

*WebCorr Corrosion Consulting Services Presents*

## External Pipeline Integrity Assessment and Composite Repairs

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

### Course Overview

Pipelines play an extremely important role throughout the world as a means of transporting gases and liquids over long distances from their sources to the ultimate consumers. Given the implications of pipeline failures and the role that external corrosion plays in these failures, it is apparent that proper corrosion control can have a major impact on the safety, environmental preservation, and the economics of pipeline operation. This 5-day course covers various forms of external pipeline corrosion, external corrosion direct assessment methods, and pipeline composite repairs. 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 integrity program;
- Technicians and maintenance personnel who deal with pipeline inspection, assessment, maintenance and repair;
- Facility owners and users who are concerned with external corrosion of pipelines

### Course Outline

- 1.1 External corrosion of oil and natural gas pipelines
  - 1.1.1 Introduction to Pipeline Integrity
  - 1.1.2 The threats and impacts of external corrosion of oil and natural gas pipelines
  - 1.1.3 Statistics on corrosion related accident reports on natural gas transmission and distribution pipelines
- 1.2 Regulations and standards
- 1.3 Chemical and tensile requirements of common long seam welded line pipe steels
- 1.4 The corrosion behavior of pipeline steels in soils, waters and atmosphere
- 1.5 External corrosion failure modes and mechanisms in underground environments
  - 1.5.1 Basic requirements of a corrosion cell
  - 1.5.2 Concentration cell corrosion
  - 1.5.3 Differential aeration cell corrosion



- 1.5.4 Galvanic corrosion
- 1.5.5 Active-passive cell corrosion
- 1.5.6 Cathode to anode area effect
- 1.5.7 Exercise/practical

- 2.1 Microbiologically Influenced Corrosion
  - 2.1.1 Magnitude of MIC on external corrosion of pipelines
  - 2.1.2 Classification of bacteria in underground environment
  - 2.1.3 aerobic bacteria
  - 2.1.4 anaerobic bacteria
  - 2.1.5 obligate aerobic bacteria
  - 2.1.6 Mechanisms of MIC
- 2.2 MIC Inspection and testing
  - 2.2.1 Field testing of MIC
  - 2.2.2 Lab testing of MIC

## Course Outline

- 2.3 Stray current corrosion
  - 2.3.1 Definition
  - 2.3.2 Sources of stray current that affects pipeline corrosion
  - 2.3.3 AC corrosion
- 2.4 Exercise/practical session
  
- 3.1 Stress corrosion cracking of pipeline steels
  - 3.1.1 Definition
  - 3.1.2 High pH SCC
  - 3.1.3 neutral pH SCC
  - 3.1.4 Stages of SCC
- 3.2 Underground environments that cause SCC of pipeline steels
- 3.3 Groundwater containing CO<sub>2</sub>
- 3.4 Effect of CP and coatings on SCC of pipeline steels
- 3.5 Effect of soil property on SCC
- 3.6 Effect of welding methods on the susceptibility of line pipe steels to SCC
- 3.7 Effect of tensile stress on SCC of gas transmission pipeline
  
- 4.1 Prevention and Mitigation of Corrosion and SCC
  - 4.1.1 Cathodic protection
  - 4.1.2 Coatings
- 4.2 Detection of Corrosion and SCC
  - 4.2.1 Hydrostatic Testing
  - 4.2.2 Direct Assessment
  - 4.2.3 In-line inspection
- 4.3 Integrity Assessment Methods
  - 4.3.1 Indirect inspections: DCVG, ACVG, CIS
  
- 5.1 External Corrosion Direct Assessment (ECDA)
- 5.2 A detailed look at NACE standard on ECDA
- 5.3 Coating damage and corrosion depth measurements
- 5.4 Assessment of ECDA Effectiveness
- 5.5 Emerging Advanced Technologies for Pipeline Integrity Assessment
  - 5.5.1 Long Range Ultrasonic Testing (LRUT) or Guide Wave Ultrasonic Testing (GWUT)
    - 5.5.1.1 Definition: What is LRUT
    - 5.5.1.2 Conventional UT vs. LRUT
    - 5.5.1.3 How LRUT works
    - 5.5.1.4 Advantages and limitations of LRUT
    - 5.5.1.5 Application examples
  - 5.5.2 Cathodic Protection Current Measurement from inside the pipeline
    - 5.5.2.1 Introduction to CPCM technology
    - 5.5.2.2 Conventional CP current measurement methods vs. CPCM

- 5.5.2.3 How CPCM works
- 5.5.2.4 Advantages and limitations of CPCM
- 5.5.2.5 Application examples

- 6.1 Remaining life calculations
- 6.2 Root cause determination
- 6.3 Defect assessment standards: ISO and ASME codes
- 6.4 Composite repairs for pipework
- 6.5 Mandatory materials qualification
- 6.6 Design calculations
  - 6.6.1 Design of Type A repairs
  - 6.6.2 Design of Type B repairs
  
- 7.1 Composite vs metal materials
- 7.2 Installation considerations
- 7.3 Installer qualification
- 7.4 Case studies
- 7.5 End of course examination



### Course Registration

Please register online at [www.corrosionclinic.com](http://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:** \$3,500      **Discount:** \$3,150

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.

