



Risk-Based Strategies for Inspection & Maintenance Course



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Introduction:

Risk-Based Inspection RBI and Risk-Based Maintenance RBM methodologies enable the systematic assessment of the likelihood and potential consequences of equipment and infrastructure failures. These strategies prioritize and optimize inspection and maintenance tasks based on the associated risk levels.

By implementing risk-based strategies, companies can achieve significant benefits, including improved safety, reduced likelihood of equipment failure, minimized forced shutdowns, and lower operational costs. Understanding what risk-based maintenance and inspection entail is foundational for developing effective risk-based strategies.

The risk-based inspection and maintenance strategy course is designed to equip participants with comprehensive knowledge and skills to develop effective strategies for asset management. This course covers risk assessment methodologies, inspection techniques, and maintenance strategies to optimize asset performance and minimize downtime.

Participants will learn to prioritize inspection and maintenance activities based on risk analysis, ensuring resources are allocated efficiently to critical components. By the end of this course, attendees will have a solid understanding of risk-based decision-making, enabling them to implement proactive maintenance plans that enhance safety, reliability, and cost-effectiveness across various industries.

Risk-Based Maintenance RBM and Risk-Based Inspection RBI:

The risk-based inspection and maintenance strategy course focuses on the principles and applications of Risk-Based Maintenance RBM. In this course, participants delve into the core concepts of risk-based maintenance, understanding its meaning and definition in asset management contexts.

Participants in this risk-based inspection and maintenance strategy training will explore the benefits of Risk-Based Inspection RBI and learn to implement efficient strategies that prioritize maintenance activities based on risk assessment.

Targeted Groups:

- Operations Engineers.
- Maintenance Engineers.
- Engineering Managers and Supervisors.
- Technical Staff are responsible for inspecting, assessing, and mitigating plant equipment degradation and want to use RBI effectively in their plants.

Course Objectives:

By the end of this risk-based inspection and maintenance strategy course, participants will be able to:

- Gain a comprehensive understanding of Risk-Based Inspection RBI and Risk-Based Maintenance RBM concepts, including their definitions, meanings, and implementation approaches.
- Recognize the benefits of RBI and RBM in enhancing the reliability of plant equipment and infrastructure.
- Illustrate the relationship between RBI and Reliability Centered Maintenance RCM.
- Conduct fitness-for-service assessments that are integral to risk-based evaluations.
- Develop and manage successful RBI and RBM programs within their facilities.
- Apply practical and effective methods for performing likelihood and consequence analysis.
- Determine optimum inspection intervals for individual pieces of equipment based on the assessed active degradation mechanisms.

Targeted Competencies:

By the end of this risk-based inspection and maintenance strategy training, participants competencies will:

- Multidisciplinary approach to plant integrity.
- Apply strategies to real-world plant scenarios.
- Design thinking for future risk scenarios.
- Know potential degradation mechanisms.
- Understand the risks associated with equipment failure.
- Awareness of Fitness for Service Assessment Techniques.

Course Content:

Unit 1: Significance of Inspection in Plant Integrity and Maintenance Costs:

- The Real Function of Inspection.
- Inspection Key Performance Indicators.
- Common Inspection Strategies and Their Limitations.
- Risk-Based Decision-Making Fundamentals and Tools.
- Risk Assessment - Probability of failure, consequences of failure.
- Risk Management - Avoidance, Mitigation.
- Risk Communication.
- Understanding and Managing Risk.
- Principles of Risk Assessment.
- Risk Assessment Elements.
- Qualitative, Semi-quantitative, and Quantitative Assessment.

Unit 2: Implementing a Risk-Based Inspection RBI Strategy:

- Clarifying RBI Risk-Based Inspection Definitions.
- RBI Risk-Based Inspection Evolution.
- Fundamental Elements of Risk-Based Inspection RBI.
- Know the reasons for implementing such strategies.
- Understand the benefits and limitations of RBI.
- RBI as a part of plant integrity management.
- Evaluate the economic benefits of RBI.
- API Risk-Based Inspection Methodology.
- API RP 580.
- API BRD 581 - Various levels of RBI Analyses.
- Impact of RBI on Related API Codes, Standards, and Recommended Practices.
- API 510, 570, and 650.
- API 579 Fitness-For-Purpose.
- API Risk-Based Inspection Software.

Unit 3: Identifying Risks through API 571 - Recognizing Conditions that Promote Deterioration or Failure

- Overview of over 60 damage mechanisms found in refineries.
- Detailed discussion of some common damage mechanisms: internal and external corrosion, brittle fracture, fatigue, SCC, HIC, and internal and external corrosion.
- Identification of Deterioration Mechanisms and Failure Modes.
- Active Damage Mechanisms in Critical Plant Equipment.
- Inactive or “Unlikely” Mechanisms.
- Identification for assessment.
- Impact of simultaneous mechanisms.
- Selection of Suitable Materials for Specific Deterioration Mechanisms.
- Integrated Asset Management.
- Linking Risk Assessment, RBI, and RCM.
- Managing Risk Using RBI.

Unit 4: Development of an Inspection Plan Based on RBI Risk Ranking:

- Inspection Planning Guidance.
- Need for Some Speculative/Exploratory Inspection.
- RBI Implementation.
- Essentials for Establishing a Successful RBI Program.
- The RBI Team - Recommended Structure and Mandate.
- Developing Equipment and Piping Systems / Circuits Inventory.
- Inspection History and Interpretation.
- Equipment Criticality Rating.
- Equipment Database.
- Shared Database by RBI and RCM.
- Importance of Data Quality.
- Computerized Maintenance Management Systems.

Unit 5: Optimization of Inspection Intervals Based on the Assessed Risk:

- Analyze and evaluate inspection findings.
- Data quality in RBI.
- Corrosion Rate Calculations.
- Remaining Life Calculations.
- Conduct Fitness-For-Service assessments.
- Estimate the consequences of potential failures and their impact on inspection frequency.

Conclusion:

Through comprehensive risk-based inspection and maintenance strategy training, participants gain insights into the risk-based inspection process and how to develop a customized risk-based maintenance program tailored to specific industry needs.

By completing this risk-based inspection and maintenance strategy course, attendees acquire the expertise to design and implement effective risk-based maintenance strategies that enhance asset performance and optimize resource allocation.

This risk-based inspection and maintenance strategy training also prepares individuals for certification in risk-based inspection, equipping them with valuable skills for advancing their careers in maintenance and reliability engineering.