KASA Redberg

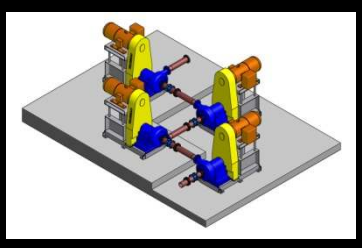
Engineers & Technical Trainers

Seminar Information Kit 2012

Revision A

January 2011

Contents



Introduction

Welcome to the KASA Redberg 2012 Seminar Information Kit. We have taken the step of putting all of the information relating to our public seminars in one document to provide a more convenient way of showing potential clients what knowledge we can provide them within the area of pumps, pipes, slurry and pressure vessels.

We have been running our flagship courses – "*Pump Fundamentals*" and "*Liquid Piping Systems Fundamentals*" for a number of years now. We have also been running "*Advanced Slurry Pumping & Piping*" since May 2008. In 2010 we launched three new seminars:

- *Gas Piping Systems Fundamentals*
- *Piping Design to AS4041 & ASME B31.3*
- *Pressure Vessel Design to AS1210*

These new seminars have been a welcome addition for those companies with formal graduate development programs as they can now provide a clear training path for their engineers who are looking at specialising in pumping systems, piping systems or pressure vessels.

Whilst our seminars have always been presented in the context of the relevant Australian standards or Australian industry standard practice, it is important to point out that two of our new seminars relate specifically to the application of relevant Australian standards and/or ASME codes. We have done this so potential attendees can become well-versed in commonly used sections of these documents as well as be aware of the common traps which can cause unknowing misapplication of their content.

Finally, for those who are considering a career (or graduate) development program and need some quick guidance in the recommended order in which our seminars should be attended, please consider the following examples…

Specialist Piping Design Engineers

Liquid Piping Systems Fundamentals → Gas Piping Systems Fundamentals → Piping Design to AS4041 & ASME B31.3 → Advanced Slurry Pumping & Piping

Plant Engineers, Process Engineers, Project Engineers & Project Managers etc

Pump Fundamentals → Liquid Piping Systems Fundamentals → Gas Piping Systems Fundamentals → Advanced Slurry Pumping & Piping

Engineers Specifically Involved in the Water/Wastewater Industry or the Mining/Minerals Processing Industry

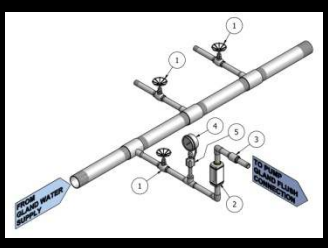
Pump Fundamentals → Liquid Piping Systems Fundamentals → Advanced Slurry Pumping & Piping

We trust you will find this information kit informative and useful. If however you need more information on any of our public seminars or would like a detailed proposal on how we can customise a seminar to suit your specific needs, then please do not hesitate to contact us.

We hope to see you and/or your colleagues at our seminars in 2012.

Best regards,

The KASA Redberg Team



Public Seminar Schedule 2012

	Adelaide	Brisbane	Darwin	Melbourne	Perth	Sydney
Pump Fundamentals	2nd half of 2012 (TBA)	5 & 6 June		18 & 19 June	12 & 13 June	2nd half of 2012 (TBA)
Liquid Piping Systems Fundamentals	2nd half of 2012 (TBA)	7 & 8 June		20 & 21 June	14 & 15 June	2nd half of 2012 (TBA)
Advanced Slurry Pumping & Piping		25 & 26 June			28 & 29 June	
Gas Piping Systems Fundamentals		19 & 20 April			3 & 4 May	
Piping Design to AS4041 & ASME B31.3		24 & 25 September		27 & 28 September	2nd half of 2012 (TBA)	
Pressure Vessel Design to AS1210						

Notes:

- A 10% discount applies for all seminar bookings that are paid in full prior to the early payment cut-off date. The early payment cut-off dates for 2011 are shown on the Seminar Registration Booking Forms which are available for download from the KASA Redberg website on the "Seminars" page.
- The Adelaide and Sydney seminars have no fixed dates at this stage. Dates will be advised after 30 June 2011.
- "Pressure Vessel Design to AS1210" will only be offered as a private/in-house seminar during 2012.

