



API 580/581 RISK BASED INSPECTION PROFESSIONAL CERTIFICATION PREPARATION PROGRAM

COURSE DURATION: 5 DAYS

COURSE DESCRIPTION

RBI methodology is an approach that is used for **optimization of inspection efforts** in a plant by identifying most critical process equipment and piping and thus focusing the inspection effort on the equipment with the highest risk.

By applying the RBI approach, a solid basis for decision making on inspection frequency, the extent of inspection, and the most suitable type of inspection can be established. The knowledge about the state of the plant and management of the corresponding risks can be further integrated in the overall plant asset (integrity) management.

This course will provide inspectors and analysts with advanced knowledge and skills in Risk-Based Inspection (RBI) based on the **framework defined in API RP 580** and **in-depth understanding of the calculations performed** according to the API RP 581 for fixed equipment and piping.

The course covers both the principles and guidelines for developing an RBI program, as per API RP 580, as well as details of quantitative methods and calculation details as given in API RP 581. Other than that, this enables the participants to **understand the safety and economic benefits** of RBI implementation in refining and process industries.

It enables the participants to understand the **calculation background and principles** and help them use the results of an RBI analysis in optimal way. It also covers the standards development and technology improvements and help understand the links to other topics that are dealing with risk and safety in the plant operation.

COURSE OBJECTIVE

- Provide basic understanding of the RBI process for the fixed equipment and piping in refining and process industries, as well as approaches to its implementation.
- Provide in-depth, in-detail knowledge and understanding of the both qualitative and quantitative approaches in the RBI
- Know how to utilize this knowledge for inspection planning and as input for condition assessment of the equipment.

COURSE OUTLINE

DAY 1

Module 1: Introduction

- API Standard/ RP 580
- API RP 581
- ASME PCC-3
- Editions, differences in implementation

Module 2: Risk Based Inspection framework (API 580)

- API 580, purpose and scope
- API 580, normative reference, link to other standards
- Basic terms, definitions, acronyms and abbreviations
- Basic Risk Assessment Concepts
- Key elements of an RBI program
- Types of RBI assessments and how to select them
- RBI and operating risks management
- RBI planning
- Screening
- Operating boundaries and limitations
- RBI Study - Estimating resources and time
- Data sources, data quality, data needs
- Damage mechanisms and failure modes, overview, link to IOW
- NDT methods and applicability

DAY 2

Module 3: Risk Assessment Process (API 580)

- Accessing probability of failure
- Accessing consequences of failure
- Risk determination, assessment and management
- Risk management with inspection activities
- Risk management with other mitigation activities („4R“ concept)
- Reassessment and update of RBI
- RBI Documentation and record keeping
- Common RBI problems and pitfalls



WHO SHOULD ATTEND

- Refining and Petrochemical Engineers & Inspectors; Individuals who are responsible for implementing risk-based inspection programs within the company or plant facility;
- Plant Engineers, Non-Destructive Testing Engineers, Materials & Corrosion Engineers,
- Plant Inspectors responsible for managing the integrity of ageing process equipment, pipelines, boilers and storage tanks;
- Maintenance personnel, operations supervisors, and process specialists who are expected to make decisions regarding the suitability of equipment for continued service;
- Engineers and inspection personnel from the pulp and paper, oil and natural gas, and chemical industries may also find the course beneficial. A working knowledge of basic equipment is recommended.

