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

Code	City	hotel	Start	End	price	Hours
540	Manama (Bahrain)	Hotel Meeting Room	2025-02-23	2025-02-27	3450 €	25

## 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

## **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

## **outline**

### **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**

### **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
  - Importance of Data Quality
  - Computerized Maintenance Management Systems
- Workshop 4 - Case Study: Risk-based categorization of equipment and failure modes



- 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



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• **Theoretical Lectures:**

- We deliver knowledge through advanced presentations such as PowerPoint and visual materials, including videos and short films.

• **Scientific Assessment:**

- We evaluate trainees skills before and after the course to ensure their progress.

• **Brainstorming and Interaction:**

- We encourage active participation through brainstorming sessions and applying concepts through role play.

• **Practical Cases:**

- We provide practical cases that align with the scientific content and the participants specific needs.

• **Examinations:**

- Tests are conducted at the end of the program to assess knowledge retention.

• **Educational Materials:**

- We provide both printed and digital scientific and practical materials to participants.

• **Attendance and Final Result Reports:**

- We prepare detailed attendance reports for participants and offer a comprehensive program evaluation.

• **Professionals and Experts:**

- The programs scientific content is prepared by the best professors and trainers in various fields.

• **Professional Completion Certificate:**

- Participants receive a professional completion certificate issued by the Scandinavian Academy for Training and Development in the Kingdom of Sweden, with the option for international authentication.

• **Program Timings:**

- Training programs are held from 10:00 AM to 2:00 PM and include coffee break sessions during lectures.