



**KASA Redberg**

*Engineers & Technical Trainers*

# **Liquid Piping Systems Fundamentals**

*A practical and interactive 2 day course  
or  
4 x 4 hour online/live streamed course  
(run over 4 days within a 2-week period)*

# Liquid Piping Systems Fundamentals

## Introduction

As a rule of thumb, "Piping" accounts for (i) 30 percent of the material costs of a process plant or water treatment facility (ii) 30 percent of the construction labour and (iii) 40 percent of the total engineering time expended in designing, installing or commissioning a plant. Despite piping systems accounting for such a large "chunk" of an overall plant, it is amazing how so many errors are made with regard to the design of such systems. For example, the incorrect selection of piping materials, end connections, valves, fittings and support systems are all too common in industry.

The purpose of this two day seminar is to provide basic instruction on the design, operation and maintenance of liquid piping systems.

## Who Should Attend?

Process, Design, Project and Consulting Engineers; Line Managers and Supervisors; Maintenance Technicians; Pump Sales Representatives; or anyone who needs to select, specify, commission, install and/or maintain liquid piping systems and pipelines.

## Delegate Pre-Requisites

It is a requirement that each delegate has an understanding of mechanical components. Experience with diploma or degree level engineering maths would also be advantageous.

## Seminar Objectives

At the completion of this seminar, each delegate should be able to:

- Select the most appropriate material and pipe type for the application.
- Determine the correct pipe schedule for an application.
- Understand cavitation and water hammer.
- Select the most appropriate valve type for an application.
- Understand control valve sizing.

## Seminar Objectives Continued

- Read and generate drawings such as P&ID's and isometrics.
- Be aware of the issues involved in designing pipe and pipe support systems.
- Be aware of various fabrication, installation and maintenance Issues.

## Training Seminar Materials

All delegates receive:

- The "**Liquid Piping Systems Fundamentals**" **Training Manual** – a reference manual comprising theory, worked example problems, tables, charts and illustrations etc based on the seminar outline. This manual has been designed to be a valuable future resource for the office, workshop, factory or plant.
- **Certificate of Attendance** – which states the number of hours of training and serves as documentary proof of attendance.

## Complementary Training

"*Liquid Piping Systems Fundamentals*" is the second seminar in a series of three "fundamentals level" pump and piping training seminars. It provides a practical introduction to liquid piping systems. It is not necessary to have previously attended any other KASA Redberg seminar prior to attending this one for the maximum benefit to be obtained.

It is recommended that this seminar is attended prior to attending "*Gas Piping Systems Fundamentals*" as all KASA Redberg seminars have now been re-designed so that only a bare minimum of information is duplicated across all seminars.



# Liquid Piping Systems Fundamentals

## Seminar Synopsis

### Day 1 (or Session 1 and 2 when delivered online)

#### BACKGROUND INFORMATION

- Terms and Definitions
- Pipe Manufacturing Methods
- Fluid Properties
- Basic Hydraulics Theory and Calculations
- Friction Losses
- Cavitation
- Water Hammer
- Worked Example Problems

#### PIPE SIZING METHODS (FOR FLOW)

- Allowable Velocity
- Head Loss Available
- Net Present Value
- Worked Example Problems

#### SELECTING PIPE & FITTINGS

- Applicable Codes and Standards
- Materials of Construction, Connection
- Types – Screwed, Flanged, Sanitary etc
- Gaskets and Jointing Materials
- Fittings
- Worked Example Problems

#### VALVES

- A detailed Analysis of Common Valve Types – (Ball, Butterfly, Globe, Gate, Pinch, Angle, Needle, Non-Return, Pressure Reducing, Solenoid, Vacuum/Pressure Break, Pressure Relief, Diaphragm etc)
- Materials of Construction
- Valve Actuators
- Valve Selection & Sizing Guidelines
- Control Valve Selection and Sizing
- Valve Maintenance and Troubleshooting
- Worked Example Problems

#### INSTRUMENTS

- Typical Instruments Found in Piping Systems – Flow, Pressure and Density
- Selection Guidelines

### Day 2 (or Sessions 3 and 4 when delivered online)

#### DESIGN & DRAFTING

- Piping Specifications
- Drafting Symbols for Pipes, Valves, Fittings, Instruments etc
- Process Flow Diagrams, Piping & Instrumentation Diagrams
- Line Lists, Plot Plans, Layouts, Isometrics, Spool Drawings

#### GUIDELINES FOR THE LAYOUT OF PIPING

- General Overview
- Maintenance and Operating Requirements
- Process Requirements
- Safety Considerations

#### PIPE SUPPORT SYSTEMS

- General Overview
- Rigid, Variable and Spring Supports
- Snubbers, Sway-Braces, Base-plates
- Introduction to the Design of Pipe Supports

#### AN INTRODUCTION TO PIPING DESIGN LOADS

- Sustained Loads – Weight and Pressure
- Occasional Loads – Wind, Relief Valve and Seismic
- Thermal Loads, Stresses and Movements
- Basic Manual Calculation Methods
- Worked Example Problems

#### MISCELLANEOUS TOPICS

- Heat Tracing
- Insulation
- Filters & Strainers
- Fabrication & Erection
- Maintenance



## About KASA Redberg

KASA Redberg is a technical training and engineering consulting group.

We have core competencies in pumping systems, piping systems, pipelines, pressure vessels and slurry handling systems. We also act as independent HAZOP workshop facilitators and Safety-in-Design workshop facilitators.

Our portfolio of services includes:

- Tank and vessel design.
- Chemicals plant design.
- Water treatment plant design.
- Pumping and piping systems design.
- Pump station and pipeline design
- Mine dewatering and water supply systems design.
- Pipe stress analysis
- Pipeline hydraulic modelling
- Water hammer analysis
- Slurry piping systems design and slurry pump selection.
- On-site troubleshooting of pumps and piping systems.
- Operator training courses
- HAZOP workshop facilitation
- Safety-in-Design workshop facilitation

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