Fitness for Service FFS (API 579-1ASME FFS-1)

Course Description:

The American Petroleum Institute (API) conducts training classes that can help the candidates understand and use the techniques Fitness-For-Service Assessments of pressurized equipment including pressure vessels, piping, and tankage. The ASME and API design codes and standards for pressurized equipment provide rules for the design, fabrication, inspection, and testing of new pressure vessels, piping systems, and storage tanks. These codes typically do not provide assessment procedures to evaluate degradation due to in-service environmentally-induced damage or from original fabrication that may be found during subsequent inspections. Fitness-For-Service (FFS) assessments are engineering evaluations that are performed to demonstrate the structural integrity of an in-service component containing a flaw or damage. The first edition of API 579 was developed to provide guidance for conducting FFS assessments of flaws commonly encountered in the refining and petrochemical industry that occur in pressure vessels, piping, and tankage. However, the assessment procedures have been used to evaluate flaws encountered in other industries such as the pulp and paper industry, fossil electric power industry, and nuclear industry. API and ASME formed a joint committee to produce a single FFS Standard that can be used for pressure-containing equipment. This standard, released in 2007, is known as API 579-1/ASME FFS-1. The new joint standard includes all topics contained in the 2000 Edition of API 579 and includes new parts covering FFS assessment procedures that address the unique damage mechanisms experienced by other industries such as the fossil electric power industry and the pulp and paper industry.

The highlights include:

- Discussion of damage mechanisms and the importance of identification
- Various detailed inspection techniques for damage mechanisms, with focus on flaw characterization
- Overview of remaining life assessment, remediation, and methods to extend the life of damaged equipment

- Presentation of practical examples of FFS procedures
- Details on how to assess damage/flaws that are not directly covered in API 579-1/ASME FFS-1
- Interaction of API 579-1/ASME FFS-1 with API Publications 510 and 570, API 653, and NBIC NB-23
- Relationship of API 579-1/ASME FFS-1 with other international FFS standards
- Future directions of API 579-1/ASME FFS-1

Training Objective:

By the end of this course delegates will know about:

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- The basic and intermediate methodologies of inspecting and assessing equipment for continued service
- The need for more advanced evaluations
- The possible remediation available will be discussed in accordance with the methodologies given in API 579-1/ASME FFS-1
- Make a run, repair or replace decision
- Confidently perform Level I and Level II Fitness-for-Service evaluations quickly for metal loss due to corrosion, erosion or cracking
- Determine if equipment is safe now as well as how long you can expect to use it

Who Should attend?

Inspectors, engineers, and technologists who are involved in performing API 579-1/ASME FFS-1 evaluations, inspecting and analyzing pressure vessels, pressure piping, tanks and pipelines for safe operation when there is a change in service temperature, or where they have been found to be damaged, distorted, cracked, blistered, or experiencing metal loss

Training Methods:

This interactive Training will be highly interactive, with opportunities to advance your opinions and ideas and will include;

- Lectures
- Workshop & Work Presentation
- Case Studies and Practical Exercise
- Videos and General Discussions

Course Outline:

Scope of API 579-1/ASME FFS-1

- Responsibilities of owner-user, inspector, engineer

General Assessment Method

- Data requirements:
- What is required
- Who is responsible
- How is data obtained and organized
- Remaining strength factor
- Need for in-service monitoring (inspection frequency)

Remaining Life Determination

Brittle Fracture Resistance

- Governing thickness concept (as per ASME VIII)
- Stress ratio
- Hydrostatic testing
- Thin wall considerations

Metal Loss Evaluation

- Point thickness methodology
- Grid thickness methodology
- Supplemental loading
- ASME B31.1 and B31.3 flexibility analysis
- Pitting evaluation

HIC and SOHIC Evaluation

- Blisters and hydrogen induced cracking

Evaluating Geometric Irregularities

- Bending and section axial forces
- Weld misalignment
- Out of round
- Internal and external pressure
- Bulges and dents
- Gouges
- Combinations of distress
- Fatigue analysis

Evaluation of Cracks and Crack-like Flaws

- Primary, secondary, and residual stress
- Non-fracture mechanics method
- Fracture mechanics method

Problem Solving Session

Creep Damage Assessment

Heat and Fire Damage Evaluation

Lamination Evaluation