

MC111 Piping Vibration Causes and Remedies – a Practical Approach

Days 1 & 2

- Introduction
 - General Definitions
 - What We are Trying to Prevent
 - Vibration Types
 - When to Solve Problems
- Mechanical Vibration
 - Single Degree of Freedom System
 - Displacement, Velocity and Acceleration
 - Damping
 - Multiple Degrees of Freedom
 - Simplified Vibration Analysis
 - What to do with Calculated Stress
 - Screening Criteria
- Acoustic Resonance
 - What is it?
 - System Effects
 - EI Guidelines
 - API 618
 - Fixing Problems
 - Example
- Reciprocating Pumps
 - General
 - Pump Discharge
 - Pump Suction
 - Fixing Problems
 - Example
- Surge
 - What is it?
 - Surge Pressure
 - Surge Wave Velocity
 - Slow Closing Valve
 - Thrust Forces
 - Vapor Column Collapse
 - Solutions to Problems
 - Examples
- Slug Flow
 - General
 - Slug Flow Force
 - Examples
 - Corrective Measures

- High Frequency Vibration
 - General
 - Acoustic Resonance
 - Acoustic Fatigue
 - Vortex Shedding
- Earthquake
 - General
 - Earthquake experience
 - Analysis
- Other Sources of Vibration
 - High flow velocity
 - Cavitation
 - Flashing
 - Flow turbulence
 - Non-condensable gases
 - Wind
 - Pressure relief valves
 - Expansion Joints
 - Mechanical Excitation
- More Rigorous Analyses
 - OM-3 Requirements
 - Types of Computer Analyses
- Solving Problems During Design
 - EI Vibration Guidelines
 - Other Guidance
- Solutions to Vibration Problems
 - Piping Restraints
 - EI Guidelines - corrective actions
 - Severe Cyclic Conditions
- Practical Examples
 - Essential Service Water
 - Cumene Piping
 - Steam & Feed Water Piping
 - Cogen Plant Cooling Water
 - Furnace Outlet Line
 - Thick Stock Pump
 - Process Condensate
- Summary & Wrap-up