

**KASA Redberg**

*Engineers & Technical Trainers*

*Proudly presents*

# **Advanced Slurry Pumping & Piping**

*A practical and interactive two day seminar*

# 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

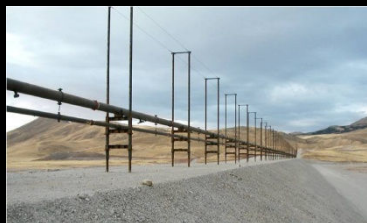
At the completion of this seminar, each delegate should be able to:

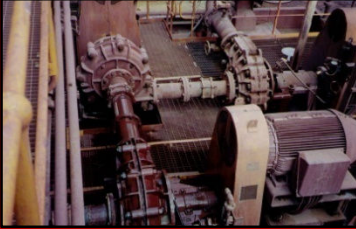
- Understand how the relevant slurry properties are determined in a laboratory environment.
- Understand how flow curves are derived from viscometer test results.
- Understand the principles of scaling-up from small-scale pipe loop tests, tube viscometers or existing pipelines for the purposes of designing 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:

- Detailed Seminar Notes** – Which provides a hardcopy of the slides presented during the seminar as well as extra worked example problems and reference notes.
- Certificate of Attendance** – Which states the number of hours of training and serves as documentary proof of attendance.





## 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.