

WebCorr Corrosion Consulting Services Presents

An Advanced Course in Cathodic Protection -Specification, Design, Commissioning, Testing & Monitoring

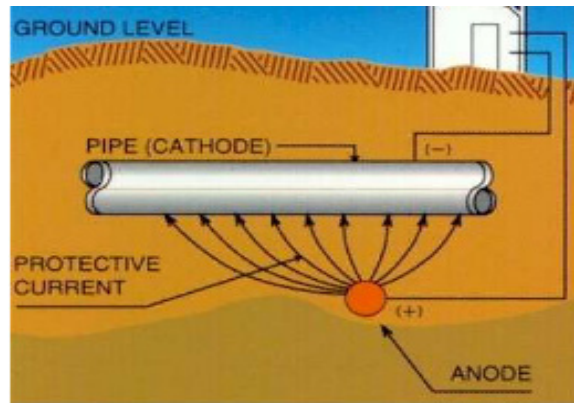
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Course Overview

Cathodic protection is a mature technique for controlling corrosion of steel structures immersed in waters, buried in soils and imbedded in concrete. This 5-day advanced course thoroughly and systematically covers the fundamental principles of cathodic protection and its practical applications such as marine and offshore structures in seawater environment, storage tanks and pipelines buried in soils, and reinforcing steels embedded in concrete structures. The course will provide detailed information on cathodic protection specification, design, commissioning, testing and monitoring. Applicable standards such as NACE, BS/ISO, AS and DnV relevant to cathodic protection design will be discussed. State-of-the-art anode materials for cathodic protection will be presented. Participants will gain advanced knowledge and skills in cathodic protection of common types of steel structures immersed in waters, buried in soils and imbedded in concrete. Included in the course notes are the 10-Step Guides to the design of galvanic anode cathodic protection system and impressed current cathodic protection system. Hands-on practical sections provide opportunities for participants to operate the devices and instruments used in cathodic protection. Engineers, architects and designers will grasp the theories and practices of cathodic protection which would lead to corrosion-proof designs and low cost durability. Participants will learn the principles and applications of advanced sensors and monitoring systems for cathodic protection monitoring, condition survey, diagnosis and troubleshooting. Facility owners will benefit from the enhanced safety and reduced maintenance costs. This corrosion short course can be taken as in-house training course, online course and distance learning course 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 cathodic protection systems; Designers who are interested in cathodic protection technology for corrosion prevention; Technicians and maintenance



personnel who deal with installed cathodic protection systems; Facility owners and users who are concerned with corrosion.

Course Outline

- 1.0 Primer on Chemistry, Metallurgy, Electricity and Mathematics
 - 1.1 Basic Concepts in Chemistry Relevant to Corrosion and Cathodic Protection
 - 1.2 Basic Concepts in Metallurgy Relevant to Corrosion and Cathodic Protection
 - 1.3 Basic Concepts in Electricity Relevant to Corrosion and Cathodic Protection
 - 1.4 Basic Math Requirement in Cathodic Protection Design Calculations
 - 1.5 Exercises and Quiz
- 2.0 Fundamentals of Corrosion
 - 2.1 Why do metals corrode
 - 2.2 How do metals corrode
 - 2.3 General methods of corrosion control & prevention
 - 2.4 Exercises and Quiz
- 3.0 Corrosion and Cathodic Protection
 - 3.1 History of Cathodic Protection
 - 3.2 How it works
 - 3.3 Why it works
 - 3.4 How effective it is
 - 3.5 Exercises and Quiz