Pump Fundamentals

Introduction

Pumps are found in all industries and come in all shapes and sizes. Decision makers operating in areas such as water treatment, minerals processing, oil and gas, utilities, metals processing, food and beverage and many more employ billions of dollars worth of pumping equipment to help achieve their objectives.

To ensure that you are achieving maximum performance from your pumping equipment, it is essential that you know the fundamentals. "*Pump Fundamentals*" is an intensive, practical and interactive two day seminar which focuses on the common types of pumps and how to select, install, troubleshoot and maintain them.

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 pumping equipment.

Delegate Pre-Requisites

It is a requirement that each delegate has an understanding of mechanical components. A basic understanding (trade level or higher) engineering maths would also be a necessity. Ideally, each delegate should have a degree or diploma in a relevant technical field or a higher level mechanical trade qualification.

Seminar Objectives

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

- Identify common pump types and their components
- Understand pump, associated component, hydraulics and slurry terminology
- Select the most appropriate pump type, make and model for an application
- Be competent in reading and using pump performance curves
- Understand cavitation and how to prevent it from occurring
- Specify the correct installation configuration for a particular pump type
- Install, commission, operate and maintain common pump types
- Troubleshoot pump problems

Training Seminar Materials

All delegates receive:

- The **"Pump 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

"*Pump Fundamentals*" is the first in a series of three pump and piping training seminars pitched at a "fundamentals level". It provides a practical introduction to the world of pumps and their applications.

The two companion seminars to "*Pump Fundamentals*" deal with liquid and gas piping systems.

Plant Engineers, Project Managers and Process Engineers should consider undertaking all three of KASA's "fundamentals level" training seminars to help aid their knowledge of pumping and piping systems.

It is also recommended that "*Pump Fundamentals*" is attended prior to attending KASA's "*Advanced Slurry Pumping & Piping*" training seminar.

Pump Fundamentals

Seminar Synopsis

DAY 1

BACKGROUND INFORMATION
- Terms and Definitions
- Fluid Properties (Viscosity, Density, Temperature etc)
- Pressure-Head Relationships
- Cavitation
- Basic Hydraulics Theory and Calculations
- Friction Losses in Pipes and Fittings
- Pump Classifications and Examples
- Pump Selection Guidelines
- Worked Example Problems

CENTRIFUGAL PUMPS
- Components, Types and Examples
- Affinity Laws and Characteristic Curves
- Matching the System to the Pump
- System Curve Calculations
- Viscosity Effects
- Parallel and Series Pumping Circuits
- Cavitation – Causes, Remedies and Calculations
- Troubleshooting
- Worked Example Problems

INTRODUCTION TO CENTRIFUGAL SLURRY PUMPS
- Slurry Classifications and Rheology
- Slurry Characteristics – Abrasion, Erosion and Corrosion
- Effects of Slurry Solids Content and Settling Velocities
- Typical Pump Components and Assemblies
- Characteristic Curves
- Pump Selection Criteria
- Worked Example Problems

DAY 2

POSITIVE DISPLACEMENT (PD) PUMPS
- PD Pump Theory
- Typical System Curves
- Comparison to Centrifugal Pumps
- A Detailed Analysis of Common PD Pumps –
- (Gear, Lobe, Progressive Cavity, Piston,
- Diaphragm, Peristaltic)
- Troubleshooting
- Worked Example Problems

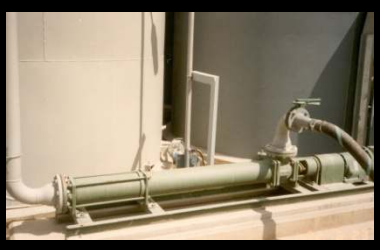
EDUCTORS (JET PUMPS)
- Principle of Operation
- Applications

