



Fitness For Service Of Piping, Vessels & Tanks



Introduction:

This course explains all fundamental principles of fitness for service, their practical application through case histories, and a step by step evaluation process for each type of degradation mechanism. The course also gives participants knowledge on all fundamental principles of component integrity, material properties of strength and toughness, and the introduction to stress and fracture mechanics. The course provides a review of degradation mechanisms, general metal loss, local wall thinning, pitting, blisters and lamination, mechanical defects (dents, gouges, misalignment, and distortion), crack like flaws (stress corrosion cracking, weld flaws, crack like defects), fatigue and fire damage.

Who Should Attend?

Maintenance, Mechanical Engineers, Foremen, Supervisors and Technicians, Production Supervisors and Engineers who require an understanding of the Fitness for Service standard, Design and System Engineers, Inspectors, Project and Maintenance Engineers who are personally responsible for the reliable design, operation, maintenance and repair of equipment, systems, tanks, vessels, piping and pipelines

Course Objectives:

By the end of this course delegates will be able to:

- Latest techniques to determine the fitness for service of operating tanks, vessels, piping systems and pipelines and make cost effective run or repair decisions
- Balanced approach between the fundamental technical principles of structural integrity, stress and fracture analysis, and their practical application to field conditions
- The tools necessary to recognize and assess defects in tanks, vessels and piping
- How to apply the step by step 3level approach to evaluate inspection results and recognize potential failure modes
- Technical basis for reliability based (risk based) evaluation of remaining life
- Latest developments in defect assessment techniques, starting with simple rules and progressing to the more comprehensive evaluation techniques
- How to evaluate the structural integrity of corroded or damaged equipment, and assess their remaining life. Degradation mechanisms include: brittle fracture, general metal loss, local wall thinning, pitting, blisters and lamination, mechanical defects (dents, gouges, misalignment, and distortion), crack like flaws (stress corrosion cracking, weld flaws, crack like defects), fatigue and fire damage

Course Outline:

Foundations of Fitness for Service Assessment

- Introduction
- Fitness For Service
- Contents, objectives and applications
- How to apply cost effective run or repair decisions
- Fitness for Service assessment procedure
- An overview of what is new in the latest release

The Assessment

- Structure of the Standard
- Examples of the major PARTS

Mechanical Integrity and Fitness for Service

Thickness and Stress equations for Assessment

- Calculation of Membrane Stress
- Pressure Vessel and End Caps
- Piping components and Boiler Tubes

Techniques

Brittle Fracture

- Data Requirements
- Assessment Techniques
- Acceptance Criteria

Pitting and Corrosion

General Metal Loss

- Data Requirements
- Assessment Techniques
- Acceptance Criteria
- Worked example

Local Metal Loss

- Data Requirements
- Assessment Techniques
- Acceptance Criteria
- Worked example

Pitting Corrosion

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- Data Requirements
- Assessment Techniques
- Acceptance Criteria
- Worked example

Blisters and Local Damage

Hydrogen Blisters

- Data Requirements
- Assessment Techniques
- Acceptance Criteria

Weld Misalignment and Shell Distortions

- Data Requirements
- Assessment Techniques
- Acceptance Criteria
- Worked example

Cracks and Crack Like Flaws

- Elements of RSTRENG
- Data Requirements
- Assessment Techniques
- Acceptance Criteria
- Worked example

Creep and Fire

Creep

- Data Requirements
- Assessment Techniques
- Acceptance Criteria

- Worked example

Fire Damage

- Data Requirements
- Assessment Techniques
- Acceptance Criteria

Software Review

- Various software packages considered

Overview and Wrap Up