



Best Technology Solutions (BTS)



Metallurgy, Corrosion & Prevention of Failures Material Selection & Properties Training program

Introduction:

The first step in safety and reliability of refinery equipment is identifying, understanding, preventing the relevant failure mechanisms. Corrosion is the primary cause of failure of components in the process industries. The success or failure of the equipment to corrosive environment to a great extent depends on the right metallurgy. Thus proper understanding of the metallurgy and corrosion phenomenon helps engineers to mitigate corrosion and to monitor it on a periodic basis, based on which, corrective actions can be taken. Premature failure of critical components like pipelines, tanks, pressure vessels, boilers and related equipment, heat exchangers and welded joints often results in operating down time, loss of production, environmental pollution and in some cases, loss of human life. Millions of dollars are spent every year by these industries to combat corrosion. The course crosses the boundaries from the fundamental information to top notch in the recent technological achievement in this field.

Who Should Attend?

Corrosion Control Engineers & Personnel, Process Engineers, Metallurgists, Inspection Personnel, Mechanical Engineers, Material Selection Personnel, Plant Contractors, Operations Engineers, Team Leaders & Supervisors, Maintenance Engineers, Maintenance Supervisors, Senior Plant Supervisors, Mechanical Engineers, Corrosion Control & Monitoring Systems Personnel, Equipment Engineers, Maintenance Engineers and Planners, Team Leaders, Managers & Coordinators, Construction Coordinators,

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Technologists, Safety Officers, Maintenance Team Leaders & Engineers, Design Engineers, Service Company Representatives, Oil and Gas Production Facilities Personnel, Chemists, Chemical Engineers, Inspectors and Inspection Engineers & Supervisors, Technicians and Supervisors, Environmental Specialists, New Petroleum Engineers, Asset Management Personnel, Construction Engineers, Refinery Chemists, Chemical Engineers, Personnel who are / will be responsible for detecting, inspecting, monitoring, controlling corrosion in oil and gas piping, pipelines used in production operations and Personnel responsible for metallurgy, corrosion or the prevention of failures in plant and equipment

Course Objectives:

By the end of this course delegates will learn about:

- Understand the fundamental theories of aqueous corrosion and dry corrosion
- Understand basic metallurgy and choice of material selection suitable for the specific application
- Enable the attendees to grasp the advanced information in preventive as well as predictive maintenance of equipment
- Present different forms of corrosion from various mechanisms and related environmental factors
- Corrosion control techniques
- Illustrate study cases pertaining to corrosion failures, mainly pipelines, storage tanks, pressure vessels, boilers and heat exchangers
- Present the advanced corrosion monitoring technologies



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- Present typical corrosion failures and to illustrate the inter-relationship between fabrication techniques, service conditions and their effect on the corrosion resistance of engineering metals and alloys

Course Outline:

- Introduction
- Review of basic metallurgy
- Review of iron carbon equilibrium diagram
- Effects of alloying elements
- Alloy steel and stainless steels
- ASTM specifications for carbon steels
- Alloy steels and stainless steels
- Mechanical properties of metals
- Materials for high temperature service
- Materials for low temperature service
- Materials of sour service (NACE standard)
- Selection of material of construction
- Selection of substitute materials
- Forms of corrosion and prevention of failure in oil and gas industries
- Common corrosion phenomenon
- Erosion/ corrosion
- Atmospheric corrosion
- Corrosion under insulation (CUI)
- Cooling water corrosion



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- Boiler water condensate corrosion
- Sulfidation
- Chloride stress corrosion cracking (CISCC)
- Caustic stress corrosion cracking (caustic embrittlement)
- Wet H₂S damage (Blistering/HIC/SOHIC/SCC)
- Case studies pertaining to the corrosion failures
- Prevention of equipment failure by choosing correct materials
- Prevention of equipment failure by choosing correct operating conditions
- Corrosion monitoring techniques
- Corrosion coupon testing
- Electrochemical resistance probe
- Ultrasonic thickness measurements
- Measurements of corrosion potential
- Alternating current impedance measurements
- Hydrogen probes
- Corrosometer probes
- Application of the corrosion monitoring methods