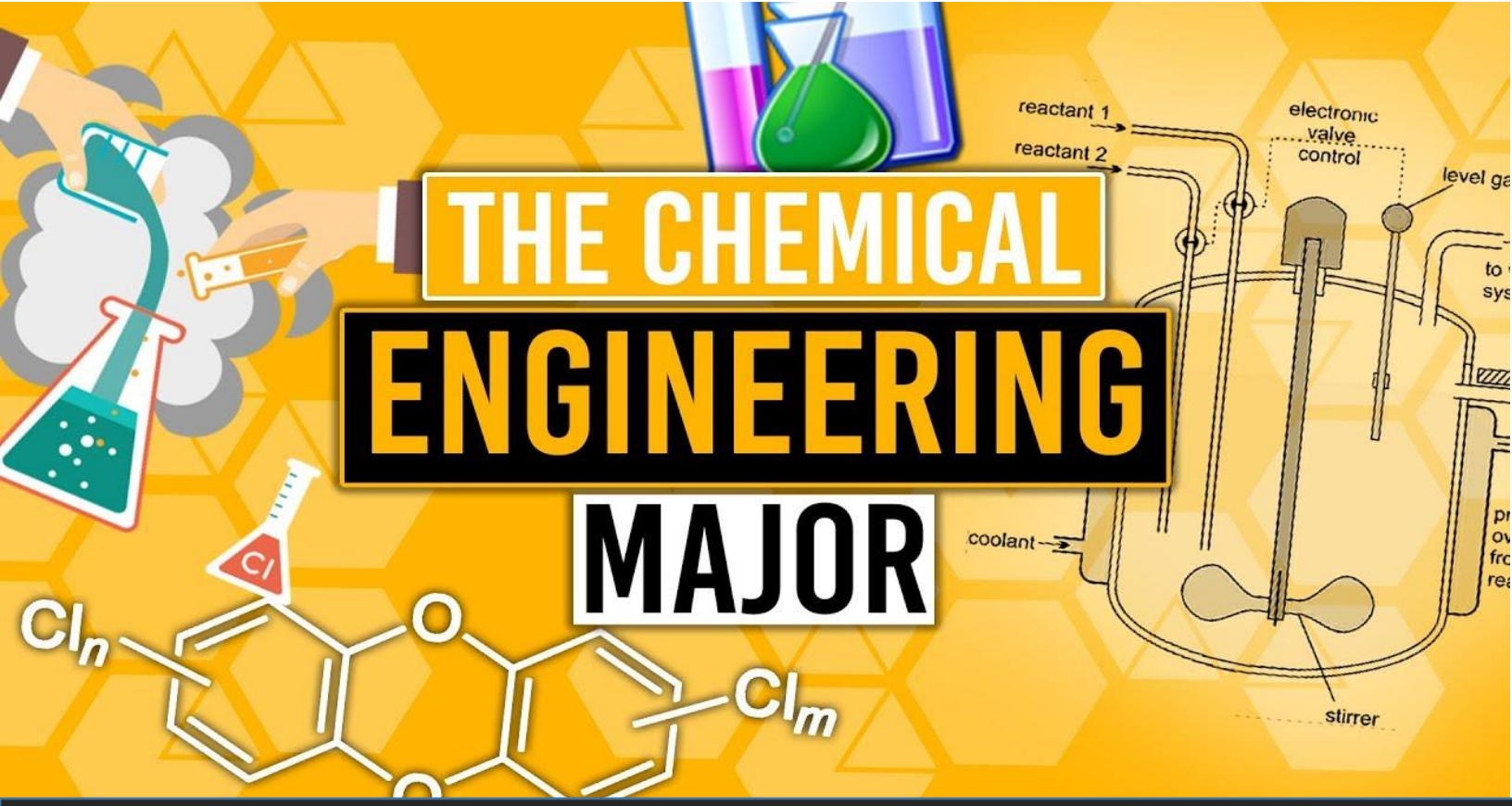

Basic Corrosion & Metal Degradation

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Training & Consultancy

Basic Corrosion & Metal Degradation

Introduction:

Corrosion is the primary means by which metals deteriorate. Most metals corrode on contact with water (and moisture in the air), acids, bases, salts, oils, aggressive metal polishes, and other solid and liquid chemicals. Certain environments offer opportunities for metals to combine chemically with elements to form compounds and return to their lower energy levels. Metals will also corrode when exposed to gaseous materials like acid vapors, formaldehyde gas, ammonia gas, and sulfur containing gases. Corrosion specifically refers to any process involving the deterioration or degradation of metal components. The best known case is that of the rusting of steel. Corrosion processes are usually electrochemical in nature, having the essential features of a battery.