SEALS AND PACKING
- General Overview
- Components and Types
- Applications and Selection
- Installation, Maintenance and Troubleshooting

PUMP DRIVES
- General Overview
- Close Coupled, Direct Driven, Canned and Magnetic Setups
- Belt Drives, Gearboxes, Variators
- Electric Motors and Inverters
- Engines and Hydraulic Motors

INSTALLATION & MAINTENANCE

FOUNDATIONS AND BASES
- Alignment
- Process Connections
- Recommended Piping Configurations
- Condition Monitoring and Preventative Maintenance



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

BACKGROUND INFORMATION
- Terms and Definitions
- Pipe Manufacturing Methods
- Fluid Properties
- Basic Hydraulics Theory and Calculations
- Friction Losses & Pipe Sizing
- Cavitation and Water Hammer
- 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, Check,
- 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
- Selection Guidelines

DAY 2

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

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.

Gas Piping Systems Fundamentals

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".

Advanced Slurry Pumping & Piping

Introduction

The design of slurry pumping systems is considerably more complex compared to that of “clean fluids”. In addition to this, the information found in the public domain relating to this subject is sometimes “academic” and does not always give the practicing engineer the simple answers he or she needs to solve a particular problem. As a result, consultants who specialise in slurries are often employed even for the less complex slurry pumping design or troubleshooting problems.

The purpose of this two-day advanced seminar is to provide information and guidance on the design of slurry pumping and piping so that the practicing engineer can either (i) design slurry systems “in-house”, and/or (ii) more successfully interact with specialist slurry consultants and/or slurry pump manufacturers.

Who Should Attend

Consulting Engineers, Process Engineers, Design Engineers, Project Engineers, Slurry Pump & Piping Sales Representatives and anyone who needs to select, specify, commission, install and/or troubleshoot slurry pumping equipment and slurry piping.

Delegate Pre-Requisites

Whilst this seminar is focused on the practical aspects of slurry flow, it is classed as an advanced level seminar due to:

•The higher level of hydraulics theory presented (i.e. compared to that presented in KASA’s “Fundamentals” seminars).

•The level of engineering mathematics understanding required in some calculations and first-principle proofs.

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 slurry systems.

•Is degree or diploma qualified in a relevant technical discipline (e.g. mechanical, chemical or mining engineering).

Those who have previously attended KASA’s “*Pump Fundamentals*” and “*Liquid Piping Systems Fundamentals*” seminars should also be well placed to derive maximum benefit from this seminar.

Seminar Objectives

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

•Understand how the relevant slurry properties are determined in a laboratory environment.

•Understand how flow curves are derived from viscometer test results.

•Understand the principles of scaling-up from small-scale pipe loop tests, tube viscometers or existing pipelines for the purposes of designing full-scale pipelines for the same slurry.

•Understand the principles of determining head loss in both settling and non-settling slurries using the relevant theoretical models and/or laboratory test results.

•Determine the “Deposit Velocity” (aka “Limiting Settling Velocity”) by calculation for a settling slurry.

•Be aware of the effects of particle size and solids concentration with respect to de-rating of pump performance for a particular slurry.

•Appreciate the advantages and disadvantages of the more commonly used slurry piping materials so that material selection can be carried out in a more informed manner.

•Be aware of the more common piping operational issues.

•Determine whether a centrifugal slurry pump or a positive displacement pump is a better choice for a particular application.

•Have a greater understanding of the more commonly available centrifugal and positive displacement pumps used for slurries.

•Be aware of various slurry pump operational issues, recommended piping configurations and component choices (i.e. seals, packing, liners etc).

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.

Advanced Slurry Pumping & Piping

Seminar Synopsis

DAY 1

BACKGROUND INFORMATION
•Specific Gravity, solids concentration, particle size analysis, rheograms (aka "flow curves"), viscosity.
•Newtonian and Non-Newtonian slurries
•Non-Newtonian Flow Models
•Homogeneous, heterogeneous, stratified and sliding bed flow profiles.
•Classifications – Settling and Non-Settling slurries.
•Slurry Pump Performance Basics.
•Worked Example Problems.