Course Outline

- 4.0 Practical Parameters in Cathodic Protection
 - 4.1 Structure potentials
 - 4.2 CP Protection Criteria: which one to use ?
 - 4.3 Is 100 mV polarization enough?
 - Optimization of cathodic protection design
 - 4.4 Current density requirements
 - 4.5 Coatings and Cathodic Protection
 - 4.6 Exercises and Quiz
- 5.0 Resistivity and Electrode Resistance
 - 5.1 Electrical resistivity
 - 5.2 Resistance of ground connections
 - 5.3 Non-uniform electrolytes
 - 5.4 Groundbed design
 - 5.5 Long pipeline and pipe insulating joints
 - 5.6 Exercises and Quiz
- 6.0 Sacrificial Anode Cathodic Protection
 - 6.1 Methods of Applying Cathodic Protection
 - 6.2 Galvanic Anode Systems
 - 6.3 Applications of Galvanic Anode Systems
 - 6.4 Advantages of Galvanic Anode Systems
 - 6.5 Limitations of Galvanic Anode Systems
 - 6.6 Component Parts of Galvanic Systems
 - 6.7 Anode Selection Guide
 - 6.8 Specifications of Galvanic Anode Systems
 - 6.9 Anode Installation
 - 6.10 Exercises and Quiz
- 7.0 Impressed Current Cathodic Protection
 - 7.1 Impressed Current Systems
 - 7.2 Impressed Current Anodes
 - 7.3 Power Source
 - 7.4 Applications of Impressed Current CP
 - 7.5 Advantages of Impressed Current Systems
 - 7.6 Limitations of Impressed Current Systems
 - 7.7 Component Parts of Impressed Current Systems
 - 7.8 ICCP Anode Selection Guide
 - 7.9 Anode Configuration and Installation
 - 7.10 Exercises and Quiz
- 8.0 CP Standards, Specification and Design
 - 8.1 Applicable International Standards on CP
 - 8.2 Cathodic Protection Specification
 - 8.3 Cathodic Protection Design Fundamentals
 - 8.4 Determining Current Requirements
 - 8.5 Calculating Cathodic Protection Circuit Resistance
 - 8.6 Calculating System Capacity and Life
 - 8.7 Cathodic Protection Design Procedure
 - 8.7.1 The 10-Step Guide to the Design of Galvanic Anode Cathodic Protection System
 - 8.7.2 The 10-Step Guide to the Design of Impressed Current Cathodic Protection System
 - 8.8 Design of Cathodic Protection Monitoring Facilities
 - 8.8.1 Current Distribution
 - 8.8.2 Attenuation
- 9.0 CP of Underground Pipelines and Storage Tanks
 - 9.1 Understanding ISO 15589-1 Petroleum and natural gas industries - Cathodic protection of pipeline transportation systems - On-land pipelines
 - 9.2 Understanding NACE SP0169 Control of External Corrosion on Underground or Submerged Metallic Piping Systems
 - 9.3 Cathodic Protection of Underground Pipelines
 - 9.4 Cathodic Protection of Storage Tanks
 - 9.5 Design Examples and Exercises
- 10.0 Cathodic Protection of Marine & Offshore Structures
 - 10.1 The nature of sea water and its impact on corrosion of steel structures
 - 10.2 Understanding DNV-RP-B401 CP Design
 - 10.3 Understanding DNV-RP-F103 Cathodic Protection of Submarine Pipelines by Galvanic Anodes
 - 10.4 Understanding ISO 15589-2 Petroleum and natural gas industries - Cathodic protection of pipeline transportation systems - Offshore pipelines
 - 10.5 Understanding BS EN 12474 Cathodic protection of submarine pipelines
 - 10.6 Understanding NORSOK M-503 Cathodic protection
 - 10.7 Understanding NACE SP0176 Corrosion Control of Submerged Areas of Permanently Installed Steel Offshore Structures Associated with Petroleum Production
 - 10.8 Slope Parameter Method in CP Design
- 11.0 Cathodic Protection of Concrete Structures
 - 11.1 The nature of concrete structure
 - 11.2 Understanding AS 2832-5 Cathodic protection of metals - Part 5: Steel in concrete structures
 - 11.3 Understanding BS EN 12696: Cathodic Protection of Steel in Concrete
 - 11.4 Understanding NACE SP 0290: Cathodic Protection of Reinforcing Steel in Atmospherically Exposed Concrete Structure
 - 11.5 Understanding NACE SP 0187: Design Considerations for Corrosion Control of Reinforcing Steel in Concrete
 - 11.6 Innovative Cathodic Protection systems for various concrete structures
 - 11.7 Sacrificial anode cathodic protection systems
 - 11.8 Anodes selection for impressed current Cathodic Protection systems
 - 11.9 Effectiveness of Cathodic Protection in concrete
 - 11.10 Optimization of Cathodic Protection systems for concrete structures

12.0 Stray Current and Cathodic Protection Interference, and Methods of Prevention

- 12.1 Stray current corrosion and electrolysis
- 12.2 Practical stray current problems and solutions
- 12.3 Interference from other CP installations
- 12.4 AC Testing and Mitigation
- 13.0 CP Commissioning, Inspection and Monitoring
- 13.1 Equipment tests
- 13.2 System tests
- 13.3 Inspection and monitoring
- 13.4 Frequency of routine inspection
- 13.5 Monitoring plan
- 13.6 Monitoring equipment
- 13.7 Specialized surveys
- 13.8 Maintenance and repair
- 14.0 Cathodic Protection and Coatings
- 14.1 Economic considerations

14.2 Specification

- 14.3 Inspection
- 14.4 Type of coatings
- 14.5 Coating failures and analysis
- 15.0 Pipeline Inspection: Survey Methods and Evaluation Techniques
- 15.1 Survey methods for pipeline not under CP
- 15.2 Survey methods for pipeline under CP
- 15.3 NACE Standard on "Pipeline External Corrosion Direct Assessment Methodology"
- 16.0 Overall Discussion, Questions and Answers, Course Feedback
- 17.0 Examination
- 17.1 General Knowledge on Corrosion and Cathodic Protection
- 17.2 Cathodic Protection Specification, Design, Commissioning, Testing and Monitoring

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.

