WebCorr
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SERVICES

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WebCorr Corrosion Consulting Services Presents

Design and Operation of Pipeline Cathodic Protection Systems
- Design, Installation, Operation, Maintenance, Survey and Monitoring

Date: As published on website Venue: As published on website

Course Overview

Maintaining the ageing infrastructure such as underground pipelines is a challenge to facility owners worldwide. Understanding why and how cathodic protection works or fails can help the operator formulate appropriate strategy in managing the pipeline corrosion problems. This 5-day course covers both the fundamentals and practices in the design, installation operation, maintenance, survey, monitoring, and trouble-shooting of pipeline cathodic protection systems.

This course is available for in-house training, online and distance learning worldwide. It can also be customized to meet the specific needs of your organization.

Who Should Attend

Engineers and technologists who are in charge of pipeline cathodic protection systems; Designers who are interested in cathodic protection technology for corrosion prevention of pipelines; Technicians and maintenance personnel who deal with installed cathodic protection systems; Facility owners and users who are concerned with corrosion.

Course Outline

1.1 Corrosion and cathodic protection
- 1.1.1 Electromotive force series
- 1.1.2 Effect of concentration on potential: the Nernest equation
- 1.1.3 Effect of temperature on potential
- 1.1.4 Common reference electrodes used in CP
- 1.1.5 Converting measured potentials between different reference electrodes
- 1.1.6 Corrosion cell componenets
- 1.1.7 Corrosion cell kinetics: polarization
- 1.1.8 Converting corrosion current to corrosion weight or thickness loss: Faradays's law

1.2. Corrosion potential
- 1.2.1 Definition

- 1.2.2 Measurement
- 1.2.3 Interpretation
- 1.2.4 CP applied potential vs. corrosion potential
- 1.2.5 Determining the corrosion rate of a structure under cathodic protection

1.3. Factors influencing operation of a corrosion cell
- 1.3.1 Depolarization of a corrosion cell
- 1.3.2 Anode depolarization
- 1.3.3 Increased polarization in a corrosion cell
- 1.3.4 Circuit resistance changes in a corrosion cell
- 1.3.5 Effect of driving voltage on a corrosion cell
- 1.3.6 Effect of time on a corrosion cell
- 1.3.7 The double layer and Randles circuit model for an electrode interface in a corrosion cell
- 1.3.8 Galvanic corrosion and galvanic anode cathodic protection

Course Outline

2.1 CP Design objectives
2.2 Cathodic protection design procedure
2.3 Determining current requirements
    2.3.1 Current density
    2.3.2 International standards on CP current requirements
2.4 Current requirement estimating methods
    2.4.1 Literature Sources
    2.4.2 Experience on Similar Structures in Similar Conditions
    2.4.3 Determining Current Requirements on a Coated Structure by Estimating the Percentage Bare
    2.4.4 Minimum Voltage Drop Method
    2.4.5 Polarization Test Method
    2.4.6 Polarization Shift Method
2.5 Calculation of Cathodic Protection Circuit Resistances
    2.5.1 Resistance of a Single Rod Shaped Anode Positioned Vertically in the Earth
    2.5.2 Resistance of Multiple Vertical Anodes Connected to a Common Header Cable
2.5.3 Resistance of a Single Rod Shaped Anode Positioned Horizontally in the Earth
    2.5.4 Resistance of Multiple Horizontal Anodes Connected on a Common Header Cable
    2.5.5 Calculating Pipe Resistance to Remote Earth
    2.5.6 Calculation of Cable and Pipe Lineal Resistances
2.6 Calculating System Capacity & Life
2.7 Calculation of System Life
2.8 Calculating Number of Anodes
2.9 Calculating System Driving Voltage
    2.9.1 Galvanic (Sacrificial) System
    2.9.2 Impressed Current System
2.10 Exercise/practical session

3.1 Sample cathodic protection designs
    3.1.1 Galvanic anodes
    3.1.2 Impressed current system
3.2 Design project exercise

4.1 CP Interference
4.2 Stray current
    4.2.1 Detecting Stray Current
    4.2.2 Effects of Stray Current on Metallic Structures
    4.2.3 Mitigation of Interference Effects from ICCP Cathodic Protection Systems
    4.2.4 Other Sources of DC Stray Current
4.3 AC Interference
    4.3.1 Conductive Coupling Due to Faults
    4.3.2 Electrostatic (Capacitive) Coupling
    4.3.3 Electromagnetic (Inductive Coupling)
4.4 Telluric Current Interference
    4.4.1 Interference Effects.
    4.4.2 Mitigation of Telluric Current Effects
4.5 Exercise/practical session

5.1 Design of Performance Monitoring Facilities
5.2 Current Distribution
    5.2.1 Introduction
    5.2.2 Attenuation
    5.2.3 Effect of Coating on Current Distribution
    5.2.4 Effect of Anode-to-Structure Spacing on Current Distribution
    5.2.5 Effect of Structure Arrangement on Current Distribution
    5.2.6 Effect of Electrolyte Resistivity Variation on Current Distribution
    5.2.7 Effect of Current Distribution on Holidays on a Coated Structure
    5.2.8 Effect of Polarization (Time) on Current Distribution
    5.2.9 Summary of Current Distribution Factors
5.3 DC Power Sources for Cathodic Protection

6.1 CP system performance evaluation
    6.1.1 Potential measurement
    6.1.2 Voltage Drop Errors External to the Metering Circuit
    6.1.3 Methods of Minimizing Voltage Drop Errors in the Potential Measurement
    6.1.4 Measurement of Polarization Potential Shift
    6.1.5 Current Measurement
    6.1.6 Monitoring Cathodic Protection
    6.1.7 Pipe-to-soil potential surveys and analysis
    6.1.8 DCVG, ACVG and CIS Potential Surveys
    6.1.9 Coating Condition Surveys
6.2 Exercise/practical sessions

7.1 Troubleshooting Cathodic Protection Systems
7.2 CP Effectiveness and Recordkeeping
7.3 Specification of CP systems
7.4 End of course examination with design project

Course Registration

Please register online at www.corrosionclinic.com
Or use the form below (photocopies of this form may be used for multiple bookings).

Dr/Mr/Ms _____

Organization _____

_____

Contact Person _____

Contact Dept _____

Telephone _____ Fax _____

Email _____

Payment should be made by TT or online banking. Currencies in Australian Dollar, Canadian Dollar, US Dollar, Euro and Sterling Pound can be transferred directly without conversion. Our bank details can be found at the link below:

https://www.corrosionclinic.com/payment.html

Course Fee and Discount

Standard: $4,950 **Discount**: $4,455

The fee includes a hardcopy of course note, certificate, light lunch, coffee breaks each day during the course.

Discount applies to a group of 3 or more persons from the same organization registering at the same time, or early-birds making payment at least 8 weeks before the course commencing date.

Cancellation and Refunds

Cancellation or replacement should be conveyed to WebCorr in writing (email or fax). An administration charge of 50% of the course fee will be levied if the cancellation notice is received from 14 to 7 days before the course commencing date. No refund will be made for cancellation notice received 6 days and less. No refunds will be given for no-shows. Should WebCorr find it necessary to cancel a course, paid registrants will receive full refund. Refund of fees is the full extent of WebCorr's liability in these circumstances.

WebCorr has NACE certified Corrosion Specialist (#5047) providing customized in-house training, online and distance learning corrosion courses, corrosion seminars and workshops on corrosion, materials, metallurgy, paints and metallic coatings. Our corrosion courses are developed and taught by NACE certified Corrosion Specialist with over 30 years of practical experience in the field. Our training success is measured by your learning outcome.