

Course No. 1287

Corrosion Under Insulation (CUI) Training Course

CORROSION, INSPECTION & NDT
INDUSTRIAL ENGINEERING, MAINTENANCE & OPERATIONS

DURATION

5 Days

DELIVERY

Classroom



Course Overview

The Corrosion Under Insulation (CUI) Training Course provides a comprehensive and practical framework for understanding corrosion mechanisms that develop beneath thermal insulation systems on industrial equipment, piping, and infrastructure. The course focuses on the relationship between insulation design, operating conditions, moisture, environmental exposure, material characteristics, and corrosion mechanisms, enabling professionals to make informed decisions in inspection, maintenance, corrosion control, and asset integrity management.

Corrosion Under Insulation is a significant asset integrity challenge because it can develop in concealed areas without obvious external evidence during conventional visual inspection. The presence of water, moisture, contaminants, temperature cycling, damaged insulation jacketing, and inadequate sealing can create conditions that promote corrosion beneath insulation. Effective CUI management therefore requires a structured understanding of the conditions that promote corrosion, the assets most susceptible to damage, and the inspection techniques appropriate for identifying hidden degradation.

The course covers the fundamentals of CUI, contributing factors, susceptible equipment and systems, degradation mechanisms, and the influence of temperature, insulation type, moisture, equipment design, and protective barriers. Participants will examine methods for identifying critical locations, assessing CUI susceptibility, selecting inspection techniques, managing insulation removal and reinstatement, evaluating surface condition, determining corrosion rates, and developing appropriate corrective actions.

The program emphasizes practical application and integration with inspection, asset integrity, reliability, and maintenance programs. Participants will learn how to develop risk-based CUI inspection strategies, prioritize equipment, select suitable inspection techniques such as visual examination, thickness measurement, ultrasonic testing, and other appropriate methods, and establish preventive measures for insulation systems. This approach supports earlier identification of corrosion, improved maintenance planning, better allocation of inspection resources, and stronger lifecycle management of industrial assets.

Objectives

- Analyze the fundamental principles of Corrosion Under Insulation and explain its relationship with industrial asset integrity during the course.
- Identify environmental, operational, material, and design factors that contribute to CUI initiation and progression.
- Evaluate equipment, piping, and industrial components that are susceptible to CUI based on service conditions, temperature, design, and insulation configuration.
- Analyze the effects of temperature, moisture, water ingress, contaminants, and insulation damage on CUI development.
- Assess insulation systems, protective jacketing, seals, barriers, penetrations, and drainage arrangements for conditions that may allow moisture ingress.
- Apply structured methods to identify critical locations and prioritize CUI inspection according to susceptibility and risk.
- Select appropriate inspection techniques for detecting CUI and assessing metal loss based on equipment type and operating conditions.
- Evaluate inspection findings, thickness measurements, corrosion rates, and degradation trends to determine equipment condition.
- Develop practical CUI prevention strategies incorporating appropriate insulation design, surface protection, moisture control, inspection, and maintenance.
- Improve decisions regarding insulation removal, surface inspection, repair, and reinstatement based on equipment condition and inspection findings.
- Strengthen coordination between corrosion, inspection, maintenance, engineering, operations, and asset integrity teams when managing CUI risks.
- Develop a practical CUI inspection and management program for a selected industrial asset by the end of the course.

Who Should Attend

The Corrosion Under Insulation (CUI) Training Course is designed for professionals responsible for equipment integrity, inspection, corrosion management, maintenance, engineering, reliability, and industrial asset management. It is particularly suitable for corrosion engineers, inspection engineers, asset integrity engineers, mechanical engineers, maintenance engineers, reliability engineers, materials engineers, equipment inspectors, NDT technicians, and specialists responsible for insulation systems and corrosion protection.

The course is also relevant to inspection, corrosion, maintenance, asset integrity, engineering, reliability, and operations managers and supervisors, as well as professionals responsible for pipelines, pressure vessels, storage tanks, heat exchangers, static equipment, steam systems, utilities, and equipment operating across different temperature ranges. It is also valuable for engineers involved in design, projects, equipment modifications, insulation specification, and protective coating selection.

Asset managers, technical decision makers, and multidisciplinary engineering teams will benefit from developing a practical understanding of CUI risks, how to identify high-priority equipment, and how to allocate inspection and maintenance resources effectively. The course also supports consistent decision-making between engineering, inspection, corrosion, maintenance, operations, and asset integrity teams.

Learning Outcomes

- Explain CUI mechanisms and the conditions that create a corrosive environment beneath insulation systems.
- Identify equipment, piping, and components that are particularly susceptible to Corrosion Under Insulation.
- Evaluate the effects of temperature, moisture, water ingress, contaminants, and insulation condition on corrosion development.
- Identify signs of insulation and external protective system deterioration that may permit moisture ingress.
- Assess critical locations and prioritize equipment according to CUI susceptibility, probability of degradation, and potential consequences.
- Select appropriate inspection techniques for detecting CUI based on equipment type, insulation configuration, and operating conditions.
- Apply principles of visual inspection, thickness measurement, ultrasonic testing, and other appropriate inspection techniques.
- Analyze inspection results, evaluate metal loss, determine corrosion rates, and identify degradation trends.
- Develop practical procedures for insulation removal, surface inspection, repair, and reinstatement based on equipment condition.

