API 510 Pressure Vessels Inspection Training Course

3 – 14 October 2027
Online



API 510 Pressure Vessels Inspection Training Course

Ref: 3255514_198814 **Date:** 3 – 14 October 2027 **Location:** Online **Fees:** 4900 GBP

API 510 pressure vessels inspection training course defines the systematic methodology for verifying the structural integrity, operational safety, and code compliance of unfired industrial pressure vessels during operation and turnaround intervals. This two-week course equips mechanical integrity personnel, asset engineers, and vessel assessors with practical methodologies to construct a vessel integrity assessment dossier covering wall thinning calculations, repair protocols, and remaining life projections.

Introduction

This course examines pressure boundary integrity through three foundational industrial benchmarks: API 510 as the in-service inspection and alteration code, API RP 572 as the recommended practice for vessel inspection practices, and ASME Section VIII Division 1 as the primary construction baseline. Instruction operates at an intermediate practitioner level, bridging fabrication design rules with operational degradation assessment. Learning proceeds through structured inspection walkthrough sessions, drawing reviews, and defect characterisation studies. Delegates analyse damaged vessel shells, head geometries, nozzle connections, and relief arrangements across petrochemical and gas processing plants to substantiate fitness-for-service outcomes.

Course Objectives

- Distinguish between API 510 in-service mandates and ASME Section VIII Division 1 new-construction rules during vessel integrity reassessments.
- Interpret non-destructive testing records and ultrasonic thickness surveys to locate localised degradation across cylindrical shells and formed heads.
- Apply remaining life calculations, corrosion allowance deductions, and maximum allowable working pressure reductions on operational equipment.
- Select suitable non-destructive testing methodologies between shear-wave ultrasonic testing and radiographic profiling for weld defect identification.
- Compare temporary flush-patch repairs against permanent insert plates to maintain structural margin under operational pressure cycles.
- Justify alteration strategies and rerating procedures using code-approved stress tables and original joint efficiency ratings.



Target Audience

- Personnel responsible for static equipment integrity who must decide interval extensions or internal inspection entries.
- Refinery and gas processing plant inspectors who must verify fabrication quality and approve weld procedure specifications.
- Maintenance team leaders overseeing turnaround scopes who must choose between temporary box repairs and permanent plate replacements.
- Mechanical reliability engineers tasked with pressure vessel risk scoring who must determine fitness-for-service re-evaluations.
- Asset life management specialists who must decide whether degraded vessels require derating or decommissioning.

Course Outline

Day 1: Codes and Pressure Boundary Foundations

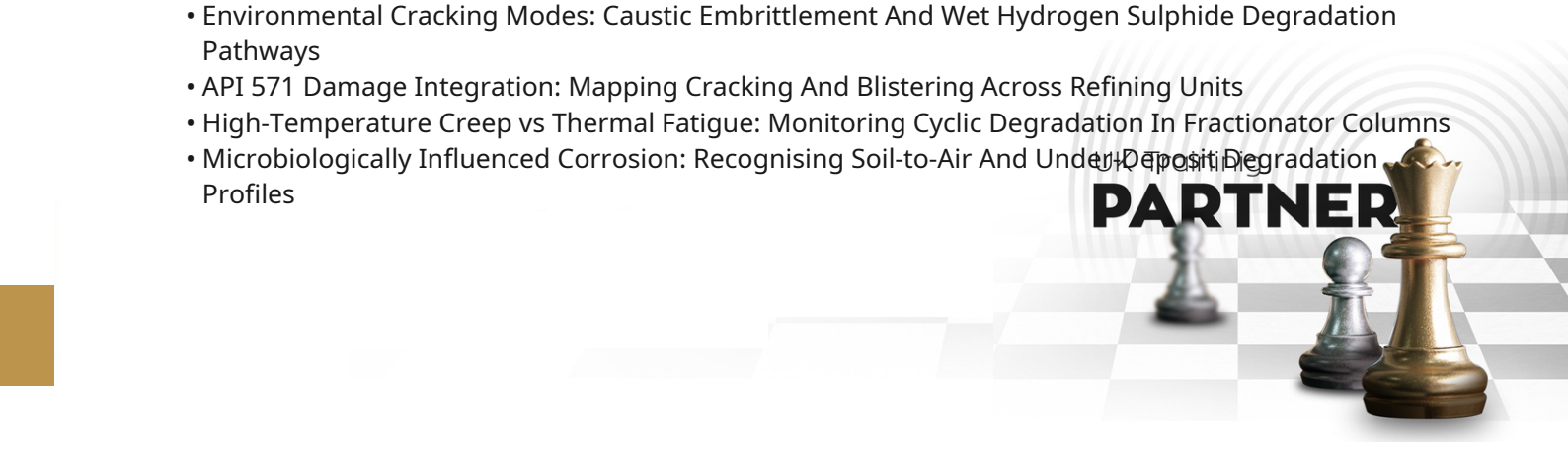
- API 510 vs ASME Section VIII: Jurisdictional Boundaries Governing In-Service Vessels And New Fabrication
- Pressure Vessel Shell Geometry: Baseline Stress Distributions Across Cylindrical And Spherical Geometries
- Inspector Roles And Responsibilities: Authorised Boundaries Under Plant Mechanical Integrity Programmes
- Design Margins And Safety Factors: Allowable Stress Philosophies Across Historic Code Revisions
- Vessel Documentation Verification: Establishing Baseline Data From Manufacturer Data Reports And Nameplates

