

# Piping Systems: Techniques to Avoid Vibration Problems

This 1/2 day course will identify the integrity risks associated with vibration induced fatigue failures on main and small bore piping. Common issues, strategies, and approaches that address vibration issues in the design stage and during field testing will be provided, as will lessons learned and best practices.

## Course Description

The agenda will include liquid and gas systems, and include strategies to control vibration on the main piping system, as well as blowdown/PSV and small bore connections (SBC). The course will address steady state vibration, as well as vibration during transient conditions.

Common issues to address during the design phase will be discussed, as will lessons learned to improve integrity, reduce vibrations, and troubleshooting tips.

Material is presented using interactive demonstrations, field case studies and industry best practices.

## Objectives

Participants will gain an understanding of:

- The sources and causes of vibration induced piping failures
- Scope of work and approaches to employ in the design phase, including specialty studies
- Ways to assess vibration and stress on small bore connections and main piping systems
- Key issues, challenges, and lessons learned when managing vibration involving compressors, pumps, and piping systems.

## Who Should Attend

The course is for engineers involved with statics/piping design, engineering consultants, or others involved with integrity management of piping systems.

## Course Outline

- Introduction
- Piping vibration sources (including flow induced excitation, flow induced turbulence, acoustic induced excitation, water hammer or gas surge, pulsations (reciprocating, screw, centrifugal compressor or pump), machinery dynamic loads, and other factors)
- Energy Institute Guideline (2008) – methodology to assess the Likelihood of Failure (LOF) for all locations in the piping system
- Small Bore Connections (SBC) analysis, design and testing approaches
- Transient analysis for liquid and gas systems (water hammer, check valve slam, blowdown, ESD, tank system transients, etc.)
- Advanced Piping Evaluations (shell/transverse acoustical analysis, piping modal analysis, cavitation, pulsation analysis, forced response).
- Piping vibration examples (refineries, offshore, compressor, pumps, SBC)
- Vibration guidelines and best practices



## Presenters

- Chris Harper, Principal Engineer
- Jordan Grose, Manager of Pump Systems
- Gufran Noor, General Manager, Field Services

