FRACTURE MECHANICS, PROVIDED BY STRUCTURAL INTEGRITY ASSOCIATES

CLASSROOM INSTRUCTORS

Dr. Dilip Dedhia

Education:

- Ph.D. Materials Science, Oregon Graduate Center

Accreditations/Industry Leadership:

- Co-developer of EPRI BLESS code for headers and pipes
- Co-developer of EPRI TULIP for high temperature tubing
- Developed Structural Integrity's pc-CRACK 4.0 for general purpose fracture mechanics analysis

Background:

- Dr. Dedhia has over 40 years of experience in Deterministic and Probabilistic Fracture Mechanics analyses. He also has extensive experience in fracture mechanics methods including high-temperature creep fatigue crack growth. Dr. Dedhia has been a key contributor to the EPRI MRP extremely low probability of rupture (xLPR) program.

CONTACT INFORMATION

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INTENDED AUDIENCE

Engineers who seek to better understand the use of fracture mechanics to analyze and predict flaw behavior. This course will be of special interest to those working with equipment design, failure analysis and material testing.

TYPE

Classroom Training

DURATION

Two days (15 PDH)

LEARNING OBJECTIVES

When a flaw is found in a reactor pressure vessel, piping, or other nuclear plant component, fracture mechanics calculations are used to analyze and predict flaw behavior, including crack growth rates and critical crack sizes.

This course will cover the fundamentals of fracture mechanics (FM) and common applications of fracture mechanics in the nuclear power industry. Topics will include linear elastic and elastic plastic fracture mechanics, methods for computation of stress intensity factors, fatigue life, and stress corrosion life. Selected applications of the ASME Code and an introduction to probabilistic fracture mechanics (PFM) will also be provided.

Structural Integrity is an industry leader in applying deterministic and probabilistic fracture mechanics techniques, including finite element analysis, to disposition flaws in a variety of materials, geometries, and applied stress fields.

Using Structural Integrity's practical experience, this course goes beyond an introduction to the theory and formulas of fracture mechanics. It will provide students with real-world practical applications and methods. The course will also cover the use of pc-CRACK, a specialized program we developed and often employ for ASME Code Section XI flaw evaluations and weld overlay design.

Topics Covered:

- Fundamentals of fracture mechanics
- Examples of fracture mechanics applications
- Limitations of fracture mechanics
- Critical crack size calculations
- Life calculations under fatigue or stress-corrosion cracking
- Selected applications of the ASME Code
- Limit-load analyses and their nuclear applications
- Introduction to the pc-CRACK© FM computer program

KEY INDUSTRY DOCUMENTS

1. Tada, H., Paris, P. C., Irwin, G. R., The Stress Analysis of Cracks Handbook, 3rd Edition, ASME Press, 2000
2. ASME Boiler and Pressure Vessel Code, Section XI, Article A-3000, 1998
3. Murakami, Y., Stress Intensity Factors Handbook, Volume 1-3, Pergamon Press, 1987-1992
4. EPRI Report No. NP-6301-D, "Ductile Fracture Handbook," in 3 Volumes, EPRI and Novetech Corp., 1989-1991
5. API Standard 579-1/ASME FFS-1, Fitness-For-Service, Second Edition, June 2007
6. Barsom, J. M. and Rolfe S. T., Fracture and Fatigue Control in Structures, 2nd Edition, Prentice-Hall, 1987