The corrosion resistance of metals and alloys is a basic property related to the easiness with which these materials react with a given environment. Corrosion is a natural process that seeks to reduce the binding energy in metals. The end result of corrosion involves a metal atom being oxidized, whereby it loses one or more electrons and leaves the bulk metal. Pure metals are used in many applications. Copper, for example, is used to make the wire which goes inside electrical cables. Copper was chosen because it can be drawn into long thin wires very easily and because it is a good conductor of electricity. Pure aluminum can also be used in wiring. It is also used as a cladding material for aluminum alloy substrates.

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 Supervisors, Senior Plant Supervisors, Mechanical Engineers, Corrosion Control & Monitoring Systems Personnel, Oil and Gas Production Facilities Personnel, Chemists, Chemical Engineers, Technicians and Supervisors, New Petroleum Engineers, Asset Management Personnel, Design & Construction Engineers, Team Leaders & Coordinators, Construction Coordinators, Maintenance Engineers, Technologists, Maintenance Team Leaders & 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 be able to:

- Develop and understanding of the nature of corrosion in relation with the environment
- Gain knowledge on the different forms of corrosion
- Understand the causes of corrosion
- Understand the nature of corrosion process
- Understand the natural matching of a material with an environment

- Become familiar with the general classification of materials and causes of corrosion
- Have a good background on metallurgy and ferrous metals
- Gain a deeper understanding of materials and metallurgy
- Select materials and designs are most effective in cutting the cost of corrosion
- Know how can different forms of corrosion be designed out of the system
- Gain information on the oxidation of metals & alloys
- Know about uniform corrosion and galvanic corrosion
- Understand the difference between crevice corrosion and pitting corrosion
- Understand Microbiologically-Influenced Corrosion (MIC)
- Set guidelines for corrosion prevention
- Understand the applications and limitations of common corrosion inhibitors
- Know about the conventional methods and the electrochemical methods
- Know the emerging technologies for corrosion control, prevention, testing and monitoring

Course Outline:

Introduction to Corrosion

Basic Concepts in Corrosion & Metal Degradation

Different Forms of Corrosion

- Uniform corrosion, Galvanic corrosion
- Dealloying and graphitization (graphitic corrosion)
- Intergranular stress corrosion cracking, weld decay and knife-line attack
- Exfoliation, Crevice corrosion, Pitting corrosion
- Filiform corrosion, Microbiologically-Influenced Corrosion (MIC)
- Environment-sensitive cracking, Hydrogen Damage, Corrosion fatigue, Fretting
- Erosion corrosion, impingement attack and cavitation damage, Stray current corrosion

Corrosion Related Chemistry & Electrochemistry

Atmospheric Corrosion

- Classification of atmosphere, Absolute humidity and relative humidity
- Calculation of time-of-wetness (ToW)
- Effect of moisture thickness on corrosion
- Effect of air pollutants, Corrosion behaviour of common metals and alloys in atmospheres

Principles of Cathodic Protection

Corrosion by Soils, Corrosion by Water & Corrosion by Steam

Localized Corrosion & Stress Corrosion

Fundamentals of Inhibitors

Metallurgical Factors Affecting Corrosion

Corrosion at High Temperatures

Alloy Behaviour at High Temperatures

Coatings for Corrosion Protection

Corrosion Testing & Materials for Corrosive Environments

Analysis and Correction of Corrosion Failures

How to Control & Prevent Corrosion

- Materials Selection and Design, Corrosion Resistant Coatings
- Cathodic & Anodic Protection, Corrosion Inhibitors, Corrosion Testing & Monitoring