

LIVE-LOADING PRINCIPLES I

Course Introduction:

Live-loading is a process that is in use in many industrial applications today. Vibration, Thermal Cycling and Environmental Concerns have led to finding a technology that will maintain a load as well as compensate for travel. This course examines how Live-loading works, all the variables that effect Live-loading, and how it can be utilized to increase process system reliability.

Course Objective:

Upon completion of this course you will be able to define the purpose for Live-loading, describe the environments that Live-loading can seal, identify equipment Live-loading is utilized in, and describe the methods for constructing a Live-loading system.

Course Curriculum Length: 32 hours

Course Modules & Syllabus

- **Live-loading Fundamentals**
 - Why Live Load?
 - Live-loading Overview
 - Live-loading - The Concept
 - Live-loading - The Effects
 - Live-loading - Retrofit of Existing Equipment
 - Live-loading - Expected Benefits
 - Summary
 - Fugitive Emissions
 - Volatile Hazardous Air Pollutants (VHAP)
 - Thermal Cycling
 - Vibration
 - Machinery Vibration
 - Automatic Adjustments
 - Live-loading Components
 - Springs
 - Physical Characteristics
 - Sealing Systems
 - Flange and Heat Exchanger Live-loading Sealing Systems
 - Valve Live-loading Sealing Systems
 - Pump and Rotating Equipment Live-loading Sealing Systems
- **Live-Loaded Equipment**
 - Flanges
 - Flanges
 - Flange Standards
 - Flange Dimensions

- Connecting the Pipe to the Flange
 - Integral Flanges
 - Welded Flanges
 - Socket Weld Flanges
 - Slip-on Flanges
 - Weld Neck Flanges
 - Lapped Flanges
- Flange Facings
 - Plain Faced or Flat Faced Flange
 - Male and Female / Tongue and Groove Faced Flanges
 - Raised Faced Flanges
 - Ring Joints
- Surface Finish
 - Surface Grooves
 - Surface Inspection
 - Surface Scale and Residual Gasket Material
- Flange Parallelism
 - Bolting Assembly
- Flange Rotation
- Hydrostatic End Thrust
- Live-loading Flanges
 - Fugitive Emissions
 - Thermal Cycling
 - Vibration
- Heat Exchangers
 - Heat Exchangers
 - Live-loading Heat Exchangers
 - Thermal Cycling
 - Vibration
- Heat Exchanger Types
 - Heat Exchanger Types
 - Fixed Tubesheet Heat Exchanger
 - U-tube Heat Exchanger
 - Split Backing Ring, Floating Head Heat Exchanger
 - Pull-through Floating Head Heat Exchanger
- Valves
 - Introduction to Valves
 - Static and Dynamic Valves
 - Valve Materials
 - Bronze
 - Cast Iron
 - Cast Steel
 - Valve Standards
 - Flange Pressure Class Ratings
 - Nominal Pipe Size

- Valve Types
 - Globe Valves
 - Gate Valves
 - Butterfly Valves
 - Ball Valves
 - Check Valves
 - Plug Valves
 - Automated Valves
 - Live-loading Valves
 - Live-loading Valves
 - Valve Thermal Cycling
 - Valve Live-loading Results
- Pumps
 - Pump Classifications
 - What are the Classifications of Centrifugal Pumps?
 - How does a Centrifugal Pump work?
 - What is a Centrifugal Pump?
 - What are the Classifications of Positive Displacement Pumps?
 - How does a Positive Displacement Pump Work?
 - What is a Rotary Pump?
 - What is a Reciprocating Pump?
 - Pump Parts and their function
 - What are the Parts in the Wet-end Section of an Overhung Impeller Centrifugal Pump?
 - What is the function of the volute?
 - What is the function of the Impeller?
 - What is the function of the Wear Ring?
 - What is the function of the Stuffing Box?
 - What is the function of the Sealing Device?
 - What is the function of the Backcover?
 - What is the function of the Cooling Jacket?
 - What is the function of the Front Cover?
 - What is the function of the Lantern Ring?
 - What are the Parts in the Power-end Section of an Overhung Impeller Centrifugal Pump?
 - What is the function of the Bearing Housing?
 - What is the function of the Frame Adapter?
 - What is the function of the Shaft?
 - What is the function of the Bearings?
 - What is the function of the Bearing Protection?
 - What is the function of The Oil Sump Area?
 - What is the function of The Oil Sight Glass?

- What is the function of the Power-End Cooling Jacket?
 - What is the function of the Breather?
 - What is the function of the Snap Ring?
 - What is the function of the Deflector?
 - What is the function of the Oil Flinger?
 - What is the function of the Thrust Bearing Cartridge?
 - Pump Shaft Speed
 - Mixers and other Rotating Equipment
 - General Definitions
 - Mixer
 - Agitator
 - Reactor
 - Mixers
 - Top Entering - Closed Vessel
 - Side Entering
 - Bottom Entering
 - Summary
 - Other Equipment
 - Soot Blowers
 - Live-loading Rotating Equipment
 - Philosophy of Sealing
 - Live Loaded Packing Glands
 - Die-Formed Rings
 - Rotary Live-loading Summary
- **Bolting Practices**
 - Bolts and Threads
 - Bolts and Threads
 - Thread Design
 - How Bolts Work
 - Strength of Materials
 - Tightening Methods
 - Tightening Methods
 - Friction
 - Friction
 - Nut Factor and Coefficient of Friction
 - Nut Factor and Coefficient of Friction
 - Relaxation of Material
 - Relaxation of Material
 - Elastic Interactions
 - Tolerances, Component Fit and Condition
 - Tolerances, Component Fit and Condition
 - Thread Engagement
 - Thermal Expansion and Contraction
 - Thermal Expansion and Contraction

- Other Factors