Tel No:+97126654546 |Fax No:+97126654182|Email: training@cmc-me.com|www.cmc-me.com



FE061:
Fitness-For-Service, Remaining Life Assessment & Repair of Pressure Equipment & Piping
(API-579/ASME FFS-1 & PCC-2 Standards)

Training Description:

This intensive training course clarifies the Fitness-for-Service concepts and technologies and provides training on the application of API 579-1/ASME FFS-1, a standard jointly published by the American Petroleum Institute (API) and the American Society for Mechanical Engineers (ASME) that covers a wide range of flaw types and damage mechanisms. It is intended to supplement and augment the requirements in API 510, API 570 and API 653 to ensure safety and reliability of plant equipment.

The general road map and procedures for flaw evaluation, acceptance criteria, calculation of remaining life, and the three levels of evaluation will be explained. Level 1 procedures for evaluation of the various flaws covered in Parts 3 through 13 are explained and demonstrated by worked example problems. Additionally, Level 2 procedures are discussed and some level 2 worked example problems are demonstrated. An introduction to level 3 analyses methods and acceptance criteria is covered. Stresses of various categories and failure modes associated with each are explained. Basic design of pressure vessels, piping and storage tanks including the relevant Code design formulas for calculating required thickness are presented and demonstrated by worked examples problems.

The course emphasizes that any FFS assessment must not conflict with code and regulatory requirements and ensures that basic engineering principles are adhered to and the intent of the reference publication is understood and followed.

Training Objectives:

The participants will learn to apply the rules of the API/ASME 579 standard "Fitness-for-Service" to recognize degradation mechanisms, evaluate the integrity and remaining life of pressure vessels, tanks, piping systems and pipelines, make cost effective run-or-repair decisions, and select the appropriate repair options.

By the end of the training, participants will be able to:

- ✓ Understand the fundamental principles of fitness-for-service, their practical application through presentations, worked examples, case studies, and a step-by-step evaluation process for each type of degradation mechanism
- ✓ Understand the fundamental principles of component integrity, application of the ASME code rules, material properties of strength and toughness, and the introduction to stress and fracture mechanics
- ✓ Have a review of degradation mechanisms and the application of API 579 to brittle fracture, general metal loss, local wall thinning, pitting, blisters and laminations, mechanical defects (dents, gouges, misalignment, and distortion), crack-like flaws (stress corrosion cracking, weld flaws, crack-like defects), fatigue, HIC and SOHIC and fire damage

Personal Impact:

- ✓ Participants will obtain all skills that are essential for assessing pressure vessels, piping and tanks against all known degradation mechanisms from first approach at field Level up to expertise level giving them extreme confidence on their recommendation through professionally written reports.

Organisational Impact:

- ✓ Optimization of process plant operation, including equipment efficiency, energy consumption and maintenance management, is vital to the budgetary success of the organisation. On completion of this seminar the delegates will be able to critically analyse the methodologies employed within the organisation and instigate improvements where required.

Training Designed for:

This course is intended for Integrity Assessment Engineers, Operations Engineers, Maintenance Engineers, Maintenance Supervisors, Facility Integrity Supervisors, Corrosion Engineers, Corrosion Specialists, Site inspection Engineers, Piping Engineers, Mechanical Engineers, Plant Managers, Plant Engineers, Project Engineers, and Engineers who are responsible for maintaining the integrity of process plant equipment and piping.

Training Requirement:

"Hand's on practical sessions, equipment and software will be applied during the course if required and as per the client's request."

Contents can be adapted to your specific wishes. It is therefore possible to focus on specific modules of the training course as per client's learning needs and objectives. Further, it should be forwarded to us a month prior to the course dates.

