
Risk-Based Inspection of Pressure Equipment: Planning and Integrity Training Course

13 – 17 June 2027
Muscat





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Programme Summary

Risk-based inspection of pressure equipment is a one-week training course for integrity, inspection and maintenance leaders at advanced level, culminating in a risk-based inspection and maintenance plan for one operating unit. Fixed-interval inspection spends effort evenly across vessels, piping and tanks whose risks differ greatly, so high-consequence items can be under-inspected while low-risk items absorb shutdown time. The approach moves from damage mechanisms to consequence modelling, interval setting and governance. Mars Training Centre UK delivers this programme in risk-based inspection and asset integrity planning.

The Business Case

Inspection budgets and turnaround windows are finite, and every loss of containment carries safety and production costs. When inspection effort follows ranked risk rather than the calendar, scarce specialists focus on the equipment that matters, run lengths can be extended where data supports it and every interval has a defensible basis.

- Loss of Containment Exposure: Falls as high-risk items receive targeted, effective inspection before damage reaches critical limits.
- Turnaround Scope and Duration: Shrinks as low-risk items are removed from routine opening and intrusive work.
- Inspection Spend per Unit of Risk Reduced: Improves as methods are chosen for proven effectiveness against each damage mechanism.

Principles and Evidence Base

- API RP 580: Its programme elements, from scope and data to reassessment, structure the governance work in Session 1 and Session 5.
- API RP 581: Its damage factors, management systems factor and consequence categories frame the quantitative risk calculation in Sessions 2 and 3.
- API RP 571: Its catalogue of damage mechanisms affecting fixed equipment underpins the corrosion loop and susceptibility review in Session 2.
- ASME PCC-3: Its guidance on inspection planning using risk-based methods supports the selection of methods and intervals in Session 4.



Intended Participants

- Leaders who own the integrity of pressure vessels, piping systems and storage tanks across a site or portfolio.
- Managers who approve inspection plans, turnaround scopes and deferral requests.
- Maintenance and reliability heads who must align inspection findings with maintenance strategy.
- Technical authorities who set integrity operating windows and review corrosion data.

The programme serves upstream and midstream oil and gas, refining and petrochemicals, power generation and chemical processing.

Learning Outcomes

1. Participants will be able to evaluate the readiness of an organisation to move from time-based to risk-based inspection.
2. Participants will be able to diagnose credible damage mechanisms for equipment grouped into corrosion loops.
3. Participants will be able to construct probability and consequence of failure estimates and place equipment on a risk matrix.
4. Participants will be able to select inspection methods and set intervals according to inspection effectiveness and a risk target.
5. Participants will be able to justify risk-based maintenance decisions for equipment where inspection alone cannot reduce risk.
6. Participants will be able to design governance, data quality and reassessment arrangements for a risk-based inspection programme.

Programme Structure

Day 1: Foundations of Risk-Based Inspection

Why should inspection effort follow risk rather than the calendar?

- Time-Based Versus Risk-Based Inspection Philosophies
- API RP 580 Programme Elements and Scope Definition
- Qualitative, Semi-Quantitative and Quantitative Approaches
- Multidisciplinary Team Roles and Competence
- Equipment Register and Data Readiness Assessment

Day 2: Damage Mechanisms and Probability of Failure

How likely is each item to fail, and why?

- API RP 571 Damage Mechanism Screening
- Corrosion Loops and Process Condition Mapping
- Integrity Operating Windows and Their Limits
- Damage Factors and Remaining Life Estimation



- Management Systems Factor in Probability Calculation

Day 3: Consequence of Failure and Risk Ranking

What happens if containment is lost, and how is exposure ranked?

- Release Scenarios and Hole Size Selection
- Flammable and Toxic Consequence Areas
- Financial and Business Interruption Consequences
- Five-by-Five Risk Matrix and Iso-Risk Plots
- Risk Target Setting and Acceptance Criteria

Day 4: Inspection Planning and Risk-Based Maintenance

Which method, how often, and when should maintenance replace inspection?

- Inspection Effectiveness Categories and Method Selection
- Interval Setting Against the Risk Target
- Non-Intrusive Inspection Versus Internal Entry
- Risk-Based Maintenance for Rotating and Relief Equipment
- Mitigation Options: Process Change, Repair and Replacement

Day 5: Governing and Applying the RBI Programme

Is the risk-based inspection plan credible, resourced and ready to sustain?

- Applying Day 2 and Day 3 Results to a Live Unit
- Converting Day 4 Intervals Into a Turnaround Scope
- Data Quality, Inspection Records and Software Governance
- Reassessment Triggers and Management of Change
- Risk-Based Inspection and Maintenance Plan Completion

Methodology

The programme relies on structured exercises built around a sample process unit with vessels, piping circuits and a storage tank. Each session pairs a short briefing with group calculation using data sheets and inspection histories from refining, gas processing and power cases.

- Suggested activity: Grouping a crude unit overhead system into corrosion loops and screening damage mechanisms.
- Suggested activity: Ranking twelve items on a risk matrix and defending the ranking to a peer panel.
- Suggested activity: Rewriting a turnaround inspection scope after risk ranking removes low-risk items.



Capstone Output

Each participant completes a risk-based inspection and maintenance plan for one unit they manage or a case unit. It lists corrosion loops, ranked equipment, chosen inspection methods and intervals, maintenance mitigations and governance arrangements, and can be presented to a technical authority for approval.

Frequently Asked Questions

Is the risk-based inspection programme suitable for managers without a corrosion background?

Yes, if you lead integrity or maintenance decisions. It is set at advanced level, assumes familiarity with plant equipment and introduces damage mechanisms from first principles.

Which standards does the risk-based inspection of pressure equipment course rest on?

It rests on API RP 580 and API RP 581 for the method, API RP 571 for damage mechanisms and ASME PCC-3 for inspection planning.

How is the risk-based inspection and maintenance plan used at work?

You can use it to propose interval changes, reshape a turnaround scope and brief your technical authority on the basis for each inspection decision.