

Piping System Fundamentals

TRAINING OUTLINE

DAY 1

Introduction

What is a Piping System?
Value of a Clear Picture of a Piping System
Understanding the Total Piping System

Terminology, Units, and Physical Laws

Fluid Properties
Flow Rate, Pressure, Head, and Head Loss
Physical Laws that Govern Fluid Flow

Tanks and Vessels

Types of Tanks and Vessels
Key Hydraulic Measurements
Measuring and Controlling Tank Level, Pressure,
and Temperature
Common and Abnormal Tank Operations

Centrifugal Pumps

Major Pump Parts
Theory of Operation
Understanding the Pump Curve
Pump Power & Cost of Operation
Net Positive Suction Head and Cavitation
Pump Affinity Laws
Parallel and Series Pump Operation
Fluid Considerations
Pump Selection
Operating Pumps Properly

Pipelines

Pipeline Terminology
Head Loss Calculations
Head Loss for Series and Parallel Piping
Factors Affecting Head Loss
Pipe Sizing and Selection

DAY 2

Valves and Fittings

Purpose of Valves and Fittings
Valve and Fitting Losses
Hydraulic Performance of Valves and Fittings
Valve Applications
Cost of Valve Head Loss

Control Valves

Types of Control Valves
Control Valve Operation
Characteristic Curves
Control Valve Applications
ASME Ratings and ANSI Valve Classes
Cavitation, Choking, and Flashing
Sizing and Selecting Control Valves
Control Valve Equations

Process Measurement and Controls

Instruments Used to Measure Processes
The Typical Process Control Loop
The PID Controller and Controller Tuning
Control Schemes

Piping System Processes and Process Equipment

Types of Processes
Process Equipment
Hydraulic Performance of Equipment

The Total System

Types of Piping Systems
Key Concepts to Understand the System
Calculating Flow Between Two Pressure Sources
Series Piping, Parallel Piping & Branching Piping
The Siphon Effect
System Static and Dynamic Head
Visualizing Energy Addition and Losses
Troubleshooting Piping Systems