

MC121

Design by Analysis Requirements in ASME BPV Code, Section VIII, Division 2 – Alternative Rules

Day 1

- Background and Development of Section VIII Division 2
 - Organization of VIII-2
 - Overview Of VIII-2, Parts 1 through 9
- Comparison: VIII-1 vs VIII-2 with a Focus on Cost
 - ASME VIII-1 PLUS Construction, (*It's what most refinery & petrochemical companies do!*)
 - Comparison – ASME VIII-1 vs ASME VIII-2
 - Comparison – t_{min} & The VIII-2 Class 2 Allowable Stress Bases
 - Comparison – ASME VIII-1 vs ASME VIII-2 – Summary
- References – ASME PTB-1 & PTB-2
- Basic Concepts in Section VIII, Division 2, Part 5 - Design by Analysis
 - Design-By-Analysis (DBA)
 - The Force Method
 - Stress Definitions
 - Primary Stress & Limits
 - VIII-2 Allowable Stress Basis
 - Secondary Stress & Limits
 - Peak Stress & Limits
 - Stress Classification – The Hopper Diagram
 - Stress Classification – Nozzles
 - Stress Calculations for Code Compliance
- Supplemental Information for VIII-2, Part 5 Design-By-Analysis Applicability
 - Applicability
 - Numerical Analysis
 - Numerical Analysis & Material properties
 - Material Properties
- Protection Against Plastic Collapse
 - Overview
 - Elastic Stress Analysis Method
 - Limit Load Analysis Method
 - Elastic-Plastic (EP) Analysis Method
 - Stress Measure for Multiaxial Stress States
 - Elastic Stress Analysis Method – Example 1
 - Limit Load Analysis Method – Example 1
 - Elastic-Plastic (EP) Analysis Method – Example 1
 - Comparison of Methods – Example 1
 - Example 2

- Protection Against Local Strain
 - Overview
 - Elastic Stress Analysis Method
 - Elastic-Plastic (EP) Analysis Method

Day 2

- Design for the Protection of Buckling
 - The Lecture Covers
 - What is Buckling?
 - Bifurcation or Eigenvalue Analysis
 - Buckling Analysis Options
 - Type 1 Buckling Analysis
 - Design Margin
 - Effects of Imperfections On Buckling Loads
 - Type 2 Buckling Analysis
 - Type 3 Buckling Analysis
 - Load Cases in Buckling Analysis
 - Example
 - References
- Design for the Protection of Fatigue
 - Definition
 - Fatigue Basics
 - VIII-2 Fatigue Analysis – Overview
 - Fatigue Screening
 - Fatigue Assessment Methods
 - Fatigue Assessment Methods – Comparison
 - Fatigue Assessment Methods – Examples
 - Fatigue Assessment Methods – References
- Development Of The ASME Smooth Bar Fatigue Curves
- The Infamous K_e and K_v Factors

Day 3

- Fundamentals of Ratcheting for Design by Analysis
 - Ratcheting Definition
 - Ratcheting Overview
 - Ratcheting Assessment – Elastic Stress Analysis
 - Ratcheting Assessment – Bree Diagram
 - Ratcheting Assessment – Bree Diagram – Loading Conditions
 - Ratcheting Assessment – Bree Diagram – Effect of Yield Stress
 - Ratcheting Overview – Elastic-Plastic Stress Analysis
 - Elastic-Plastic Modeling of Ratcheting Using FEA
 - Cyclic Plasticity
 - Ratcheting Summary
 - References - Ratcheting
- Summary of Section VIII Division 2 Code Case 2605



- Background of ASME VIII-2 Code Case 2605 (CC2605)
 - Technical Background of CC2605
 - Highlights of CC2605
 - Modifications to CC2605
 - Example Problem
- What's New in Fatigue – see API 579-1/ASME FFS-1, Part 14
 - Fatigue Analysis Using A Fracture Mechanics Approach
 - Material Toughness Requirements Using A Fracture Mechanics Approach
 - Brittle Fracture Overview
 - VIII-2 Toughness Rules
 - Using Fracture Mechanics To Determine the MDMT
 - Technical Basis Of VIII-2 Toughness Rules
 - Summary