Risk Based Strategies for Inspection & Maintenance

Introduction:

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.

Targeted Competencies:

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

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 Objectives:

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

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

Course Outline:

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: 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

Unit 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

Unit 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 DataBase
- Shared Database by RBI and RCM
- Importance of Data Quality
- Computerized Maintenance Management Systems

Unit 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