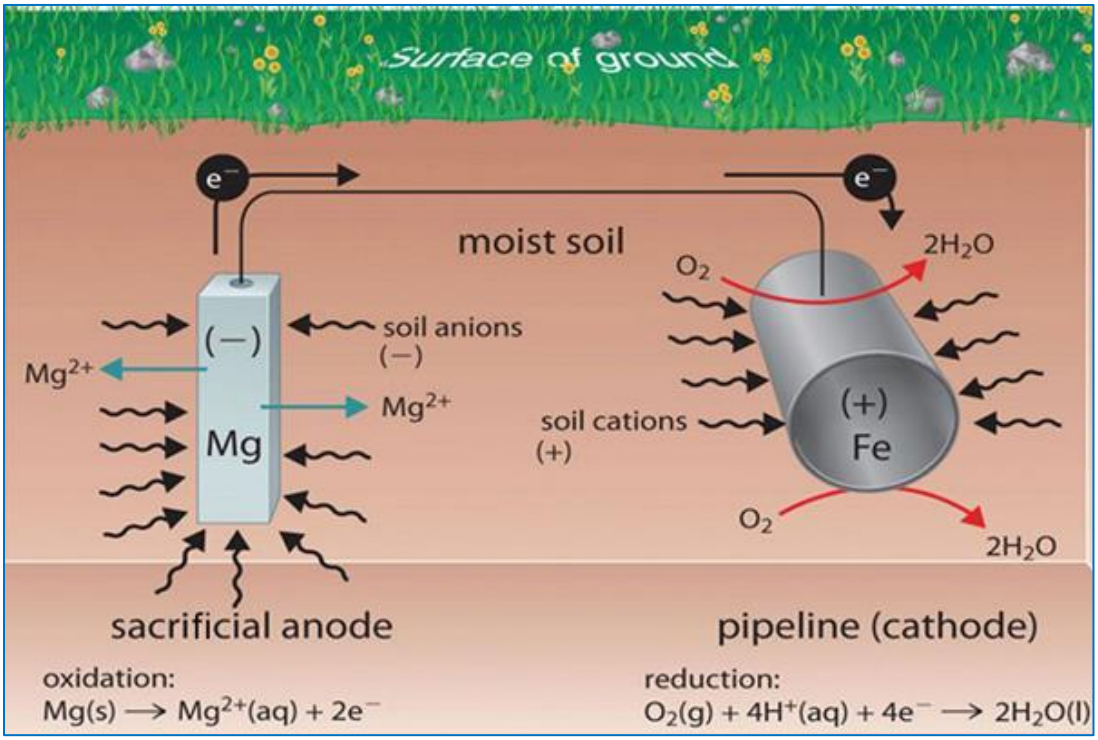
Tel No:+97126654546 | Fax No:+97126654182 | Email: training@cmc-me.com | www.cmc-me.com



FE163:
Cathodic Corrosion Protection System

Training Description:

Maintaining the ageing infrastructure such as underground pipelines is a challenge to the oil and gas industry worldwide. Corrosion is one of the major causes of ageing the industrial infrastructures. Understanding its mechanism and how to control it can lead to a remarkable re-education in the operation cost of piping and static equipment.

Cathodic Corrosion Protection is one of the most widely used methods to control corrosion control in industry. The Cathodic Protection is a method of that eliminates the corrosion of metals by the use of sacrificial anodes or the application of an electric current. It is a technique that has been known for 160 years, and is extensively applied to pipelines and tank farms, etc. with great success. However, despite this long history and broad applicability, it is a technique that is all too often inadequately or even improperly applied; with the result that structures are poorly protected or, worse, adversely interfered with.

This intensive training course provides you with essential principles, evaluation and applications of Cathodic Protection, helping participants recognize them, select Cathodic Protection control methods and apply them to protect the assets of the organization.

Training Objectives:

By the end of the training, participants will be able to learn:

- ✓ The theoretical basis and the practical ability necessary operate and maintain Cathodic Protection (CP) systems in the oil and gas surface production facilities
- ✓ Understanding of the basic principles of corrosion and applications of galvanic and impressed current CP systems
- ✓ Understanding of the field equipment used to monitor CP systems and how they work
- ✓ Understanding of the various factors that impact the performance of these systems
- ✓ Learn about essential CP monitoring techniques to ensure effective operation
- ✓ Understanding of increase productivity by avoiding costly shutdowns thus reducing the cost of the overall corrosion control program

Training Designed for:

This course is intended for those personnel who are working in technical areas related to materials, maintenance and integrity who deal directly or indirectly with cathodic protection such us; Corrosion Engineers and Technicians, Inspection and Maintenance Personnel, Static Equipment Engineers, Safety Personnel, Project Engineers, Managers and Team Leaders.

Training Requirement:

"Hand's on practical sessions, equipment and software will be applied during the course if required and as per the client's request."

This training course is available upon request in English or Arabic, virtual online live or face to face public/inhouse. Content, location and duration can be adapted to your specific wishes. It is therefore possible to focus on specific modules of the training course as per client's learning needs and objectives. Further, it should be forwarded to us a month prior to the course dates.

