



KASA Redberg

Engineers & Technical Trainers

Proudly presents

Gas Piping Systems Fundamentals

A practical and interactive two day seminar

Gas Piping Systems Fundamentals

Introduction

Compressible flow offers some unique challenges when compared to liquid flow in pipes. This is due to the properties of gases and how these properties change depending on the piping system temperature, pressure and even flow velocity.

The purpose of this two-day seminar is to provide information and guidance on the design of gas piping so that those new to gas piping systems can design such systems with minimal supervision.

Who Should Attend

Consulting Engineers, Process Engineers, Design Engineers, Project Engineers, Sales Representatives and anyone who needs to have a greater understanding of the design and operation of gas piping systems including fuel gas, steam, compressed air and nitrogen etc.

Delegate Pre-Requisites

As this seminar includes many system design calculations, it is recommended that each attendee is degree or diploma qualified in a relevant technical discipline (e.g. mechanical, chemical or mining engineering or physics, chemistry etc).

For the maximum benefit to be obtained, it is recommended that each delegate:

- Is familiar with basic hydraulics theory.
- Has had some previous exposure to gas piping systems.
- Has a basic understanding of the more common valve types.

Those who have previously attended KASA's "*Liquid Piping Systems Fundamentals*" seminars should also be well placed to derive maximum benefit from this seminar.

Overlap With Other KASA Piping Seminars

This seminar has been designed so that it is attended after delegates have already completed KASA's "*Liquid Piping Systems Fundamentals*" seminar. Because of this, any information relating to piping materials, piping connections, valves, instruments, drafting and hydraulics theory that is presented in the "*Liquid Piping Systems Fundamentals*" seminar will not be presented again in this seminar. It is advised that delegates review these topics as they are considered "assumed knowledge".

Seminar Objectives

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

- Understand how pressure, temperature and velocity affect compressible fluid properties.
- Appreciate the higher risks associated with compressible flow systems compared to liquid flow systems.
- Perform pipe sizing calculations for the flow of fuel gas, steam, compressed air etc based on a number of popular industry methods.
- Perform basic control valve sizing calculations and have a greater understanding of the difficulties associated with control valves for compressible flow.
- Be better placed to select materials of construction for common gas piping systems.
- Design/select/calculate gas piping ancillaries such as: relief and safety valves; flares and vents; dryers; condensate traps.
- Be aware of the more common gas piping operational issues such as "double block and bleed", valve leakage classes, determining system leakage, wear rates and hot tapping etc.
- Be able to perform pressure drop calculations for gases in pipes, fittings and valves using common industry methods.
- Have a greater understanding of hazardous area classifications and the flow of combustibles through pipe systems.
- Appreciate how to better lay gas piping systems out so that operational safety is paramount.

Training Seminar Materials

All delegates receive:

- A Detailed Seminar Manual** – Which provides a reference text of all of the material presented during the seminar. Note: This manual is written as a textbook which allows it to be more useful as a future design reference.
- Certificate of Attendance** – Which states the number of hours of training and serves as documentary proof of attendance.





Seminar Synopsis

DAY 1

SAFETY & HAZARDS

- Leaks versus plumes.
- An introduction to hazardous area classifications.
- Isolation, double block and bleed; draining and venting considerations.
- The piping of combustibles, flammables etc.
- Examples of gas and piping systems failures.

BACKGROUND INFORMATION

- Fluid properties and hydraulics theory common to all compressible fluids: specific gravity, vapour pressure, gas laws, cavitation, the laws of thermodynamics, Joule-Thomson, terms and definitions.

COMPRESSED AIR

- The properties of air.
- Free air, standard air and actual air.
- Plant air versus instrument air.
- Compressed air pipe sizing methods and pressure drop calculations.
- Materials and end connections for compressed air systems.
- Traps, dryers, filters and other ancillaries.
- Piping layout tips specific to compressed air.
- Worked example problems.

NITROGEN

- The properties of Nitrogen.
- Comparison to compressed air including pipe sizing methods, ancillary equipment, layout etc.

STEAM

- Enthalpy, specific heat, steam tables, steam quality.
- Steam pipe sizing methods and pressure drop calculations.
- Steam flow through nozzles and restrictions.
- Materials and end connections for steam piping systems.
- Steam piping ancillaries, valves and instruments.
- Piping layout tips specific to steam.
- Worked example problems.

DAY 2

GAS – GENERAL (INCLUDING FUEL GAS)

- Flow types – Adiabatic, Isothermal and Isentropic
- Properties of gases – mass, volume, density, specific gravity, viscosity, compressibility factor, heating value.
- “Ideal” versus “Real” gases.
- Gas mixtures and how to calculate their mixture properties.
- Gas pipe sizing methods and pressure drop calculations.
- An introduction to two phase flow calculations.
- Discussion and tips relating to relevant piping standards and codes.
- Specific tips relating to fuel gas systems.
- Recommended piping materials and end connections for specific gas systems.
- Recommended piping layout tips for specific gas systems.
- Worked example problems.

VALVES

- Valves and applications specific to compressible flow (that are not presented in KASA’s “Liquid Piping...” seminar).
- Leakage classes.
- Recommended valves tips for particular applications.
- Purchasing and specifying valves for flammables, combustibles and “dangerous” fluids.
- Safety and relief valve sizing (including flare and vent pipe sizing) for specific applications.
- Tips relating to valve materials of construction.
- The sizing and selection of control valves for gas, air and steam applications.
- Worked example problems.

INSTRUMENTATION

- Instrumentation specific to compressible flow (that is not presented in KASA’s “Liquid Piping...” seminar).

MISCELLANEOUS TOPICS

- Hot-tapping, inspection and maintenance, leakage, wear, testing requirements, commissioning and common “traps for the inexperienced”.