

Piping System Assessment & Optimization

TRAINING OUTLINE

Introduction

- Energy flow in piping systems
- Why optimize a piping system?
- Energy losses in a piping system
- Industry and government resources
- Developing an optimization method
- DOE case studies of successful optimization

Energy Assessments

- ASME Energy Assessment for Pumping Systems standard
- Assessment levels
- How to organize a plant assessment
- Prescreening your systems
- System walk-through
- Data collection
- Analyzing plant data
- Solutions to excessive energy use
- Reporting and documenting

Motors and Drives

- Motors as an energy conversion device
- Energy loss in a motor
- Motor efficiency standards
- Motor power equations
- Motor and drive calculation worksheet
- Variable speed drives
- VFD efficiency

Centrifugal Pumps

- Theory of operation
- NPSH and cavitation
- Pump performance curve
- Pump power equations
- Energy loss in a pump and pump efficiency
- Calculating pump operating cost
- Pump affinity rules
- Options for optimizing pump operation
- Cross-validating pump and motor data
- Pump calculation worksheet

Energy Losses in Pipelines

- Forms of hydraulic energy and energy loss
- Bernoulli Equation
- Converting pressure to head
- Calculating fluid velocity
- Head loss calculations for pipes, valves, and fittings
- Cost of head loss
- Options for reducing head loss
- Pipeline calculation worksheet

Control Valves

- Types of control valves
- Energy profile through a valve
- Flow coefficient equation
- Control valve characteristics
- Calculating the cost of throttling
- Control valve calculation worksheet

The Piping System

- Types of piping systems
- Hydraulic performance of piping system devices
- Component calculation worksheet
- Use and limitations of the system resistance curve
- System static and dynamic head
- Understanding system process requirements
- Effect of over-sizing equipment in a system
- Methods of controlling a system
- Cost comparison of control methods

Solutions for Excessive Energy Use

- Reducing system static and dynamic head
- Reducing system flow rates
- Reducing system run times
- Modifying system equipment and configuration
- Replacing inefficient equipment

Developing an Assessment & Optimization Method

- Prioritizing systems by prescreening
- Conducting a system walk through
- Data collection and analysis
- Identifying inefficient operation
- Developing options for system optimization
- Economically justifying optimization projects
- Implementing system optimization
- Monitoring and reporting results

Case Studies

- Reviewing the system description
- Understanding the design case
- Detailed equipment descriptions
- Maintenance and operational histories
- Load profiles
- Current operating conditions
- Analyzing system operation
- Operating cost calculation
- Identifying options for optimization
- Evaluating options for economic feasibility.