TECHNICAL
EDUCATION
ACADEMY

School of Engineering

COURSE PROGRAMME

000678

MECH070 - API 579-1/ASME FFS-1 Fitness-For-Service

In the high-stakes world of oil and gas, the integrity of pressure vessels, piping, and critical equipment is paramount.



Learn from the Best in the Business!

Course overview

Foundation level

Why take this course

In the high-stakes world of oil and gas, the integrity of pressure vessels, piping, and critical equipment is paramount. The API 579-1/ASME FFS-1 Fitness-for-Service (FFS) training programme equips engineers and professionals with the skills to assess and manage equipment health, ensuring safe and efficient operations. Over five intensive days, participants delve into the technical intricacies of identifying, evaluating, and addressing damage mechanisms that threaten industrial assets.

This comprehensive course bridges theoretical principles with practical applications, providing a roadmap for analyzing general and local metal loss, hydrogen damage, crack-like flaws, and more. Participants gain hands-on experience with industry-standard tools and methodologies, learning how to perform Level 1 and Level 2 assessments, calculate remaining life, and make informed decisions about repair or replacement.

Designed for engineers, maintenance professionals, and safety experts, this programme not only enhances technical expertise but also fosters a deeper understanding of compliance with global standards. By the end of the course, participants will have the confidence to address complex fitness-for-service challenges, ensuring the safety, reliability, and longevity of critical industrial equipment.

Who it is for and how it helps

This course is designed for professionals involved in the inspection, maintenance, and assessment of pressure vessels, piping, and other critical equipment in the oil and gas industry, including:

- Inspection Engineers
- Maintenance Engineers
- Mechanical Engineers
- Plant Managers and Supervisors
- Integrity Engineers
- Design Engineers
- Risk and Reliability Engineers
- Health, Safety, and Environment (HSE) Professionals

It is especially beneficial for those who are responsible for implementing Fitness-for-Service (FFS) assessments and ensuring the safe operation of industrial equipment.

What you will learn

- Explain the scope, structure, and applicability of the FFS standard
- Identify modes of equipment degradation and appropriate assessment procedures
- Conduct Level 1 and Level 2 assessments for various types of equipment flaws, including general metal loss, local metal loss, pitting, hydrogen damage, cracks, and more

Course overview — continued

- Apply failure assessment diagrams (FADs) and calculate remaining strength factors (RSF)
- Assess components for brittle fracture, creep damage, and fire damage
- Evaluate hydrogen-induced cracking (HIC) and shell distortions
- Calculate required thickness and remaining life for pressure vessels and piping
- Use step-by-step methodologies to assess flaws and damage, ensuring safe continued operation or recommending repair/replacement
- Utilize real-world case studies and exercises to master assessment techniques
- Interpret results to ensure compliance with safety and operational standards

Curriculum

Modules 01–04

01 Introduction to Fitness-for-Service (FFS)

- Overview of API 579-1/ASME FFS-1 Standard
- Fundamentals of Pressure Vessels and Piping
- Scope and Limitations of API 579
- Definition of Technical Terms
- FFS Assessment Procedures and Levels
- Failure Assessment Diagrams (FAD) and Remaining Strength Factor

02 General Engineering Evaluation Procedures

- Fitness-for-Service Engineering Evaluation Roadmap
- Calculation of Required Thickness and MAWP
- Concept of Minimum Allowable Temperature (MAT) and Critical Exposure Temperature (CET)
- Overview of Flaw Damage and Assessment Procedures
- Modes of Deterioration and Metal Loss

03 Assessment of Metal Loss

- Definition and Assessment of General Metal Loss
- Procedures for Level 1 Assessment
- Calculation of Minimum Required Thickness and Average Thickness
- Coefficient of Variation
- Case Studies and Exercises: General Metal Loss
- Assessment of Local Metal Loss and Pitting Corrosion
- Required Data, Measurements, and Acceptance Criteria

04 Assessment of Hydrogen-Related Damage

- Hydrogen-Induced Cracking (HIC) and Step-by-Step Assessment
- Assessment of Hydrogen Blisters
- Techniques and Acceptance Criteria for Hydrogen Damage
- Case Studies and Exercises: Hydrogen Damage Analysis

Curriculum

Modules 05–08

05 Assessment of Crack-Like Flaws

- Flaw Characterization: Single and Multiple Cracks
- Step-by-Step Assessment Method
- Failure Assessment Curves and FAD Selection
- Maximum Permissible Crack Dimensions
- Case Studies and Exercises: Crack Analysis as per Level 1
- Introduction to Fracture Mechanics
- Level 2 Assessment of Crack-Like Flaws

06 Special Assessments

- Assessment of Components Operating in the Creep Regime
- Creep Range Temperatures and Creep Curves for Various Materials
- Case Studies: Creep Damage Analysis
- Assessment of Fire Damage
- Fire Zones and Damage Characterization
- Case Studies on Fire Damage
- Assessment of Dents, Gouges, and Dent-Gouge Combinations
- Techniques and Acceptance Criteria
- Case Studies and Exercises: Dents and Gouges

07 Geometric and Structural Deformation

- Assessment of Weld Misalignment and Shell Distortion
- Techniques and Acceptance Criteria for Level 1
- Case Studies: Weld and Shell Distortions
- Assessment of Laminations - Step-by-Step Evaluation and Case Studies

08 Fatigue and Long-Term Life Assessment

- Overview of Fatigue Damage Mechanisms
- Assessment Techniques and Acceptance Criteria
- Case Studies: Fatigue Damage
- Remaining Life Assessment and Reduced Permissible MAWP

Curriculum

Modules 08–09 · Module 08 — continued

- Application of API 579 Methodology to Long-Term Maintenance

09 Integrated Problem-Solving Workshop

- Practical Applications of API 579: 1. General Metal Loss, Local Metal Loss, and Pitting Corrosion; 2.Crack-Like Flaws and Hydrogen Damage; 3. Creep, Fire Damage, and Dents/Gouges
- Group Exercises and Case Studies
- Instructor Feedback and Discussion

Joining the programme

Contact the Academy and quote course code 000678 to confirm dates, delivery format, prices and enrolment terms.

Training for your team

Tell us your business goals, the roles and number of participants, and your preferred dates and location. This will help us discuss the right training option.

Preparing for the programme

The published programme does not specify any prerequisites. Contact us before enrolling to confirm how to prepare.

Discuss your training needs

mail@tecedu.org
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Learn from the Best in the Business!