Module 4: Introduction to API 581 (RBI) Part 1 - Inspection Planning Methodology

- Scope and definitions
- Probability of Failure
- Consequence of Failure
- Risk analysis and inspection planning
- RBI on Pressure vessels and piping
- RBI on Atmospheric storage tanks
- RBI on Pressure relief devices
- RBI on Heat exchanger tube bundles

DAY 3

Module 5: API 581 (RBI) Part 2 - Probability of Failure Methodology

- Probability of failure methodology
- Management system factor, link to PSM (Process Safety Management) and AIM (Asset Integrity Management)
- Thinning damage factor and inspection effectiveness
- Component lining damage factor and inspection effectiveness
- External corrosion damage factor, ferritic component and inspection effectiveness
- Corrosion under insulation (CUI) damage factor, ferritic component and inspection effectiveness
- SCC Damage factor and inspection effectiveness
- External SCC damage factor and inspection effectiveness
- External CUI damage factor and inspection effectiveness
- High temperature hydrogen attack damage factor and inspection effectiveness
- Brittle Fracture damage and inspection effectiveness factor
- Piping mechanical fatigue damage factor and inspection effectiveness
- Furnace tube probability of failure calculation (API 581:2000)
- Buried components and inspection effectiveness
- Atmospheric storage tanks and inspection effectiveness



Note

No required class pre-requisites. However, if you wish to pursue the API Certification Exam, a minimal years of experience on subject matter is required depending on your educational qualifications.

Please refer to the Exam Qualification Requirements at: www.api.org/icp

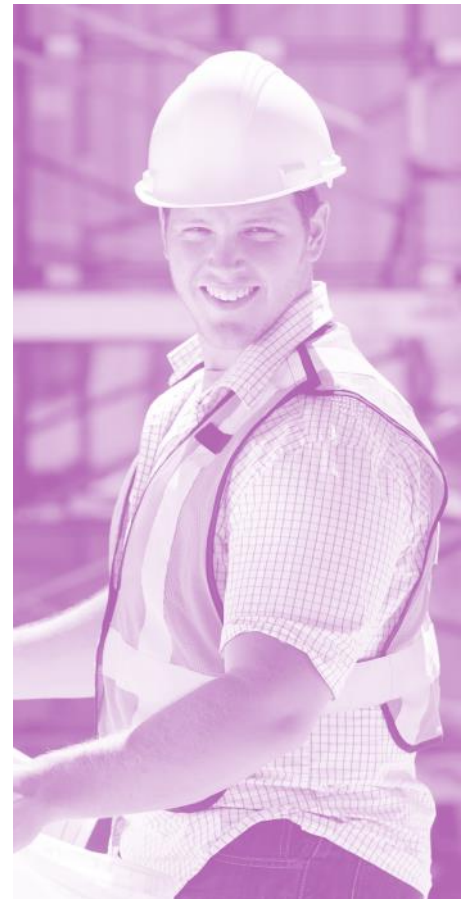
Module 6: API 581 (RBI) Part 3 - Consequence of Failure Methodology

- Consequence of failure types
- Consequence of failure methodology
- Consequence of failure calculation levels
- Consequence of failure – level 1 – representative fluid
- Consequence of failure – level 1/2 – hole size selection
- Consequence of failure – level 1 – Release rate calculation
- Consequence of failure – level 1/2 – Fluid inventory estimations
- Consequence of failure – level 1/2 – release type determination
- Consequence of failure – level 1/2 – impact of detection, isolation and mitigation systems

DAY 4

Module 6: API (RBI) Part 3 - Consequence of Failure Methodology (continued)

- Consequence of failure – level 1 – release rate and mass for consequence of failure
- Consequence of failure – level 1 – Flammable and explosive consequences
- Consequence of failure – level 1 – Toxic consequences
- Consequence of failure – level 1 – Non-flammable and non-toxic consequences
- Consequence of failure – level 1/2 – Component damage and personnel injury consequence area
- Consequence of failure – level 1/2 – Financial consequences
- Consequence of failure – level 2 – fluid composition and properties
- Consequence of failure – level 2 – release rate calculation
- Consequence of failure – level 2 – release rate and mass for consequence of failure
- Consequence of failure – level 2 – Flammable and explosive consequences
- Consequence of failure – level 2 – Toxic consequences
- Consequence of failure – level 2 – Non-flammable and non-toxic consequences
- Atmospheric Storage tanks consequence of failure calculation



COURSE DURATION

- 5 Days Training

DAILY SCHEDULE

- 8:30am - 5:30pm (Workshop)

ITEMS TO BRING

- Lots of Questions
- A "CAN-DO" Attitude
- Codes / Standards (in soft / hard copy)
 - * **API 580**
 - * **API 581 (Optional)**

Stationeries such as pen and highlighter will be provided.