SLURRY PIPING – MATERIALS, EXAMPLES & ISSUES
•A review of common slurry piping materials of construction including: rubber lined steel, ceramic lined steel, plastic lined steel, polyethylene, fibreglass etc.
•Selection criteria, advantages/disadvantages etc of the above-mentioned materials.
•Pipe wear and wear testing methods.

PIPING DESIGN FOR NON-SETTLING SLURRIES
•Recommended methods for determining head loss for laminar and turbulent flow from viscosity measurements and/or small-scale pipe flow data.
•Recommended method for determining head loss for Newtonian Non-Settling Slurries.
•Worked example problems.

CENTRIFUGAL SLURRY PUMPS
•Components, types, examples, design features.
•Selecting materials of construction based on wear classes and service classes.
•Envelopes of operation.
•Series and parallel pumping, design & operational Issues.
•A review of the commonly available types of seals and packing.
•Focus on submersible slurry pumps
•Focus on horizontal end-suction slurry pumps.

DAY 2

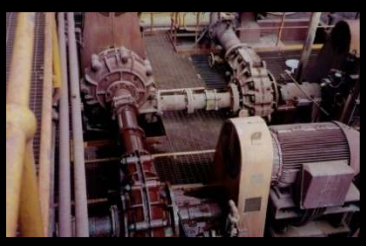
CENTRIFUGAL SLURRY PUMPS (CONTINUED)
•Drive Arrangements.
•Maintenance considerations.
•Gland water setups.

THE DE-RATING OF SLURRY PUMPS
•Recommended methods of determining the de-rating effects (i.e. Head Ratio, Efficiency Ratio etc) on centrifugal slurry pumps when dealing with settling slurries.
•Dealing with non-settling, non-Newtonian slurries.
•Dealing with frothing slurries.
•NPSHR corrections.
•Worked example problems.

PIPING DESIGN FOR SETTLING SLURRIES
•Recommended methods for determining head loss.
•Recommended methods for determining the Deposit Velocity.
•Recommendations for pipe diameter and flow velocity.
•Flow in inclined pipes.
•Worked example problems.

ROTARY POSITIVE DISPLACEMENT PUMPS
•A brief review of Progressive Cavity, Lobe and Peristaltic Pumps.
•Selection criteria, relative advantages and disadvantages, envelopes of operation.
•Operation and maintenance considerations.

RECIPROCATING POSITIVE DISPLACEMENT PUMPS
•A review of piston, piston-diaphragm, piston-diaphragm-hose and diaphragm pumps for slurry pumping applications.
•Selection criteria, relative advantages and disadvantages, envelopes of operation.
•Operation and maintenance considerations.
•Recommended suction and discharge piping arrangements.
•Recommendations on when to choose a PD pump and when to choose a centrifugal pump.



Piping Design to AS4041 & ASME B31.3

Introduction

The purpose of this two-day seminar is to provide guidance on the fundamentals of piping stress and flexibility analysis so that compliance with AS4041 and/or ASME B31.3 is achieved. The secondary aim is to show how to spot check the results from computer based solutions using conservative manual calculation methods.

Upon completion of this seminar, the attendee should be well placed to perform common pressure piping stress and flexibility analysis tasks under the minimal supervision of a Senior/Supervising Engineer.

Who Should Attend

Engineers who are required to design piping systems as part of their job function or those who want to have a better understanding of the requirements of AS4041 and/or ASME B31.3. This seminar is ideally suited to Junior/Graduate Engineers or those new to the field of piping design and stress analysis.

Delegate Pre-Requisites

As this seminar includes numerous design calculations, it is recommended that each attendee is degree or diploma qualified in a relevant technical discipline (e.g. mechanical, chemical or structural engineering).

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 piping systems.

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

Overlap With Other KASA Piping Seminars

Material relating to the pressure design of straight pipe (to AS4041) is briefly introduced in KASA's "*Liquid Piping Systems Fundamentals*" seminar. In this "*Piping Design to AS4041 & ASME B31.3*" seminar, this material is taken to a more advanced level. There is no overlap with any other KASA seminar.

