



Expansion Joint Design & Application



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Introduction:

In this expansion joint design and application course, we will delve into a range of crucial topics: principles of expansion joint design, different types of expansion joints, the comparative performance of metallic bellows versus fabric bellows, the intricate process of designing fabric expansion joints, thorough stress analysis of these components, understanding equilibrium and the resultant anchor forces, appreciating field services related to expansion joints, and gaining in-depth insights into the manufacturing processes of expansion joints in our facilities.

Joint Application Design Development and Expansion Application:

The expansion joint design and application course will also introduce the Joint Application Design JAD development concept, emphasizing the collaborative efforts necessary for successfully expanding joint application projects.

Participants in this expansion joint design and application training will learn how to strategically use JAD sessions to define and design functional expansion joints tailored to specific industrial needs.

This holistic approach ensures that all stakeholders, including engineers, project managers, and technicians, are actively involved in the development process, from the conceptual design to the final application of expansion joints in their respective operational contexts.

Target Audience:

- Process, Mechanical, and Chemical Engineers.
- Operation and Maintenance Engineers.
- Project Engineers.
- Supervisors and Managers.
- Technical Personnel are involved in the inspection.

Course Objectives:

At the end of this expansion joint design and application course, the participants will be able to:

- Increase awareness and understanding of the mechanical integrity of process equipment and piping systems that depend on proper design, operation, condition assessment, and maintenance.
- Provide practical methods and tools for basic design calculations for pressure equipment following codes, standards, and best practices.
- Understand degradation mechanisms, how to identify and predict them, determine their impact, and prevent/control resultant damage.
- Acquire failure analysis skills to conduct damage assessment and avoid future failures.
- Enhance knowledge and skills in hazard identification and analysis, as well as risk assessment and management.

Targeted Competencies:

Upon the end of this expansion joint design and application training, the participant's competencies will:

- Overview of Piping.
- Preliminary Piping Design - Components and Total System.
- Basic Concepts of Stress Analysis - Flexibility Analysis and Design Bases.
- Influences on Pipe Support Design - Rigid Supports, Spring Supports, and Restraints.

Course Content:

Unit 1: Introduction - Why Expansion Joints:

- Thermal expansion of pipes.
- Piping system designer tools.
- Explore the steps to procure a metal bellow expansion joint.
- Case study: A US Bellows project.

Unit 2: System Design: Anchors, Guides, and Expansion Joints:

- Metal expansion joints.
- Explore expansion joint design types and applications.
- Single bellows systems.
- Multiple bellows systems.
- Slip-type expansion joints.

Unit 3: Fabric Expansion Joints and Bellows Geometry:

- Refractory lined expansion joints.
- Parameters determining metal bellows convolution.
- Explore software and databases used in design.
- Understand bellows instability and cycle life.
- Learn about the role of fabric expansion joints.

Unit 4: Fabric Expansion Joints:

- Compare Metallic vs. Fabric expansion joints.
- Selection of fabric materials.
- Know the significance of the belt in the design.

Unit 5: Expansion Joint Stress Analysis:

- Materials used in metallic bellows.
- Geometrical considerations are below.
- Identify types of stresses in metal bellows.
- Essential design considerations.



Unit 6: Forces and Movements:

- Forces and moments on piping systems due to spring and pressure forces of Metal Expansion Joints.
- Establish equilibrium conditions.
- Learn about the role and design of main anchors.
- Calculate anchor forces.

Unit 7: Field Services:

- Plan for major turnarounds and emergency shutdowns.
- Importance of periodic inspections.
- Strategies for planning turnarounds.
- Address unscheduled maintenance.
- Overview of field services offered.

Unit 8: Course Conclusion:

- Tour of Houston plant facilities.
- Address business concerns related to expansion joints.
- Understand Emphasis on quality control in production.