Training Program:

DAY ONE:

Principles and Types of Corrosion and Corrosion Control

- Section I - Significance of Corrosion Control
  - Corrosion - Largest Single Cause of Plant Failure
  - Economic Effects
  - Environmental Effects
  - Safety Effects
  - Corrosion Management Preventive Strategies
  - Cost of Corrosion
- Section II - Corrosion & Its Control
  - Requirements for Corrosion to Occur
  - Metallurgical Factors
  - Forms of Corrosion
  - Corrosion Control Methods
  - Environmental Modification
  - Protective Coatings
  - Introduction to Cathodic Protection
  - Case Study: Catastrophic Corrosion Accidents

DAY TWO:

Corrosion Environment, Material Selection and Elements of Cathodic Protection

- Section III - Corrosive Environments & Construction of Materials
  - Atmospheric Environments
  - Marine Atmospheres
  - Industrial Atmospheres
  - Underground Environments
  - Material Selection
  - Corrosion Properties of Steels
  - Concrete Structure Environment
- Section IV - Fundamentals of Cathodic Protection Systems
  - Galvanic Series
  - General Application of Cathodic Protection
  - Industry Standard & Codes
  - Principle of CPS
  - The Cathodic Protection Cell
  - Methods of Applying Cathodic Protection
  - Sacrificial Cathodic Protection System
  - Impressed-Current Cathodic Protection System
  - Advantages of SCPS
  - Disadvantages SCPS
  - Advantages ICCP
  - Disadvantages ICCP
  - CPS Selection
  - Basic Requirements for Cathodic Protection

- Cathodic Protection Criteria
- Current Rectifiers / DC Power Source
- High Impedance Voltmeter
- Reference Cells (Half Cells) Reference Cells
- Applicable NACE Standard for Cathodic Protection Systems

DAY THREE:

Cathodic Protection Systems Design and Coating Issues

❖ Section V - Cathodic Protection System Design

- Design Factors
- Electrolyte Resistivity Survey
- Electrolyte pH Survey
- Structure vs. Electrolyte Potential Survey
- Current Requirement
- Coating Resistance
- Protective Current Required
- Sacrificial Anode (Galvanic) Cathodic Protection Design
- Impressed current Cathodic Protection System Design
- Soil Resistivity
- Current Requirement Test
- Typical CPS Design Parameters

❖ Section VI - Cathodic Protection Systems and Coatings

- Role of Protective Coating in CPS
- Selection Factors
- Coating Defects
- Coating Efficiency
- Over Voltage
- Cathodic Disbondment
- Commonly used Coating in Conjunction with CPS

DAY FOUR:

Cathodic Protection Anodes and Construction

❖ Section VII - Anodes & Rectifiers

- Anode Selection
- Anode Material Types - *magnesium, zinc, aluminum, etc.*
- Current Output
- Driving Potential
- Anode Life
- Anode Shape & Dimension
- Anode Efficiency
- Galvanic Anode Types
- Current Requirements for ICCP System
- Anode Materials for ICCP
- Anode Backfilling
- Installation of Sacrificial Anodes
- Impressed Current Anode Beds

- Impressed Current Rectifiers / DC Power Source
- CP Equations
- Solved CP Calculation Examples

❖ Section VIII - Practicing & Construction of Cathodic Protection System

- Components of Cathodic Protection Systems
- Essential Components
- Isolating Joints
- Junction Boxes
- Test Stations - *measuring points and coupons*
- Thermite Weld
- Earthing Systems
- Line Current Measurement
- Pipe Sleeves / Casings
- Cathodic Protection Vessels & Tank Internals Vessels & Tank
- Tanks for Storage of Chemicals
- Water Circulating Systems
- Heat Exchangers *(tube and shell)*
- Case Study: Construction of Cathodic Protection Systems

DAY FIVE:

Line and Coating Inspection, Safety and Corrosion Comics

❖ Section IX - Inspection of Pipeline and Coating Defects

- Pearson Surveys
- Close Interval Potential Survey (CIPS) Technique
- Direct Current Voltage Gradient (DCVG) Technique
- Signal Attenuation Coating (SAC) Survey
- Common Impressed Current Rectifier Problems
- Over the Trench Pipe Holiday Inspection

❖ Section X - Instrumentation & Safety Aspects

- Alkalinity
- Hydrogen Evolution
- Chloride Evolution
- Installation Adjacent to Telecommunication Services
- Installation Adjacent to Railway Signal & Protection Circuits
- Interaction at Discontinuities in Cathodically Protected Structures
- Installation at Jetties & Ships
- Danger of Electric Shock
- Installations on Immersed Structures
- Installations for the Internal Protection of Plant
- Fault Conditions in Electricity Power Systems
- Stray Current Corrosion

❖ Section XI - Corrosion Management Systems

- Economic Considerations
- Corrosion Key Performance Indicators (KPIs)
- Asset Integrity and Corrosion Management
- Corrosion Data Management

- Course Conclusion
- POST-ASSESSMENT and EVALUATION

Training Methodology:

This interactive training course includes the following training methodologies as a percentage of the total tuition hours:

- 30% Lectures, Concepts, Role Play
- 70% Workshops & Work Presentations, Techniques, Based on Case Studies & Practical Exercises, Gamification, Software & General Discussions
- Pre and Post Test

Training Certificate(s):

CMCT Internationally recognized certificate(s) will be issued to each participant who completed the course.

Training Fees:

To be advised as per the venue/location - This rate includes participant's manual, hand-outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Note: The 5% VAT (Value Added Tax), will be effective starting 01st of January 2018 as per the new regulation from the UAE Government. The VAT applies for all quotation both for local and abroad.

Training Timings:

Daily Timings:

07:45 - 08:00	Morning Coffee / Tea
08:00 - 10:00	First Session
10:00 - 10:20	Recess (Coffee/Tea/Snacks)
10:20 - 12:20	Second Session
12:20 - 13:30	Recess (Prayer Break & Lunch)
13:30 - 15:00	Last Session

For training registrations or in-house enquiries, please contact:

Aisha Relativo - Training & Career Development Manager
aisha@cmc-me.com / training@cmc-me.com
Tel.: +971 2 665 3945 or +971 2 643 6653 | Mob.: +971 52 2954615