Seminar Objectives

The following primary learning objectives have been designed so that each attendee can:

•Understand the difference between "piping hydraulic design", "piping stress analysis" and "piping flexibility analysis".

•Have an appreciation for how "strength of materials" theory forms a basis for all international piping design codes.

•Understand the intent of both AS4041 and ASME B31.3 and how the design process should proceed so as to ensure compliance with these piping codes.

•Using manual calculation methods, determine the required wall thickness for pipes exposed to load combinations such as internal or external pressure/vacuum, wind, earthquake etc in accordance with the nominated piping codes.

•Using manual calculation methods, design elbows, bends, branches, fabricated tees, headers etc in accordance with the nominated piping codes.

•Using manual calculation methods, determine pipe support spacing and design appropriate supports.

•Understand fatigue analysis, flexibility analysis, fabrication, testing and examination of piping.

•Use appropriate judgment when dealing with stresses at connections with rotating and stationary equipment.

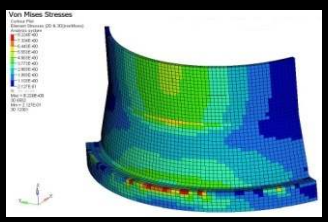
Training Seminar Materials

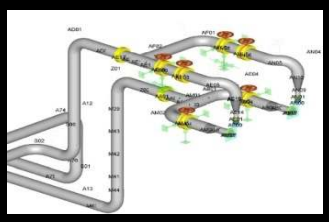
All delegates receive:

•**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.

Note: Copies of the most recent editions of AS4041 and ASME B31.3 shall be made available to each attendee during the seminar. These copies shall be returned to KASA at the completion of the seminar. Alternatively, attendees can bring their own copies of these piping codes should they wish to bookmark particular sections.





Piping Design to AS4041 & ASME B31.3

Seminar Synopsis

DAY 1

STRENGTH OF MATERIALS
- Terms and definitions.
- Stress, strain, allowable stresses and safety factors.
- Principle and secondary stresses.
- Axisymetric loading.
- Bending and torsion of pipes.
- Pipes subjected to plane stress.
- Combined bending, torsion and pressure loading.
- Failure theories used in piping design codes.
- Stresses and deflections due to temperature.
- Cyclic loading and creep.
- Examples of piping failure.
- Worked example problems.

AS4041 & ASME B31.3 BACKGROUND
- The history and intent of AS4041 and ASME B31.3.
- The basis of AS4041 and ASME B31.3.
- How to use piping codes.
- A "walk-through" of AS4041 and ASME B31.3.
- Assessment and classification of piping/service combinations.
- Worked example problems.

AS4041 & ASME B31.3 PIPE STRESS ANALYSIS
- Design temperature, design pressure and design loading combinations for stress analysis purposes.
- Basis for determining allowable stresses.
- Reduction factors, allowable stress tables.
- Determining wall thickness for internal pressure.
- Determining wall thickness for external pressure.
- Design of stiffener rings for external pressure or vacuum conditions.
- Design of elbows, bends, branches, fabricated tees, headers etc.
- Determining pipe support spacing.
- Dealing with combined static loadings.
- Dealing with dynamic fluid loadings.
- Worked example problems.

DAY 2

AS4041 & ASME B31.3 PIPE FLEXIBILITY ANALYSIS
- Forces, stresses and displacements due to thermal expansion.
- Methods of providing piping flexibility.
- Stress Intensification and Flexibility Factors (SIFs), elastic equivalent stress, allowable thermal expansion range.
- Cold spring.
- Pressure and its effects on piping flexibility.
- Guidelines on when to perform a piping flexibility analysis.
- The balance between flexibility and structural stability.
- Worked example problems.

PIPE SUPPORTS
- Analysis of support types and placement.
- Selection of the most appropriate support type.
- Examples of common support situations and associated calculations.
- Dealing with support friction.
- Worked example problems.