Training Program:

DAY ONE:

- ❖ Fitness-For-Service Technology
  - Overview of API 579 Contents, Objectives and Applications
  - How to apply API 579 for cost-effective run-or-repair decisions
  - Fitness-for-Service assessment procedure
  - An overview of what is new in the latest release
  - FFS Assessment Methodology and Procedure
  - Structure of the Standard - Road map for Parts 3 through 13 of the FFS Standard
  - The FFS eight-step procedure
  - Examples of the major parts

DAY TWO:

- ❖ Inspection and Fitness-For-Service
  - Real function of inspection
  - Inspection reliability and effectiveness
  - Nondestructive testing techniques - PT, VT, MT, ET, UT, RT, AE
  - Fundamentals of Design and Construction of Pressure Vessels, Storage Tanks and Piping
  - Annex A - Thickness, MAWP and stress equations for a FFS assessment
  - Fitness-for-Service and Remaining Life (cont'd) Brittle Fracture and Cryogenic Service
  - Assessment of General Wall Thinning
  - Assessment of Local Thin Areas and B31G for Pipelines
  - Assessment of Pitting Corrosion

- Fabrication Defects and in-Service Degradation of Pressure Equipment and Piping
- Annex G - Damage Mechanisms

DAY THREE:

❖ FFS Assessment of Brittle Fracture and Metal Loss

- Assessment of Existing Equipment for Brittle Fracture
- Overview of brittle fracture
- Data requirements
- Assessment techniques
- Acceptance criteria
- Worked examples
- Overview of Corrosion, Erosion and Pitting
- Assessment of General Metal Loss
- Data requirements
- Assessment techniques
- Acceptance criteria
- Worked examples
- Assessment of Local Metal Loss
- Data requirements
- Assessment techniques
- Acceptance criteria
- Worked examples *Assessment techniques laminations-Distortion-cracks*

DAY FOUR:

❖ Assessment of Pitting Corrosion

- Data requirements
- Assessment techniques
- Acceptance criteria
- Worked example
- Fitness for Service Assessment of Corroded Pipelines
- ASME B31G
- RSTRENG
- KAPA
- Worked Example - Blisters, Local and Mechanical Damage
- Assessment of Hydrogen Blisters and Hydrogen Damage Associated with HIC and SOHIC
- Data requirements
- Assessment techniques
- Acceptance criteria
- Worked examples Assessment techniques creep-fire damage-fatigue

DAY FIVE:

❖ Assessment of Weld Misalignment and Shell Distortions

- Data requirements
- Assessment techniques
- Acceptance criteria
- Worked example

- Introduction to Fracture Mechanics
- Assessment of Crack-Like Flaws
- Data requirements
- Assessment techniques
- Acceptance criteria
- Worked examples
- Creep, Fire and Mechanical Damage
- Assessment of Components Operating in the Creep Range
- Data requirements
- Assessment techniques
- Acceptance criteria
- Worked example
- Assessment of Fire Damage
- Data requirements
- Assessment techniques
- Acceptance criteria
- Case study
- Assessment of Dents, Gouges, and Dent-Gouge Combinations
- Data requirements
- Assessment techniques
- Acceptance criteria
- Worked example
- Assessment of Laminations
- Data requirements
- Assessment techniques
- Acceptance criteria
- Worked example Repair methodologies
- Repair Techniques
- New Developments in Repair Standards
- Permanent and Temporary Repairs
- Overview of All Repair Techniques
- Selection of the Right Repair
- Contents and Structure of the Repair Plan
- Welding on In-Service Equipment
- Welded Repairs
- Non-Welded Repairs

❖ Course Conclusion
❖ POST-ASSESSMENT and EVALUATION

Training Certificate(s):

CMCT Internationally recognized certificate(s) will be issued to each participant who completed the course.

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Training Methodology:

This interactive training course includes the following training methodologies as a percentage of the total tuition hours:

- 30% Lectures, Concepts, Role Play
- 70% Workshops & Work Presentations, Techniques, Based on Case Studies & Practical Exercises, Gamification, Software & General Discussions
- Pre and Post Test

Training Fees:

TBA as per the course location - This rate includes participant's manual, hand-outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Note: The 5% VAT (Value Added Tax), will be effective starting 01st of January 2018 as per the new regulation from the UAE Government. The VAT applies for all quotation both for local and abroad.

Training Timings:

Daily Timings:

07:45 - 08:00	Morning Coffee / Tea
08:00 - 10:00	First Session
10:00 - 10:20	Recess (Coffee/Tea/Snacks)
10:20 - 12:20	Second Session
12:20 - 13:00	Recess (Prayer Break & Lunch)
13:00 - 14:00	Last Session

For training registrations or in-house enquiries, please contact:
Aisha Relativo - Training & Career Development Manager
aisha@cmc-me.com / training@cmc-me.com
Tel.: +971 2 665 3945 or +971 2 643 6653 | Mob.: +971 52 2954615