Steam System Training for Reliability, Safety, and Energy Sustainability

One-Day Training Program

(CEU Credits)

Virginia, Utah and Oklahoma

$292.00 per person

Cost includes all training materials, an in-depth training manual, plus lunch and refreshments

Email wendy.harwood@invenoeng.com or call 239-289-4498 for more information

Inveno Engineering will be delivering an exciting one-day Steam System Training for Reliability, Safety, and Energy Sustainability. The course will improve attendees' understanding of steam safety, optimization, reliability, and energy efficiency.

The course will provide an overview of each subject listed in the attached course syllabus. We use a combination of lecture and hands-on demonstrations using specially designed steam system training prints. Our senior steam field engineering instructors are available at any time to go into further detail on any subject matter at an attendee's request.

Inveno Engineering use a Steam Team Group Concept to maximize comprehension of the training materials. Attendees will be divided into teams of two or three people. Each team will complete exercises using the training prints to reinforce the knowledge acquired from the instructors.

Attendees will also receive in-depth training manuals written by leaders in steam system engineering. Attendees will leave the course with a tremendous reference book for the class and their future work on steam systems.

COURSE SYLLABUS

Introductions

1.1. Steam Overview

1) Reviewing steam basics

2) Learning how to calculate Btu usage
3) Understanding superheat, including its benefits and production
4) **Tasks:**
    a. Calculating equipment Btus
    b. Understanding equipment steam requirements

1.2. Steam Tables: What They Are and How to Use Them

1) Using steam tables
2) Reviewing all the information in steam tables

1.3. Steam Cost: Calculating This Key Benchmark

1) Understanding the factors that reduce steam cost
2) Calculating the steam cost
3) **Tasks:**
    a. Calculating the steam cost for the training print system

1.4. Steam: Names and Terminology

1) Understanding the different names used for steam
2) Knowing the terminology and its meaning

1.5. Flash Steam: What It Is and How It Affects the Steam and Condensate System

1) Learning why flash steam occurs
2) Understanding the effects of flash on steam and condensate systems
3) Calculating the percentage of flash steam
4) **Tasks:**
    a. Using tables to determine the quantity of flash steam
    b. Calculating the energy losses when flash steam is not recovered

1.6. Flash Steam: Recovering the Main Energy Loss in Steam Systems

1) Understanding what a recovery system is
2) Managing flash steam generation

3) Recognizing different flash steam operating systems
4) Deciding when to recover and how to recover flash steam, including the advantages and disadvantages of each type of recovery system
5) Determining the appropriate size for a flash tank
6) **Tasks:**
    a. Implementing a flash recovery system on a modulating system
    b. Implementing a flash recovery system on a nonmodulating system

1.7. Low Steam Quality: How It Negatively Affects Process Applications

1) Defining steam quality
2) Determining how steam quality affects process operations and steam components
3) Testing and measuring steam quality in the field
4) Learning what calorimeters are available for testing
5) Taking the necessary steps to improve steam quality
6) **Tasks:**
    a. Reviewing steam quality testing procedures
    b. Learning the testing points for steam quality

1.8. Boiler Combustion Efficiency: Testing Boiler Energy Performance

1) Analyzing combustion efficiency
2) Determining whether combustion testing personnel are qualified
3) **Tasks:**
    a. Reviewing combustion testing reports
    b. Developing a fuel-air ratio curve

1.9. Deaerator Operation: Why It Is Critical to the Steam System

1) Determining whether deaerators are operating to ASME specifications
2) Making corrections to deaerators that aren't meeting design specifications
3) **Tasks:**
    a. Listing preventative maintenance checks that need to occur
    b. Reviewing testing methods

1.10. Steam Valves: Meeting Steam Safety and Reliability Requirements

1) Reviewing all valves used in steam systems
2) Understanding valves' operational design
3) Choosing the correct valve for each application
4) **Tasks:**
    a. Reviewing valves and calculating CV
    b. Selecting the correct valve arrangement
    c. Developing an installation detail
    a. Reviewing different applications

1.11. Condensate Loss: Addressing Losses From Condensate Tanks and Pumping Systems

1) Discussing why it's important to return condensate (reducing emissions, optimizing performance, and reducing energy usage)
2) Calculating condensate recovery
3) Reviewing different condensate pump unit types: their advantages and operation and condensate tank sizing
4) Understanding why net positive suction head (NPSH) is critical
5) **Tasks:**
    a. Sizing a condensate pumping system
    b. Selecting the proper condensate tank unit for a system
    c. Designing a condensate tank system
    d. Sizing NPSH for the pumping units

1.12. Water Hammer: Addressing the Top Safety Issue in Steam Systems

1) Reviewing what water hammer is
2) Understanding the different causes of water hammer: thermal, flow shock, and differential shock
3) Determining how to eliminate water hammer

1.13. Condensate Leakage: Eliminate Leaks in Steam and Condensate Systems

1) Understanding the major causes of steam and condensate leakage

2) Reviewing different steam leakage areas
3) Estimating the energy losses
4) Conducting root-cause analysis, including what to review when analyzing
5) Eliminating leakage
6) **Tasks:**
    a. Listing changes that will be implemented
    b. Evaluating methods to prevent steam leakage

1.14. Steam Trap Station Performance: Optimization and Sizing

1) Considering the functions of the steam trap
2) Reviewing the different types of steam traps
3) Understanding steam trap operation
4) Selecting the correct steam trap for the application
5) Sizing steam traps properly
6) **Tasks:**
    a. Selecting a steam trap for two different applications
    b. Sizing steam traps for these applications
    c. Testing methods to achieve 98% accurate test results