

Course No. 1283

Risk-Based Inspection (RBI) Training Course

CORROSION, INSPECTION & NDT
INDUSTRIAL ENGINEERING, MAINTENANCE & OPERATIONS

DURATION

5 Days

DELIVERY

Classroom



Course Overview

The Risk-Based Inspection (RBI) Training Course provides a comprehensive and practical framework for applying risk-based inspection principles to industrial assets and equipment. The course focuses on how organizations can use structured risk assessment to identify potential degradation mechanisms, evaluate the likelihood and consequences of failure, prioritize inspection activities, and allocate inspection resources according to asset criticality. It connects inspection planning with asset integrity, reliability, maintenance, engineering, and operational requirements.

Risk-Based Inspection provides a systematic approach for moving beyond inspection programs based solely on fixed intervals toward inspection strategies that consider the actual risks associated with equipment and degradation mechanisms. Effective RBI requires an understanding of materials, process conditions, damage mechanisms, equipment design, operating history, inspection effectiveness, probability of failure, and consequences of failure. This course develops the technical and analytical capabilities required to establish and maintain practical RBI programs.

Participants will examine the key elements of an RBI framework, including asset identification, damage mechanism assessment, probability of failure, consequence assessment, risk ranking, inspection effectiveness, risk mitigation, and inspection interval development. The course also addresses common degradation mechanisms such as corrosion, erosion, fatigue, cracking, creep, embrittlement, and other forms of material deterioration that may affect equipment integrity.

The program emphasizes practical application and decision-making. Participants will learn how to establish risk profiles, prioritize critical equipment, select appropriate inspection methods, determine inspection coverage and intervals, evaluate inspection findings, and update risk assessments based on new information. The course supports organizations in improving inspection effectiveness, strengthening asset integrity management, optimizing inspection resources, and making informed decisions regarding the condition and reliability of industrial assets.

Objectives

- Analyze the fundamental principles and objectives of Risk-Based Inspection and explain its relationship with asset integrity and inspection management during the course.
- Identify critical equipment, systems, and components requiring risk-based inspection assessment according to their operational importance and potential failure consequences.

- Evaluate applicable degradation and damage mechanisms based on materials, process conditions, equipment design, operating history, and environmental exposure.
- Assess probability of failure using structured approaches that consider degradation mechanisms, equipment condition, inspection history, and failure potential.
- Evaluate consequences of failure by considering safety, environmental, operational, production, financial, and asset-related impacts.
- Develop risk profiles and prioritize equipment according to relative risk levels and asset criticality.
- Apply risk-based principles to select appropriate inspection methods, inspection locations, examination coverage, and inspection frequencies.
- Evaluate inspection effectiveness and determine how inspection results can influence risk levels and future inspection requirements.
- Develop practical inspection strategies that align inspection resources with identified risks and organizational asset integrity priorities.
- Improve RBI decision-making by integrating inspection findings, operational changes, degradation data, and equipment history into risk assessments.
- Strengthen coordination between inspection, engineering, maintenance, operations, reliability, and asset integrity teams through structured RBI processes.
- Develop a practical Risk-Based Inspection program and implementation plan for a selected industrial asset by the end of the course.

Who Should Attend

The Risk-Based Inspection (RBI) Training Course is designed for professionals responsible for asset integrity, inspection, reliability, maintenance, engineering, and operational risk management. It is particularly suitable for inspection engineers, integrity engineers, corrosion engineers, reliability engineers, mechanical engineers, materials engineers, maintenance engineers, risk professionals, process engineers, and technical specialists involved in evaluating equipment condition and inspection requirements.

The course is also relevant to inspection managers, asset integrity managers, maintenance managers, reliability managers, engineering managers, plant managers, operations managers, technical authorities, quality professionals, and project engineers. It is especially valuable for professionals responsible for pressure equipment, pipelines, storage tanks, process systems, static equipment, industrial structures, and other assets where degradation and failure risks must be systematically assessed and controlled.

Senior managers, asset owners, executives, and technical decision makers will benefit from the course's focus on risk prioritization, inspection effectiveness, resource allocation, asset integrity, and lifecycle decision-making. The program also supports cross-functional teams that need to establish consistent criteria for determining where, when, how, and why inspection resources should be applied.

Learning Outcomes

- Explain the principles, objectives, scope, and key components of Risk-Based Inspection.
- Identify critical assets and determine the equipment boundaries and systems requiring RBI assessment.
- Identify relevant degradation and damage mechanisms affecting industrial equipment and components.
- Evaluate the relationship between materials, process conditions, operating history, equipment design, and potential degradation.
- Assess probability of failure using appropriate technical and historical information.
- Evaluate potential consequences of equipment failure from safety, environmental, operational, production, and financial perspectives.
- Develop qualitative or semi-quantitative risk profiles and rank equipment according to relative risk.
- Select appropriate inspection methods and examination techniques based on identified damage mechanisms and risk levels.
- Determine inspection locations, examination coverage, and inspection priorities using risk-based principles.
- Evaluate the effectiveness of previous inspections and use inspection results to refine future inspection strategies.
- Integrate RBI findings with asset integrity, reliability, maintenance, engineering, and operational management processes.
- Develop a practical RBI implementation plan for a selected industrial asset, including risk assessment, inspection strategy, priorities, responsibilities, and review requirements.

