API 583 Corrosion Under Insulation

Energy Milestones Corporation

Advancing Professionals to the next level

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Overview

Corrosion Under Insulation (CUI) is a common and challenging problem that occurs in industrial facilities where pipes, vessels, and equipment are insulated for various purposes such as temperature control, energy conservation, and personnel protection. The insulation serves as a protective barrier to prevent heat transfer, but if it becomes compromised or damaged, it can lead to the onset of corrosion on the underlying metal surface.

Course Objectives

At the end of this course, the participants will be able to:

- Explain what CUI is, including the components of a typical CUI system and why it is required in a range of industrial settings
- Explain the importance of lab testing in the selection of CUI system components
- Define the role protective coatings play in the prevention of CUI and outline the factors that need to be considered when selecting a coating for application under insulation.
- Identify the common types of coatings applied under insulation and describe their advantages and disadvantages.
- Outline the factors that need to be considered when selecting insulation
- Describe the types of insulation and jacketing commonly used within CUI Protective Systems
- Describe the different kinds of spray-on insulation and their advantages and disadvantages
- Identify when passive fire protection is required and outline the steps to minimise the likelihood of corrosion under fireproofing occurring
- Summarise the differences between intumescent coatings, high-density concrete coatings and cementitious coatings

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Course Objectives

- Explain standard design practices used to minimise CUI
- Outline the common steps involved in installing a CUI Protective System
- Recognise common mistakes made during the application of insulation, jacketing, banding, vapour barriers and when sealing entry/exit points
- Identify the key components of risk-based inspection programs and describe their benefits within a CUI context
- Discuss the inspection methods that can be utilised with and without the removal of the CUI Protective System

Course Content

1. Introduction to Corrosion Under Insulation (CUI)
2. Corrosion: Basic Concepts and Terminology
3. Why Does CUI Occur -The Causes of Corrosion Under Insulation (CUI)
   - The Corrosivity of Water and Moisture
   - The Sources of Water
   - How Much Water Is Required for CUI to Occur
   - The Effect of Contaminants on Corrosion Under Insulation
   - The Effect of Temperature on the Rate of Corrosion Under Insulation
   - The Effect of Insulation Type and Insulation Characteristics on CUI
   - Other Factors Influencing the Rate and Form of Corrosion Under Insulation

4. How Does CUI Occur -Common Forms of Corrosion Encountered Under Insulation
   - General Corrosion
   - Pitting Corrosion
   - Crevice Corrosion
   - Chloride External Stress Corrosion Cracking (Cl-ESCC)

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Course Content

5. CUI in Common Alloys

- CUI in Carbon and Low Alloy Steels
- CUI in Austenitic and Duplex Stainless Steels
- CUF in Carbon and Low Alloy Steels
- CUI on Aluminium Piping

6. Areas Susceptible to Damage

- General Areas of Damage
- Pressure Vessels
- Piping
- Tankage and Spheres
- Heat-traced Systems
- Shutdown/Mothballing

7. Insulation and Fireproofing Systems

- Insulation Materials
- Insulation Jacketing
- Caulking
- Fireproofing Materials
- Coatings Under Insulation & Fireproofing Systems

8. Inspection for CUI and CUF Damage

- Inspection of Piping Operating Below 32°F (0°C)
- Inspection Tools and Methods

9. Risk-Based Inspection (RBI)

- Inspection Activities and Strategy
- Non-Destructive Examination and Testing Screening Techniques for CUI
- Examples of Risk-Based Inspection Plan

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Course Content

10. Design Practices to Minimise Corrosion Under Insulation (CUI)

- Coatings for Hot and Cold Services
- Insulation Materials
- Jacketing
- General Design Aspects
- Insulation
- Heat-traced Systems
- Protective Coatings and Caulk
- Shutdown/Mothballing
- Quality Control/Quality Assurance

11. Design Practices to Minimise CUF

- Dense and Lightweight Concrete
- Lightweight Cementitious Products
- Intumescent Coatings and Subliming Compounds
- Protective Coatings
- Quality Control/Quality Assurance

12 . Maintenance and Mitigation of CUI/CUF Issues

- Programmed/Condition-based Maintenance
- Execution
- Deluge System Issues
- Mitigation of CUI/CUF Damage
- Repair Techniques/Strategies

13. Case Studies and Examples

- Examples of a Qualitative Likelihood Assessment System
- Examples of Insulation Techniques for Various Applications
- Case Studies

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Targeted Audience

- Specifiers and Designers
- Metals, Coatings and Risk-Based Inspectors
- Coating Contractors
- Maintenance personnel and project engineers
- Manufacturers of insulation materials and equipment
- Unit managers involved in CUI

Course Methodology

Facilitated by an experienced professional trainer, this training course will be conducted as a highly interactive workshop session. A variety of training methodologies and facilitation techniques will be employed before and during the course, as applicable. These methods are aimed at enhancing individual and group interaction while maximising learning. Some of these methods are:

- Online Pre-post Test
- Colourful Visual Aids
- Gamification
- Self-Assessment Instruments
- Simulations
- Case Studies
- Videos
- Group Exercises & Discussions
- Role plays
- Indoor & Outdoor games