineering.
- Power Generation and Utilities.
- Governmental regulatory bodies and environmental agencies.

Target Organizations Departments:

- Engineering and Design.
- Asset Integrity Management.
- Maintenance and Reliability.
- Operations and Production.
- Inspection and Non-Destructive Testing (NDT).
- Health, Safety, and Environment (HSE).
- Procurement and Supply Chain Management.
- Research and Development.

Course Offerings:

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

- Analyze the fundamental principles of electrochemistry and corrosion.
- Identify and differentiate various forms of corrosion common in the oil and gas industry.
- Evaluate the impact of environmental factors like sour and sweet service on material degradation.
- Select appropriate metallic and non-metallic materials for specific operational conditions.
- Apply industry standards from NACE and API for corrosion management and materials selection.
- Design and implement effective corrosion control strategies, including coatings and cathodic protection.
- Develop robust corrosion monitoring and inspection programs.
- Conduct basic failure analysis to determine the root cause of corrosion-related incidents.
- Integrate corrosion management into a holistic asset integrity framework.
- Assess the economic impact of corrosion and justify prevention expenditures.

Course Methodology:

The training methodology at BIG BEN Training Center is designed to foster a dynamic and engaging learning environment that maximizes knowledge retention and practical application. This course moves beyond traditional lectures to incorporate a blended learning approach. Participants will engage in interactive sessions, expert-led presentations, and collaborative group discussions that encourage the sharing of experiences and challenges. A significant portion of the program is dedicated to analyzing real-world case studies of corrosion-related failures in pipelines, refineries, and offshore platforms, allowing attendees to dissect complex problems and formulate effective solutions. Practical workshops will focus on tasks such as interpreting inspection data, selecting materials using industry software principles, and developing a risk-based inspection (RBI) plan. The course promotes a hands-on approach, ensuring that theoretical concepts are immediately reinforced with practical exercises. Continuous feedback and Q&A sessions are integrated throughout the five days to ensure all participant queries are addressed, creating a supportive and effective educational experience.

Course Agenda (Course Units):

Unit One Fundamentals of Corrosion Science and Engineering

- Introduction to corrosion and its economic impact in the oil and gas industry.
- Principles of electrochemistry, thermodynamics, and kinetics of corrosion.
- The Pourbaix diagram and its application.
- Eight forms of corrosion part one: uniform, galvanic, and crevice corrosion.
- Eight forms of corrosion part two: pitting, intergranular, selective leaching.
- Eight forms of corrosion part three: erosion corrosion and stress corrosion cracking.
- Introduction to key industry standards (NACE, API, ISO).

Unit Two Corrosion Mechanisms in Oil and Gas Environments

- Carbon dioxide (CO2) or sweet corrosion mechanisms and prediction models.
- Hydrogen sulfide (H2S) or sour corrosion and sulfide stress cracking (SSC).
- Corrosion in the presence of both H2S and CO2.
- Microbiologically Influenced Corrosion (MIC) in production and pipeline systems.
- Corrosion Under Insulation (CUI) and its detection.
- High-temperature corrosion and oxidation challenges.
- Corrosion in marine and offshore environments.

Unit Three Materials Selection for Oil and Gas Applications

- Properties and applications of carbon and low-alloy steels.
- Introduction to Corrosion Resistant Alloys (CRAs) such as stainless steels and nickel alloys.
- Selection criteria for CRAs in sour service environments (NACE MR0175/ISO 15156).
- Application and limitations of non-metallic materials (polymers, composites, elastomers).
- Welding metallurgy and its effect on corrosion resistance.
- Understanding material specifications and test certificates.
- Cost-benefit analysis in materials selection for lifecycle performance.

Unit Four Corrosion Control and Prevention Strategies

- Protective coatings and linings: selection, application, and inspection.
- Principles and design of cathodic protection systems (sacrificial and impressed current).
- The role and selection of corrosion inhibitors for production and transport systems.
- Materials selection and design considerations for corrosion prevention.
- Corrosion control in processing units, vessels, and storage tanks.
- Environmental regulations and their impact on corrosion control methods.
- Synergies and conflicts between different protection methods.

Unit Five Corrosion Management, Monitoring, and Integrity Assessment

- Developing a comprehensive Corrosion Management System (CMS).
- Techniques for corrosion monitoring: weight loss coupons, probes, and sensors.
- Inspection methods: Non-Destructive Testing (NDT) techniques for corrosion detection.
- Introduction to Risk-Based Inspection (RBI) methodology.
- Failure analysis and root cause investigation of corrosion-related incidents.
- Fitness-for-Service (FFS) assessment according to API 579.
- Data management and predictive modeling for asset lifetime extension.

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:

In an industry driven by cost-efficiency, how can engineers effectively advocate for the higher upfront investment in corrosion-resistant alloys versus the long-term operational risks and maintenance costs of using conventional materials?

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

This training course distinguishes itself by focusing on the critical intersection of materials science, engineering design, and operational asset management. Unlike programs that treat corrosion as a purely chemical phenomenon, this course frames it as a business risk that must be managed throughout an asset's lifecycle. We move beyond simply listing corrosion types and delve into the complex decision-making processes required in the field. The curriculum is built around a wealth of practical case studies drawn from real-world incidents in upstream, midstream, and downstream sectors, providing participants with a deep understanding of failure mechanisms and prevention strategies. Furthermore, the course places a strong emphasis on the application of key international standards, such as NACE MR0175/ISO 15156, ensuring that the knowledge gained is directly applicable, compliant, and aligned with global best practices. The content is structured to empower participants not just to identify corrosion, but to develop and implement comprehensive, cost-effective corrosion management plans that enhance safety, ensure regulatory compliance, and maximize the operational life and profitability of critical oil and gas assets.