STRESSES AND DISPLACEMENTS AT CONNECTIONS
- Bellows, slip joints, flexible hoses etc.
- Tie rods and limit rods for flexible connections.
- Flange loadings.
- Dealing with piping loads imposed on tanks and vessels.
- Dealing with piping loads imposed on pumps, turbines and compressors.
- Worked example problems.

FABRICATION, INSTALLATION & TESTING
- A brief discussion on selected core material relating to fabrication, installation and testing in AS4041 and ASME B31.3.

COMPUTER BASED SOLUTIONS
- A comparison between the results obtained from various manual calculation methods (e.g. Kellogg, Timoshenko etc) and those obtained from computer programs.
- Discussion relating to popular computer programs for pipe stress analysis.



Pressure Vessel Design to AS1210

Introduction

The design of pressure vessels is a specialist task that requires a thorough understanding of topics such as: "strength of materials"; stress analysis and relevant design codes. Pressure vessel design also necessitates a logical, planned approach to the documentation of all relevant calculations as in many cases, these design calculations can be quite extensive.

AS1210 Pressure Vessels is the governing standard in Australia relating to pressure vessel design. It is therefore appropriate that Australian engineers should be provided with an opportunity to formally receive instruction in the area of pressure vessel design in the context of the relevant Australian standard.

The purpose of this two-day seminar is to provide a thorough understanding of the fundamental design principles of pressure vessels as well as instruction in the most commonly employed clauses of AS1210. Attendees also gain a brief insight into the differences between AS1210 and ASME BPVC Section VIII Div. 1.

Who Should Attend

Consulting Engineers, Process Engineers, Design Engineers, Project Engineers, and anyone who needs to design, inspect or sell pressure vessels compliant with AS1210 as part of their job function. This seminar is ideally suited to Junior/Graduate Engineers or those new to the area of pressure vessel design or migrant engineers who have no experience with AS1210.

Delegate Pre-Requisites

As this seminar includes numerous design calculations, it is recommended that each attendee is degree or diploma qualified in a relevant technical discipline (e.g. mechanical, chemical or structural engineering).

As this seminar guides the attendee from relevant "strength of materials" theory and stress calculations all the way through to AS1210 specific clauses, no previous knowledge or exposure to pressure vessel design is required. However, it would be extremely beneficial for the attendee to have seen some examples of pressure vessels at their place of work prior to attending so that some "context" can be provided to better aid the learning process.

Seminar Objectives

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

•Thoroughly understand how "strength of materials" theory forms the basis of all international pressure vessel codes and standards.

•Understand the most commonly used terms and jargon within the area of pressure vessel design.

•Appreciate the attention to detail required in designing the various components and parts that make-up a pressure vessel (e.g. head types, supports, connections, shells etc).

•Understand how pressure vessels fail.

•Recognise and compare the different methods of stress analysis available for pressure vessel design purposes.

•Design industry standard types of pressure vessels so that compliance with AS1210 is achieved with a minimal amount of supervision and/or guidance from a Senior/Supervising Engineer.

•Appreciate the intent and instruction contained within the most commonly employed clauses of AS1210.

•Understand some basic differences between AS1210 and ASME BPVC Section VIII Div. 1.

•Have a basic understanding of topics relating to: vessel manufacturing methods; vessel testing, marking and qualification; and pressure relief devices.

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.

Note: Copies of the most recent edition of *AS1210 Pressure Vessels* shall be made available to each attendee during the seminar. These copies shall be returned to KASA at the completion of the seminar. Alternatively, attendees can bring their own copy if more convenient.

Pressure Vessel Design to AS1210

Seminar Synopsis

DAY 1

BACKGROUND INFORMATION
- Industry terms and jargon defined.
- Examples of pressure vessel failures.
- Tensile tests and stress-strain diagrams.
- Stresses: Primary , secondary, peak and allowable.
- Failure theories.
- Thin walled versus thick-walled pressure vessels.
- Roark's, Shigley's and Timoshenko's formulas versus finite element (FEA) methods.
- Background information to AS1210.
- Vessel classes.
- AS1210 "Walk-through".
- Worked example problems.

