

Risk Based Strategies for Inspection & Maintenance **(RBI & RBM)**



Course Description

Risk Based Inspection (RBI) methodology enables the assessment of the likelihood and potential consequences of pressure equipment failures. RBI provides companies the opportunity to prioritize their equipment for inspection; optimize inspection methods, frequencies, and resources; develop specific equipment inspection plans; and enable the implementation of Reliability Centered Maintenance. This results in improved safety, lower failure risks, fewer forced shutdowns, and reduced operational costs.

The risk-based approach needs:

- To be multi-disciplined
- To be realistically applicable to plant integrity
- Design with future scenarios in mind
- Consideration of all potential degradation mechanisms
- Understanding of the risks involved
- Awareness of Fitness for Service assessment techniques

Course Objective:

- To provide clear understanding of the key aspects of Risk Based Inspection, its advantages and limitations
- To provide a clear understanding of how it is linked to reliability-centered maintenance.
- Understand how fitness-for-service assessment affects the Risk
- To show you how to develop a successful RBI program at your facility
- Provide you with the practical and effective methods you need to perform practical likelihood and consequence analysis.
- Show you how to develop optimum Inspection intervals for individual equipment based on the assessment of the active degradation mechanisms.

Training Methodology

This Pioneers Risk Based Strategies for Inspection & Maintenance (RBI & RBM) training course combines presentation of the key principles, methods, and best practices and enforces the learnings with case studies and Question & Answer workshops to maximize the benefits to the participants. The comprehensive course notes and presentation material will provide valuable reference.

ORGANISATIONAL IMPACT

- Identification and assessment of active degradation mechanisms
- Implementation of a Risk Based Inspection program would result in significant measurable improvements and improved plant integrity.
- Fewer failures
- Optimization of inspection and maintenance plans and resources
- Reduction in operating costs

PERSONAL IMPACT

- Delegates will acquire the knowledge necessary to apply the risk-based methodology.
- Delegates will acquire the skills necessary to apply the risk-based methodology.
- Enhance competence in RBI.
- Enhance performance level.
- Contribute additional value to the organization.

Who Should Attend?

- Operations Engineers
- Maintenance Engineers
- Engineering Managers and Supervisors
- Technical Staff with responsibilities for inspection, maintenance, assessment, and mitigation of plant equipment degradation, and who want to use RBI effectively in their plants.

Course Outline

DAY 1

Course Objectives and Overview

- 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 Risk Assessment
 - Risk Assessment Elements
 - Qualitative, Semi-quantitative, and Quantitative Assessment
- Workshop 1- Illustrative Example of Risk Assessment

Course Content:

DAY 2

▣ *Risk Based Inspection (RBI)*

- ▣ Definitions
- ▣ Evolution
- ▣ Key Elements of RBI
- ▣ Reasons for implementing RBI
- ▣ Benefits and Limitations of using RBI
- ▣ RBI as a part of plant integrity management
- ▣ Economic Benefits
- ▣ 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
 - ▣ Workshop 2 - *Q&A on API RBI Methodology*

Course Content

- **DAY 3**
- ***Overview of API 571 - Recognition of Conditions Causing Deterioration of 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, internal and external corrosion
 - Identification of Deterioration Mechanisms & 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
 - *Workshop 3 - Case studies involving a few equipment damage and failures, and learnings.*

DAY 4

Development of 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, Interpretation
 - Equipment Criticality Rating
- Equipment Data Base
 - Shared Database by RBI and RCM
 - Importance of Data Quality
 - Computerized Maintenance Management Systems
- Workshop 4 – Case Study: *Risk-based categorization of equipment and failure modes*

DAY 5

- Inspection Interval Optimization Based on Assessed Risk
- Evaluation of Inspection Results
 - Data Quality
 - Corrosion Rate Calculations
 - Remaining Life Calculations
- Fitness-For-Service Assessments
- Estimation of Consequences of Failures
- Workshop 5 - Case Study - *Assessment of defects in critical equipment*