Module 7: API 581 - Wrapping It All; case studies and calculation examples

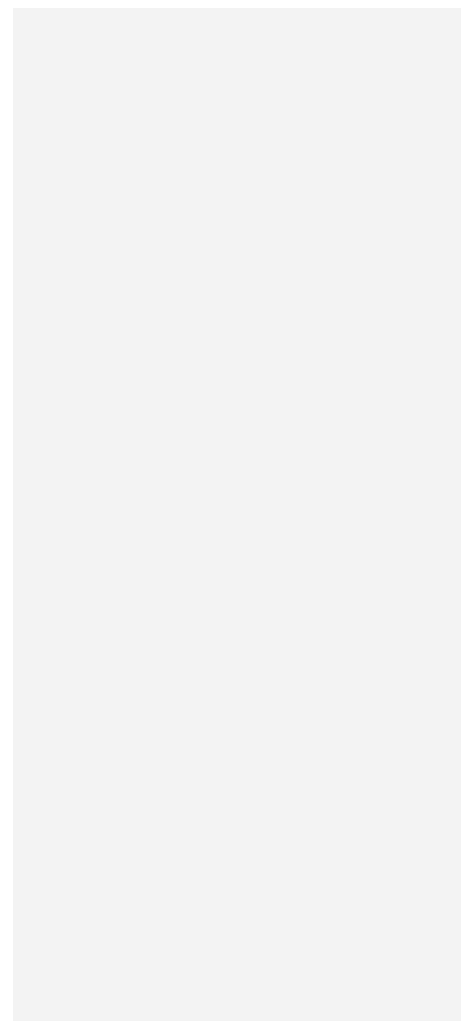
- Risk analysis, time horizon and inspection planning
- Pressure vessel PoF calculation example
- Pressure vessel CoF Level 1 calculation example
- Pressure vessel CoF Level 2 calculation example
- Inspection planning examples
- Optional: own examples

DAY 5

Module 8: Repetitorium, focus on RBI methodology (API 580)

- RBI Methodology review
- RBI - linking methodology and implementation
- Other tools and methodologies related to RBI and inspection planning – how and when to use them
- Limits and extensions of the RBI methodology – from RBI towards Asset Integrity
- RBI key points and topics review and joint discussion
- Final Exam preparation – typical questions, formats, answers

Final Exam





TRAINER'S PROFILE

DANIEL BALOS

MSc in Mechanical Engineering with the specialization in applicative IT and industrial management, PhD in application of data mining techniques on material behaviour modelling for high temperature components.

Almost 20 years of work in research and industrial projects, as well as training activities especially in risk-based inspections for power plants and refining industry. Participated or led more than 20 EU funded projects, and participated in a number of national projects in the area of material research and education abroad.

In these projects, a vast understanding and knowledge about materials, material degradation mechanisms, inspection methods, risks has been accumulated. Project and risk management skills are proven in numerous projects in last 10 years. Sub-project leader and part of the management team for iNTeg-Risk project (2008-2013).

In the area of RBI, he is active last 15 years, starting with participation in the key EU project in the area – RIMAP (Risk based inspection and maintenance procedures for European industry) – work in development and implementation of RBI approach for power plants, work in CEN CWA 15740 (standardization initiative for RBI in Europe), developed and implemented tools for RBI assessment of refining equipment in various projects.

Participation in the implementation project of RBI for NIS Serbia, EnBW Germany, as well as MOL, Hungary, ESKOM in South Africa, QP in Qatar and SINOPEC in China. Teaching RBI techniques and holding courses in RBI for petrochemical and power industry since 2005, with successful courses delivered in Germany, the Netherlands, Serbia, Romania and China.