Course Outline

DAY 01

Fundamentals of Risk-Based Inspection and Asset Integrity

- Introduction to Risk-Based Inspection and its role in industrial asset management.
- Principles and objectives of RBI programs.
- Relationship between RBI, asset integrity management, reliability, inspection, and maintenance.
- Differences between time-based, condition-based, and risk-based inspection approaches.
- Asset hierarchy, equipment boundaries, and identification of inspection units.
- Critical equipment identification and asset classification.
- Fundamentals of risk, probability, consequence, and risk ranking.
- Overview of RBI assessment methodologies and decision-making processes.
- Data requirements for establishing an effective RBI assessment.
- Roles and responsibilities of inspection, engineering, maintenance, operations, reliability, and management teams.

PRACTICAL APPLICATION

Establish an asset hierarchy and identify critical equipment requiring risk-based inspection assessment.

DAY 02

Damage Mechanisms and Probability of Failure

- Principles of degradation and damage mechanism identification.
- Relationship between operating conditions and equipment degradation.
- Corrosion and corrosion-related degradation mechanisms.
- Erosion, erosion-corrosion, and flow-related deterioration.
- Fatigue and cyclic loading effects.
- Stress corrosion cracking and environmentally assisted cracking.
- Creep and high-temperature degradation.
- Hydrogen-related damage and embrittlement.

DAY 02 — CONTINUED

- Mechanical damage, thermal damage, and other relevant deterioration mechanisms.
- Evaluation of inspection history, operating history, materials, and equipment design.
- Assessing probability of failure and degradation progression.

PRACTICAL APPLICATION

Identify applicable damage mechanisms and evaluate probability of failure for selected industrial equipment.

DAY 03

Consequence Assessment and Risk Evaluation

- Principles of consequence assessment within RBI.
- Safety and personnel consequences of equipment failure.
- Environmental consequences and potential release scenarios.
- Production, operational, and business interruption consequences.
- Equipment damage and asset replacement considerations.
- Financial and lifecycle implications of equipment failure.
- Defining failure scenarios and credible consequences.
- Combining probability and consequence to establish risk.
- Risk ranking, risk matrices, and prioritization principles.
- Identification of high-risk, medium-risk, and lower-risk inspection units.
- Risk communication and presentation of RBI results to decision makers.

PRACTICAL APPLICATION

Develop consequence assessments and risk rankings for selected equipment failure scenarios.

DAY 04

Inspection Strategy, Methods, and Optimization

- Developing inspection strategies based on identified risks and damage mechanisms.
- Selecting appropriate inspection methods and examination techniques.

DAY 04 — CONTINUED

- Visual inspection, thickness measurement, ultrasonic testing, radiographic testing, magnetic particle testing, liquid penetrant testing, and other applicable techniques.
- Selecting inspection locations and critical examination points.
- Defining inspection coverage and examination effectiveness.
- Determining risk-based inspection intervals and review requirements.
- Evaluating inspection effectiveness and probability of detection.
- Using previous inspection results to refine future inspection plans.
- Risk mitigation through inspection, monitoring, process control, maintenance, and engineering measures.
- Managing changes in operating conditions and their effect on inspection requirements.
- Integrating RBI inspection plans with maintenance and shutdown planning.

PRACTICAL APPLICATION

Develop an inspection strategy for selected equipment based on damage mechanisms, risk level, inspection effectiveness, and available inspection techniques.

DAY 05

RBI Program Development, Implementation, and Continuous Improvement

- Developing a structured Risk-Based Inspection program.
- Establishing RBI assessment procedures, roles, responsibilities, and governance.
- Documenting risk assessments, inspection strategies, assumptions, and technical decisions.
- Integrating RBI with asset integrity management systems.
- Linking RBI results with maintenance, reliability, turnaround, and inspection planning.
- Updating risk assessments using inspection findings and new operational information.
- Managing inspection findings, anomalies, and changes in equipment condition.
- Establishing RBI review cycles and reassessment requirements.
- Performance monitoring and continuous improvement of RBI programs.
- Communicating RBI results and inspection priorities to management and operational teams.
- Using RBI to support inspection resource allocation and asset lifecycle decisions.

DAY 05 — CONTINUED

FINAL WORKSHOP

Develop a comprehensive Risk-Based Inspection program for a selected industrial asset, including asset identification, damage mechanisms, probability of failure, consequence assessment, risk ranking, inspection methods, inspection locations, inspection intervals, risk mitigation measures, responsibilities, and implementation priorities.

Register or Request More Information

Course page: <https://quest-training.com/courses/risk-based-inspection-rbi-training-course>

Website: <https://quest-training.com>

Email: info@quest-training.com

Phone: +905016771440