



**KASA Redberg**

*Engineers & Technical Trainers*

# **Advanced Slurry Pumping & Piping**

***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)***

# 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 (or Sessions 1 and 2 when delivered online)

#### 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 losses for laminar and turbulent flow from viscosity measurements and/or small-scale pipe flow data.
- Recommended methods for determining head losses for non-Newtonian (non-settling) slurries.
- A focus on tailings pipelines.
- Focus question: Is any slurry really non-settling?
- 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 (or sessions 3 and 4 when delivered online)

#### 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 vertical and 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.



## 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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