Day 2: Materials, Welding, and Joint Efficiency

- Carbon Steel vs Low-Alloy Steel: Material Toughness Behaviour Under Elevated Temperature Services
- ASME Section IX Weld Classifications: Evaluating Procedure Qualifications And Welder Performance Limits
- Weld Joint Efficiencies: Radiographic Categories Determining Shell And Head Thickness Criteria
- Preheat vs Post-Weld Heat Treatment: Controlling Residual Stress In Thick Wall Vessels
- Impact Testing Requirements: Minimum Design Metal Temperature Thresholds For Brittle Fracture Prevention

Day 3: Degradation Modes and Damage Identification

- General Wall Loss vs Localised Thinning: Corrosion Morphology Assessment Inside Process Vessels
- Environmental Cracking Modes: Caustic Embrittlement And Wet Hydrogen Sulphide Degradation Pathways
- API 571 Damage Integration: Mapping Cracking And Blistering Across Refining Units
- High-Temperature Creep vs Thermal Fatigue: Monitoring Cyclic Degradation In Fractionator Columns
- Microbiologically Influenced Corrosion: Recognising Soil-to-Air And Under-Deposit Degradation Profiles



Day 4: Internal and External Visual Assessments

- Direct Visual Inspection vs Remote Video Probes: Gaining Access Inside Confined Vessel Shells
- API RP 572 Inspection Procedures: Systematic Checklists For Trays, Baffles, And Shell Walls
- Corrosion Under Insulation: External Wall Loss Detection Protocols For Lagged Vessels
- Nozzle And Flange Face Evaluation: Detecting Distortion, Wire Drawing, And Gasket Seating Flaws
- Support Skirt And Saddle Integrity: Assessing Anchor Bolts, Fireproofing, And Foundation Settlements

Day 5: Non-Destructive Examination Methodologies

- Ultrasonic Thickness Gauging vs Profile Radiography: Determining Localised Wall Loss Extent
- Time-Of-Flight Diffraction: Sizing Planar Flaws And Cracks In Heavy-Wall Vessel Welds
- Magnetic Particle vs Liquid Penetrant Testing: Detecting Surface Breaking Flaws In Vessel Welds
- Positive Material Identification: Verifying Alloy Metallurgy During Alterations And Nozzle Replacements
- Acoustic Emission Testing: Real-Time Integrity Screening During Vessel Hydrostatic Re-qualification Tests

Day 6: Thickness Calculations and Remaining Life

- Minimum Thickness Determination: Applying Cylindrical Shell And Spherical Shell Formulas
- Ellipsoidal vs Torispherical Heads: Code Equations For Pressure Capacity And Formed Heads
- Corrosion Rate Derivation: Short-Term Versus Long-Term Metal Loss Velocity Computations
- Remaining Operational Life: Calculating Future Retirement Dates Based On Measured Corrosion Allowance
- Statistical Thickness Assessment: Identifying Thickness Measurement Location Outliers In Big Data

Day 7: Maximum Allowable Working Pressure and Rerating

- MAWP Recalculation: Adjusting Vessel Pressure Thresholds Following Operational Wall Loss
- API 579-1 Fitness-for-Service vs API 510: Screening Local Thin Areas Using Multilevel Assessments
- Brittle Fracture Screening: Constructing Minimum Safe Operating Temperature Exemption Curves
- Vessel Rerating Procedures: Code Prerequisites For Increasing Operating Temperature Or Internal Pressure
- Nozzle Reinforcement Re-evaluation: Calculating Replacement Area For Added Process Connections

