Piping System Assessment and Optimization

Course Overview

The Piping System Assessment and Optimization seminar is based on the approved Energy Assessment Standard for Pumping Systems (ASME EA-2-2009). This course teaches participants how to evaluate energy consumption within piping systems and identify ways of improving system reliability while reducing maintenance, capital, and operating costs.

Who Should Attend? Is this course for me?

This seminar is perfect for engineers interested in developing an energy assessment and optimization plan for piping and pumping systems. Since the cornerstone of the piping system assessment is to operate the equipment efficiently, this seminar is also ideal for individuals responsible for implementing local energy assessment and optimization plans or operating and maintaining piping systems.

Course objectives

Attendees will:

• Build a solid understanding of how certain devices when not functioning at their Best Efficiency Point increase overall operating costs
• Use a simple payback method to understand the cost of each device in a piping system
• Gain hands-on experience in performing assessment exercises using the knowledge gained during the seminar
• Create a useful assessment that is immediately applicable to their work environment

Course outline

Example problems are provided so bring a calculator if you want to test out your new skills. Laptops are also recommended for using the provided electronic worksheets.

Topic 1 Day 1: 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
Topic 2 Day 1: 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

Topic 3 Day 1: 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

Topic 4 Day 1: 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

Topic 1 Day 2: 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
Topic 2 Day 2: 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

Topic 3 Day 2: 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

Topic 1 Day 3: 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

Topic 2 Day 3: Developing an Assessment and 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

Topic 3 Day 3: Assessment Exercises
- Prescreening
System assessments
System description
Maintenance and operational histories
Load profile & utility rates
Detailed equipment descriptions
Current operating conditions
Data collection and analysis
Identify high energy costs
Identify solutions
Economically justify solutions

What's included

ASME Standard EA-2-2009, Energy Assessment for Pumping Systems:
The ASME standard EA-2-2009 covers pumping systems including pump(s), driver, drives, distribution piping, valves, sealing systems, controls, instrumentation, and end-use equipment such as heat exchangers.

Comprehensive Course Workbook:
The comprehensive course workbook has several useful guidelines and key points of information covered in the course. This manual is an excellent resource for retrieving concepts taught during the seminar and applying them in the field.

Continuing Education Credits:
This training seminar qualifies 2.4 Continuing Educational Units (CEU) or 24 Professional Development Hours needed to meet the continuing education requirements for Professional Engineers in many states.

Course Certificate:
At the conclusion of the training course, attendees will be awarded a Certificate of Completion, with a course content description included for confirmation of continued education units.

Course Schedule
Classes are from 8AM to 5PM with one hour for lunch.