

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

## 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.

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

## OBJECTIVES

- 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 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 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

### 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 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

## 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 number of equipment damage and failures, and learnings

## 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