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Course Name

Mechanical Integrity & Performance of Piping Systems

Sector Name

Mechanical Engineering

Document Type

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Mechanical Integrity & Performance of Piping Systems

Course Introduction

Industrial piping systems are exposed to far more than internal pressure alone. Thermal expansion, equipment movement, vibration, inadequate support, external loads, operating changes, corrosion, and repeated transients can gradually alter piping behavior and create mechanical integrity concerns. Problems such as leakage, excessive movement, support damage, nozzle loading, or recurring vibration often require engineers to understand how the entire piping system is responding rather than focusing only on the location where damage becomes visible.

Boost Consulting & Training offers this course to develop a practical engineering approach to piping system performance and mechanical integrity. Participants examine piping loads, thermal behavior, flexibility, supports and restraints, vibration, equipment interfaces, degradation mechanisms, inspection findings, and operating evidence. The course emphasizes identifying abnormal piping behavior, evaluating its significance, and selecting engineering responses that protect both piping and connected equipment.

The **main concept of this course** is to understand piping as a dynamic mechanical system whose loads, movement, support,

condition, and equipment interfaces must work together to maintain safe and reliable performance.

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Target Audience

- ✓ Mechanical and piping engineers
- ✓ Plant and technical engineers
- ✓ Mechanical integrity professionals
- ✓ Engineers and supervisors responsible for piping system performance

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Learning Objectives

- ✓ Explain the mechanical behavior of industrial piping under different operating conditions.
- ✓ Identify major loads and stresses affecting piping system performance.
- ✓ Evaluate thermal expansion, flexibility, and piping movement.
- ✓ Assess the functions and performance of piping supports and restraints.
- ✓ Recognize piping vibration and its potential mechanical consequences.
- ✓ Evaluate piping interaction with pumps, compressors, vessels, and other connected equipment.
- ✓ Interpret degradation and inspection findings from a mechanical integrity perspective.
- ✓ Apply structured engineering assessment to common piping performance problems.

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Course Outline

✓ Day 01

Understanding Piping as a Mechanical System

Reading Piping Loads and Behavior

- ✓ Examine pressure, weight, thermal, dynamic, and external loads acting on piping systems.
- ✓ Understand how piping geometry and operating conditions influence mechanical response.
- ✓ Distinguish sustained, occasional, and displacement-related loading conditions.

Recognizing Mechanical Integrity Concerns

- ✓ Identify abnormal movement, deformation, leakage, vibration, and support-related indicators.
- ✓ Connect visible piping symptoms with possible system-level causes.
- ✓ Develop a **Piping Mechanical Behavior Map** for an operating system.

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Course Outline

✓ Day 02

Managing Thermal Movement and Flexibility

Understanding Thermal Expansion

- ✓ Evaluate how temperature changes create expansion, contraction, displacement, and mechanical loading.
- ✓ Recognize the importance of allowing controlled piping movement.
- ✓ Identify configurations where restricted movement can transfer excessive loads.

Controlling Piping Movement

- ✓ Examine flexibility, expansion loops, offsets, restraints, and movement accommodation.
- ✓ Evaluate the consequences of excessive flexibility and excessive restraint.
- ✓ Complete a **Thermal Movement Assessment** for a changing operating-temperature scenario.

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Course Outline

✓ Day 03

Engineering Effective Supports and Restraints

Understanding Support Functions

- ✓ Distinguish support, guides, anchors, stops, hangers, and other restraint arrangements.
- ✓ Connect support location and function with piping weight and expected movement.
- ✓ Recognize the mechanical effects of missing, damaged, incorrectly positioned, or locked supports.

Investigating Support Problems

- ✓ Assess support condition during hot and cold operating states.
- ✓ Identify load redistribution and unintended restraint within piping systems.
- ✓ Conduct a **Piping Support Investigation** using field observations and operating evidence.

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Course Outline

✓ Day 04

Controlling Vibration and Equipment Interaction

Investigating Piping Vibration

- ✓ Identify vibration associated with mechanical excitation, flow conditions, pulsation, and structural response.
- ✓ Recognize locations where cyclic movement can create fatigue concerns.
- ✓ Evaluate vibration severity using operating behavior and physical evidence.

Protecting Connected Equipment

- ✓ Understand how piping loads can affect pumps, compressors, vessels, valves, and equipment nozzles.
- ✓ Identify alignment and equipment problems that may originate from piping forces or movement.
- ✓ Run a **Piping-Equipment Interaction Case** to trace the source of recurring mechanical problems.

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Course Outline

✓ Day 05

Making Piping Integrity Decisions

Evaluating Condition and Degradation

- ✓ Examine corrosion, erosion, wall loss, cracking, fatigue, leakage, and mechanical damage from an engineering perspective.
- ✓ Combine inspection findings with operating conditions, loading, and piping behavior.
- ✓ Determine when observed degradation requires further engineering assessment.

Resolving Piping Performance Problems

- ✓ Distinguish local repair needs from problems requiring support, routing, operating, or system-level changes.
- ✓ Prioritize engineering responses according to condition, consequence, and operational impact.
- ✓ Complete a **Piping Integrity & Performance Case** from field observations and inspection evidence through engineering assessment and recommended action.

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Confirmed Sessions

FROM	TO	DURATION	FEES	LOCATION
Dec. 7, 2026	Dec. 11, 2026	5 days	4250.00 \$	UAE , Dubai

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