- Develop CUI prevention strategies incorporating insulation design, protective coatings, moisture management, inspection, and maintenance.
- Prepare technical reports documenting insulation condition, inspection findings, corrosion rates, degradation areas, and required corrective actions.
- Develop an integrated CUI management program linked to inspection, maintenance, corrosion management, and asset integrity systems.

Course Outline

DAY 01

Fundamentals of Corrosion Under Insulation and CUI Mechanisms

- Introduction to Corrosion Under Insulation and its role in asset integrity management.
- Definition of CUI and its characteristics compared with other corrosion mechanisms.
- Relationship between thermal insulation, operating conditions, and corrosion.
- Formation of corrosive environments beneath insulation systems.
- Role of water, moisture, salts, and contaminants in CUI development.
- Effects of heating, cooling, condensation, and temperature cycling on moisture ingress.
- Relationship between operating temperature and corrosion susceptibility.
- Metallic materials commonly affected by CUI.
- Influence of equipment design and insulation systems on corrosion susceptibility.
- Equipment and asset types most exposed to CUI risks.

PRACTICAL APPLICATION

Analyze different industrial assets and determine their susceptibility to CUI and the factors influencing their risk level.

DAY 02

CUI Risk Assessment and Identification of Critical Locations

- Identification of CUI risk factors.
- Assessment of insulation condition, external jacketing, and protective barriers.

DAY 02 — CONTINUED

- Identification of potential water and moisture entry points.
- Evaluation of insulation joints, penetrations, supports, and connection areas.
- Critical locations around valves, flanges, supports, fittings, and penetrations.
- Assessment of horizontal and vertical piping and low-drainage areas.
- Influence of operating conditions and temperature on CUI susceptibility.
- Classification of equipment according to degradation likelihood and failure consequences.
- Development of CUI inspection priority matrices.
- Identification of equipment and areas requiring insulation removal.
- Integration of CUI risk assessment with risk-based inspection principles.

PRACTICAL APPLICATION

Develop a CUI risk assessment and identify critical locations and high-priority assets for inspection within a selected industrial system.

DAY 03

Inspection Techniques for Detecting CUI

- Principles of CUI inspection planning.
- Visual examination and assessment of insulation and external jacketing.
- Requirements for insulation removal and access to equipment surfaces.
- Surface examination following insulation removal.
- Thickness measurement using ultrasonic testing.
- Selection of thickness measurement locations and inspection points.
- Assessment of metal loss, localized corrosion, and pitting.
- Selection of appropriate non-destructive testing techniques according to equipment condition.
- Specialized inspection approaches for difficult-to-access locations.
- Evaluation of inspection findings and identification of requirements for additional examination.
- Documentation of inspection results and development of corrosion maps and measurement locations.

DAY 03 — CONTINUED

PRACTICAL APPLICATION

Develop a CUI inspection plan for a selected industrial asset, including inspection techniques, critical areas, and required measurement locations.

DAY 04**CUI Prevention, Control, and Insulation Management**

- Principles of CUI prevention and mitigation.
- Selection and design of insulation systems suitable for service conditions.
- Design of external barriers to prevent water and moisture ingress.
- Surface preparation and corrosion protection before insulation installation.
- Protective coating systems used beneath insulation.
- Selection of insulation materials and reduction of moisture retention risks.
- Drainage design and prevention of water accumulation.
- Management of insulation penetrations, joints, supports, and equipment interfaces.
- Procedures for insulation removal and reinstatement following inspection.
- Repair of insulation, external jacketing, and protective coating systems.
- Development of preventive maintenance and insulation condition monitoring programs.

PRACTICAL APPLICATION

Develop an integrated CUI prevention strategy for an industrial asset covering insulation, surface protection, drainage, inspection, and maintenance.

DAY 05**CUI Management Program and Asset Integrity**

- Developing an integrated Corrosion Under Insulation management program.
- Identification of critical assets and development of a CUI susceptible-area register.
- Integration of CUI management with asset integrity systems.
- Linking inspection findings with maintenance, reliability, and risk-based inspection programs.
- Analysis of corrosion rates and degradation trends.

DAY 05 — CONTINUED

- Establishing re-inspection intervals and monitoring requirements.
- Management of inspection findings, defects, and corrective actions.
- Determining requirements for insulation repair, replacement, and surface protection.
- Developing procedures for managing changes in operating conditions.
- Preparing CUI inspection reports and documenting technical decisions.
- Monitoring program performance and implementing continuous improvement.

FINAL WORKSHOP

Develop a comprehensive CUI inspection and management program for a selected industrial asset, including corrosion mechanism identification, operating condition assessment, risk classification, critical location identification, inspection technique selection, measurement locations, insulation removal and reinstatement procedures, corrosion prevention and surface protection strategies, maintenance and monitoring plans, reporting requirements, and corrective actions.

Register or Request More Information

Course page: <https://quest-training.com/courses/corrosion-under-insulation-cui-training-course>

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