Course Content

Title: API-579 / ASME FFS-1 Fitness for Service with BechtFFS Software

Potential PDH: 40 **Code:** BTT008

Description:

This course provides theory and practical application of API-579/ASME FFS-1 methods for assessing the acceptability of equipment with various kinds of flaws. The Fitness-for-Service training provides direction for performing FFS assessments using procedures specifically prepared for pressurized equipment. For the topics covered in the training, example problems will be solved using hand calculations supplemented with BechtFFS software.

Outline:

1. Introduction to Fitness-for-Service
    - Overview of API 579/ASME FFS-1
    - Scope and Objectives
    - Responsibilities in FFS
2. FFS Methods and Margins
    - Design Margins for New Equipment
    - Remaining Strength Factor
    - Margins for In-Service Equipment
    - Three Levels of FFS Analysis
3. Brittle Fracture
    - Factors Influencing Brittle Fracture
    - Applicability and Limitations
    - Data Requirements
    - Level 1 and 2 Brittle Fracture Assessment
4. General Metal Loss
    - Local vs General Thinning
    - Applicability and Limitations
    - Data Requirements
    - Level 1 and 2 Assessment
    - Remaining Life Assessment
5. Local Thin Areas
    - Applicability and Limitations
    - Data Requirements
    - Level 1 and 2 Assessment
    - Remaining Life Assessment
    - Remediation
6. Pitting Corrosion
    - Applicability and Limitations
    - Pit Measurement and Pit Couples
    - Level 1 and 2 Assessment
    - Remaining Life Assessment
    - Remediation
7. Hydrogen Blisters and Hydrogen Damage Associated with HIC and SOHIC
    - Applicability and Limitations

- Inspection Technique and Sizing Requirments
- Data Requirements
- Level 1 and 2 Assessment for Blisters, HIC and SOHIC
- Remaining Life Assessment
- Remediation

8. Weld Misalignment and Shell Distortion
    - Applicability and Limitations
    - Data Requirements
    - Level 1 and 2 Assessment
    - Remaining Life Assessment
    - Remediation
9. Crack-Like Flaws
    - Applicability and Limitations
    - Flaw Sizing and Inspection Technique
    - Level 1 and 2 Assessment
    - Failure Assessment Diagram (FAD)
    - Leak before Break
    - Remediation and In Service Monitoring
10. High Temperature Creep
    - Applicability and Limitation
    - Data Requirement
    - Assessment Technique
    - Creep Rupture Life for Tubes
    - Remediation
11. Fire Damage
    - Applicability and Limitation
    - Data Requirement
    - Assessment Technique and Acceptance Criteria
    - Level 1 and 2 Assessment
    - Remainign Life Assessment and Remediation
12. Assessment of Dents, Gouges and Dent-Gouge Combinations
    - Applicability and Limitation
    - Data Requirement
    - Level 1 and 2 Assessment of Dents Only and Gouges Only
    - Level 1 and 2 Assessment of Dents and Gouge Combination
    - Remaining Life Assessment
    - Remediation
13. Assessment of Lamination
    - Applicability and Limitations
    - Data Requirements
    - Level 1 and 2 Assessment
    - Remaining Life Assessment
    - Remediation

Instructor:

Nadarajah ("Ranjan") Chithranjan, Ph.D, PE, career has spanned over 18 years of worldwide involvement in petrochemical industries for ExxonMobil Research and Engineering. Prior to joining Becht Engineering, he worked as a fixed equipment specialist at ExxonMobil Research and Engineering

and he has worked in more than a dozen countries worldwide to solve complex mechanical plant problems as well as mechanical support for large scale projects. He has extensive knowledge in pressure vessels, piping, and storage tanks, design and maintenance codes. At ExxonMobil, he was the lead fitness for service specialist and he is very well versed with the fitness for service codes as well as linear and non-linear finite element methods to solve complicated plant problems. Ranjan was also the Mechanical Delayed Coker and Storage Tank subject matter expert at ExxonMobil Research and Engineering. He was a former member of API-650 Welded Steel Tank for Oil Storage and presently he is a member of the ASME Working Group on Section VIII, Division II, Design by Analysis and Working Group on Section VIII, Division II, High temperature design. He has more than twenty publications and two patents. Dr. Nadarajah received his PhD and Bachelors in Mechanical Engineering from the University of Strathclyde, Glasgow, United Kingdom.