LAYOUT
- Pressure vessel parts and components: Shell, head, legs, skirt, internals etc.
- Pressure Vessel Orientation.
- Examples of industry standard pressure vessels for various selected applications.
- Worked example problems.

AS1210 GUIDANCE - MATERIALS
- Materials selection and specification.
- Commonly used materials and their applications.
- Material identification.
- Materials testing.
- Corrosion allowances.

AS1210 GUIDANCE – LOADS, SHELLS & JOINTS
- Design pressure, temperature, load factors and combined loadings.
- Joint design – welded, brazed, soldered etc.
- Basic shell design – internal pressure only.
- Advanced shell design – pressure and combined loadings.
- Worked example problems.

DAY 2

AS1210 GUIDANCE – LOADS, SHELLS & JOINTS CONTINUED
- Advanced shell design - pressure and combined loadings.
- Advanced shell design – stiffening rings.
- End design – thickness, shape, attachment.
- Design of doors, stays and manholes etc.
- Worked example problems.

AS1210 GUIDANCE – OPENINGS, CONNECTIONS, BRANCHES & SUPPORTS
- Design of openings – un-reinforced and reinforced.
- Design of connections and branches.
- Design of vessel supports.
- Worked example problems.

AS1210 GUIDANCE - ANCILLARIES
- Level gauges.
- Arrestors.
- Relief valves.

AS1210 GUIDANCE – MANUFACTURING
- Pressure vessel fabrication.
- Pressure vessel inspection.
- Testing and documentation.

ASME BPVC Section VIII Div. 1 COMPARISON
- ASME pressure vessel code history and structure.
- A brief summary of design rules and equations.
- A brief comparison between ASME BPVC Section VIII Div. 1 and AS1210.
- A basic worked example problem to ASME BPVC Section VIII Div. 1.

Presenter Profiles

Karl Danenbergsons

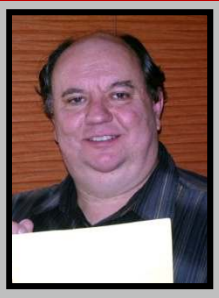
Karl Danenbergsons is Principal Mechanical Engineer at URS Corporation and one of the founding Directors of KASA. He has been well known to KASA seminar attendees since January 2004 and he has successfully presented “Pump Fundamentals” in public and private venues since that time.

Karl’s experience with pump and piping systems spans more than twenty years. He has applied his knowledge of liquid storage, pumping and piping systems for major organisations such as ADI, BHP, James Hardie and Nalco Pacific. He has held many titles in these organisations such as Design Engineer, Project Engineer, Process Engineer and Senior Project Engineer amongst others. Karl held the position of Engineering Division Manager for Nalco Pacific prior to joining KASA. His group was responsible for the design, supply, installation and commissioning of chemicals handling and water treatment plants with a geographical coverage spanning China, Japan, Thailand, Korea, Malaysia, Singapore, New Zealand and Australia.

Karl has lived and worked in the US whilst operating as a Design/Process Engineer specialising in slurry-based processes. He has also completed on-site commissioning and troubleshooting of chemicals and water treatment plants in countries such as Fiji, New Caledonia, USA, Italy, China and the UK. A transfer to KASA Redberg (UK) in 2007/08 resulted in specialist consulting activities in the areas of red mud disposal as well as sand/gravel operations.

With a first class honours degree in Mechanical Engineering, formal training as a public speaker and on-site experience in the Mining, Manufacturing, Chemicals and Water Treatment sectors of industry, Karl is a valuable asset to the KASA Redberg team.

