



MC127

Bases and Application of Design Requirements for High Pressure Vessels in ASME BPV Code, Section VIII, Division 3

Day 1

Background and Development of ASME BPV Code VIII-3 Basic Concepts

- Overview of VIII-3
- Discussion of VIII-3 Criteria
- User's Design Specification Overview
- Key References
- ASME PTB-5 VIII-3 Example Problem Manual

Materials

- Overview of Materials Used
- Mechanical Property Testing and Locations
- Toughness Requirements

Basic Concepts in VIII-3, Design by Analysis

- Key Definitions – Liners, Layers, Leak before Burst, Design Pressure, Design Temperature, etc.
- Common Failure Modes
- Loadings

Linear Elastic Stress Analysis Method

- Overview
- Stress Categories and their Stress Limits
- Ratcheting – Bree Diagram
- Local Failure
- Elastic Stress Analysis Method – Example

Nonlinear Stress Analysis Method

- Design By Analysis – Global, Local and Hydrotest
- Stress Definitions
- Stress Equations – Design Pressure / Principal Stresses
- Design with Non-Linear Material Models – KD-230

Fundamentals of Nonlinear Ratcheting

- Ratcheting Overview
- Definitions
- Elastic-Plastic Modeling of Ratcheting Using FEA
- Cyclic Plasticity
- Summary
- Ratcheting – References



Day 2

Design for the Protection of Fatigue

- Definition
- VIII-3 Fatigue Analysis – Overview
- Fatigue Assessment Methods
 - Fatigue Curves
 - Fracture Mechanics
 - Structural Stress
- Fatigue Assessment Methods – Comparison
- Fatigue Assessment Methods – Example
- Fatigue Assessment Methods – Commentary
- Fatigue Assessment Methods – References

Special Design Topics ASME VIII-3

- Autofrettage
- Closures, Heads, Fasteners and Seals
- Layered Construction
- Wire Wound Vessels
- Environmental Considerations including Hydrogen
- Welded Construction
- Experimental Design Verification
- Overview of Additional CRPV Requirements

VIII-3 Examination and Testing Requirements

- Examination overview and use of NDE
- Rules for Autofrettage and Hydrostatic testing