CONCEPT

Fitness-for-Service Assessment: API 579-1/ASME FFS-1, Remaining Life and Repair

Fitness-for-Service Assessment: API 579-1/ASME FFS-1, Remaining Life and Repair

Introduction:

Fitness-for-service assessment decides whether a thinned, pitted, distorted or cracked vessel, tank or pipe can keep running, must be derated, repaired or retired. Without a structured calculation, plants either shut down sound equipment or keep damaged components in service with no margin. This Core Concept course trains integrity and mechanical engineers to gather the right inspection data, apply the API 579-1/ASME FFS-1 assessment levels, calculate remaining strength and remaining life, and set re-inspection intervals and repairs. Participants produce a Fitness-for-Service Assessment Report for a damaged component from their own plant.

Course Objectives:

- Select the assessment level and the data package needed to evaluate a damaged pressure vessel, tank, piping or pipeline component
- Calculate remaining thickness ratios, minimum required thickness and reduced maximum allowable working pressure for general and local metal loss
- Evaluate pitting, blisters, laminations, weld misalignment and shell distortion against acceptance criteria and decide run, derate, repair or retire
- Estimate remaining strength of corroded pipelines with ASME B31G and compare the safe operating pressure with the current operating pressure
- Determine remaining life and re-inspection intervals from corrosion rates, future corrosion allowance and creep damage at overview level
- Specify a repair method in line with ASME PCC-2 and document the decision in a Fitness-for-Service Assessment Report

Target Audience:

- Integrity engineers who disposition inspection findings on pressure equipment and piping
- Mechanical and static equipment engineers who approve derating, repair and continued operation
- Inspection engineers who plan thickness surveys and define data for defect evaluation
- Pipeline integrity engineers who evaluate corrosion anomalies and set safe operating pressures
- Engineering technical authorities who sign off run, repair or replace decisions

Course Outline:

Day 1: Fitness-for-Service Principles, Damage Screening and Data Inputs

- Run, Derate, Repair or Retire: The Fitness-for-Service Decision Chain
- API 579-1/ASME FFS-1 Structure: Parts, Procedures and Acceptance Philosophy
- Assessment Levels 1, 2 and 3: Screening Criteria, Data Demand and Conservatism
- Original Design Data Pack: ASME Boiler and Pressure Vessel Code, ASME B31.3, API 650 and API 620 Records
- Damage Mechanism Identification as the Entry Point to an FFS Assessment

Day 2: Metal Loss Assessment: General, Local and Pitting Damage

- Point Thickness Readings Versus Critical Thickness Profiles for General Metal Loss
- Remaining Thickness Ratio and Minimum Measured Thickness Calculation Worksheet
- Local Thin Area Sizing: Longitudinal and Circumferential Extent and Remaining Strength Factor
- Reduced Maximum Allowable Working Pressure and Fill Height Recalculation
- Pitting Damage Evaluation: Pit Density Charts, Pit Couples and Widespread Pitting

Day 3: Blisters, Laminations, Weld Misalignment, Distortion and Pipeline Defects

- Hydrogen Blister and Lamination Sizing, Spacing and Crown Cracking Checks
- Centreline Offset, Angular Misalignment and Peaking at Weld Joints
- Out-of-Roundness, Bulges and General Shell Distortion Stress Evaluation
- ASME B31G Remaining Strength Calculation for Corroded Pipeline Anomalies
- Safe Operating Pressure Ratio and Anomaly Response Ranking for Pipeline Metal Loss

Day 4: Crack-Like Flaws, Creep, Remaining Life and Re-Inspection Intervals

- Crack-Like Flaw Characterisation and Failure Assessment Diagram at Overview
- High-Temperature Creep Damage and Time-Dependent Remaining Life at Overview
- Future Corrosion Allowance and Corrosion Rate Selection From Inspection History
- Remaining Life Calculation and Re-Inspection Interval Setting for Thinning Components
- Uncertainty in Thickness Data, Material Properties and Loads: Sensitivity Checks

Day 5: Repair Decisions and the Fitness-for-Service Assessment Report

- ASME PCC-2 Repair Options: Welded Sleeves, Weld Buildup and Composite Repair Selection
- Temporary Versus Permanent Repair Decisions With Examination and Testing Requirements
- Guided Case: Refinery Pressure Vessel With Local Thin Area and Pitting
- Guided Case: Gas Pipeline Corrosion Cluster and Process Piping Misalignment
- Own-Plant Fitness-for-Service Assessment Report Build and Peer Review

Skills You Will Gain:

- Assessment Level Selection
- Metal Loss Evaluation
- Pressure Rerating
- Pitting Damage Analysis
- Weld Misalignment Evaluation
- Corroded Pipeline Strength Calculation
- Remaining Life Estimation
- Repair Method Selection

Why Attend This Course:

- Return with a Fitness-for-Service Assessment Report prepared on a damaged component from your own plant
- Avoid unnecessary shutdowns by showing with calculations when damaged equipment can safely stay in service
- Defend derating, repair and re-inspection decisions to operations, technical authorities and auditors
- Compare damage evaluation practice with engineers from refining, petrochemical, gas processing, power and pipeline operators

Conclusion:

Sound run, repair or retire decisions depend on reliable inspection data and calculations that follow a recognised procedure. The course moves from the fitness-for-service decision chain and assessment levels, through metal loss, pitting, blisters, laminations, misalignment and distortion, to corroded pipeline strength, crack-like flaws, creep, remaining life and re-inspection intervals. The final day applies ASME PCC-2 repair choices in guided cases and produces a Fitness-for-Service Assessment Report that each participant can take to their technical authority.