Courses Presented: *Advanced Slurry Pumping & Piping (selected topics)*
Liquid Piping Systems Fundamentals
Pump Fundamentals



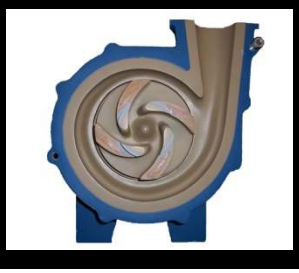
John Westover

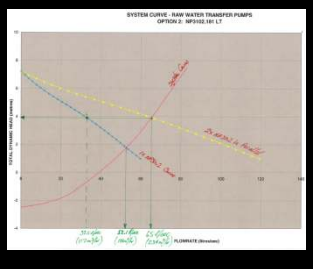
John has over 28 years of experience in the oil and gas industry, and his career has taken him from the US Rocky Mountains and the Arctic Coast of Alaska to various locations in Australia, with several stops in between. He has previously worked for both owner/operators such as Amoco and BP as well as the engineering company - Fluor and has first hand understanding of the unique needs and requirements of various stakeholders.

He first earned the respect of his operations and maintenance co-workers when he proved some thermocouples were not working properly - he had to wear a safety harness and climb a 35-tray distillation column outside the ladder cage to get some data (the data verified his theory).

After reaching the age of 40, John completed his Masters degree, specifically looking at how process integration could be systematically used to reduce the weight of offshore platforms (which resulted in a paper for the Society of Petroleum Engineers). Since then his career has started to transition into training and mentoring roles. He developed a practical course for Monash University, showing how the principles of Chemical Engineering taught in school could be applied to real engineering problems and has consistently been one of the most highly rated courses by the students. He has also developed remote training modules for operations and maintenance personnel for a facility expansion with new technology in Pakistan.

Courses Presented: *Gas Piping Systems Fundamentals*
Liquid Piping Systems Fundamentals
Pump Fundamentals





Presenter Profiles

Prof. Paul Slatter

Paul Slatter is Professor of Rheology and Fluid Engineering, and Director of the Rheology and Materials Processing Centre, at RMIT University in Melbourne, Australia. He has 30 years' teaching experience, and has been researching the engineering hydrodynamics of complex industrial fluids for the past 27 years.

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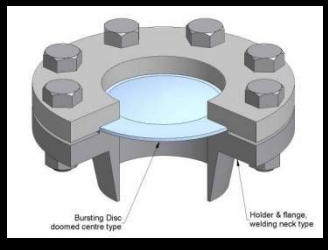
Courses Presented: Advanced Slurry Pumping & Piping (selected topics)



Registration & Payment Information

Registrations

To register for any of our public seminars, please go to the KASA website located at:

www.kasa.com.au

Registration forms for all of our seminars can be found on the "Seminars" page.

Full terms and conditions can be found on our registration forms.

Important Information Relating to Discounts

Previous attendees of any KASA Redberg seminar are automatically entitled to a 10% discount.

Companies that book three or more attendees at the same time are entitled to a 10% discount.

If you register and pay in full prior to the "Early Payment Cut-Off Date" then a 10% discount applies. It should be noted that if you are paying by EFT or cheque, we will invoice you for the full amount and then refund you the 10% early payment discount after the cut-off date. If you are paying by credit card, you will receive the full discount immediately.

Discounts are capped at a maximum of 20%.

Contact Details & Capabilities

About KASA Redberg

KASA Redberg is a technical training and engineering consulting group.

We have core competencies in pumping systems, piping systems, pressure vessels and slurry handling systems.

Our portfolio of services includes:

•Operator Training Seminars
•Public and private training seminars

With the departure of Karl Danenbergsons to global engineering consultants – URSCorp in February 2011, we now recommend that you contact Karl directly for design and consulting services relating to:

•Tank and vessel design.
•Chemicals plant design.
•Water treatment plant design.
•Pumping and piping systems design.
•Municipal pump station design.
•Pipeline design
•Mine dewatering
•Managed Aquifer Recharge
•Slurry testing (both on-site and at our facility)
•Slurry piping/pipeline systems design and slurry pump selection.
•On-site troubleshooting of pumps and piping systems.

Email: Karl.Danenbergsons@urs.com
Phone: +61 (0)2 8925 5636

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For seminar registrations, general administration and accounts related enquiries, please email: admin@kasa.com.au