Day 8: Repairs, Alterations, and Re-rating Protocols

- Full-Encirclement Sleeve vs Flush-Welded Patch: Choosing Between Approved Vessel Shell Repairs
- Window Patch Welds: Design Restrictions And Non-Destructive Examination Quality Acceptance Criteria
- Weld Overlay Cladding: Mitigating Aggressive Process Attack Through Austenitic Stainless Cladding
- Mechanical Clamps And Enclosures: Managing Active Leaks Prior To Scheduled Turnaround Repairs
- Pre-Heat Substitution Methods: Temper-Bead Welding Alternatives To Post-Weld Heat Treatment



Day 9: Pressure Relief Devices and Pressure Testing

- Direct Spring-Operated Valves vs Rupture Discs: Protecting Vessels From Uncontrolled Overpressure
- API 576 Maintenance Intervals: Servicing, Bench Testing, And Setting Pressure Relieving Devices
- Hydrostatic vs Pneumatic Pressure Tests: Risk Calculations And Code Safety Distance Protocols
- Target Test Pressure Calculations: Factoring Temperature Stress Ratios Into Proof Testing Procedures
- Alternative Leak Testing Protocols: Sensitive Tracer Gas And Halogen Sniffing Assessment Routines

Day 10: In-Service Vessel Dossier Compilation

- Integrated Inspection Case Studies: Evaluating Complex Refinery Flash Drums And Desalters
- Repair Quality Audits vs Baseline Compliance: Benchmarking Field Contractor Execution Records
- Inspection Interval Determination: Establishing RBI Intervals Under API 580 And Prescriptive Codes
- Regulatory Records Retention: Ensuring Traceability For Insurance And Operational Stewardship
- Deliverable Finalisation: Completing The Vessel Integrity Assessment Dossier For Return To Duty

Skills You Will Gain

- ASME Section VIII Division 1 shell and head thickness derivation
- API 510 remaining operational life calculation
- Corrosion under insulation inspection screening
- API 571 degradation mechanism identification
- Fitness-for-service Level 1 thin area assessment
- Weld procedure specification code compliance verification
- Vessel rerate calculation and documentation structuring

Why Attend This Course

- From guessing remaining equipment lifespans to calculating remaining life and corrosion rates using certified code methods.
- From uncertainty over obscure shell cracks to selecting the correct non-destructive testing methodology for deep planar weld flaws.
- From relying on unverified vendor repair proposals to specifying code-compliant flush patches and temper-bead weld alternatives.
- From fragmented maintenance inspection notes to producing a professional vessel integrity assessment dossier that supports continued safe plant operation.



Conclusion

API 510 pressure vessels inspection training course provides engineers with an objective methodology to evaluate static pressurised assets against established international codes. The course clarifies the boundary between new-construction design guidelines and post-commissioning run-or-repair thresholds, while contrasting temporary remedial alterations with permanent modifications. It is suited for plant integrity professionals, stationary equipment supervisors, and mechanical inspectors seeking a structured approach to lifecycle monitoring, degradation characterisation, and code-approved return-to-service decision-making across industrial sectors.

Course FAQs

What is the API 510 pressure vessels inspection training course?

API 510 pressure vessels inspection training course is an engineering training syllabus covering the evaluation, degradation monitoring, remaining life calculation, and repair governance of unfired operational pressure vessels under international design and maintenance standards.

What is the difference between API 510 and ASME Section VIII Division 1?

ASME Section VIII Division 1 governs the initial design, fabrication, and testing of new pressure vessels, whereas API 510 governs the continued inspection, alteration, rerating, and maintenance of vessels once they have entered operational service.

Which standards are examined during the API 510 pressure vessels inspection training course?

The syllabus references API 510 for in-service practices, API RP 572 for internal vessel inspection routines, ASME Section VIII Division 1 for pressure calculations, and selected elements of ASME Section IX and API 579-1.

Is this course appropriate for a turnaround maintenance engineer?

Yes. The syllabus teaches turnaround engineers how to assess unexpected vessel wall loss, evaluate weld defects, review alteration proposals, and select approved repair designs to safely clear vessels for operational restarts.

What will delegates produce during the API 510 pressure vessels inspection training course?

Delegates produce a vessel integrity assessment dossier that documents thickness calculations, remaining life projections, degradation analysis, non-destructive testing selections, and compliant repair recommendations for an operational process drum.

