Slurries, Suspensions and Solids

Courses in Cranfield, Bedfordshire UK : 19 – 22 April, 2010

To register, please return one form per delegate together with your payment.

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Please register me for the following courses.

Course	Fee for delegate 1-2 Ex VAT	Fee for delegate 1-2 Incl VAT	3rd delegate 50% off Ex VAT	3rd delegate 50% off Incl VAT	Amount Due
Slurry Viscosity (1-day)	£495.00	£581.62	£247.50	£290.81	
Slurry Handling (2-day)	£895.00	£1051.62	£447.50	£525.81	
On-line Slurry Instrumntn (1-day)	£495.00	£581.62	£247.50	£290.81	

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EXPERTS IN FLUID ENGINEERING

Three 1 - 2 day Training Courses

SLURRY VISCOSITY: FUNDAMENTALS AND MEASUREMENT

SLURRY HANDLING

and

ON-LINE SLURRY INSTRUMENTATION

CRANFIELD, BEDFORDSHIRE UK, 19-22 APRIL 2010

Introduction

The challenges of handling solid/liquid mixtures such as suspension, dispersions, slurries, pastes and filter cakes occur throughout industry. Such handling operations include in-plant transfers in pipelines, and feeding and discharge to and from agitated storage vessels. These processes provide cost-effective, economic and efficient methods of transporting products with the minimum of maintenance and low environmental impact. An understanding of how to optimise handling techniques; how different industries have solved complex problems; trouble shooting - all demand an understanding of the techniques required and the deployment of different engineering solutions.

Whether you deploy the technique through in-plant chemical or pharmaceutical processing, across mining, oil or construction applications, or the secure transportation of effluent and waste products, these training courses will be focussing upon aspects critical to the effective operation of your processes.

Course Arrangements

Course delegates will receive a pack giving details of transport, session times, and detailed programmes.

Delegates are responsible for booking their own accommodation. Accommodation is normally available at the Cranfield Management Development Centre and Mitchell Hall, within a few minutes walk of the course venue on the Cranfield University Campus in Bedfordshire. Halls can book up well in advance, so please book early via the links on the course website at www.bhrconferences.com. Alternatively, Milton Keynes and Bedford are both within 20-minute drive, with a range of hotels to choose from.

Course Fees

The delegate fee for a 1-day course is £495.00 + VAT for the 1st and 2nd delegate from an organisation. For the third or further delegates, a 50% discount is available.

Similarly, the fee for the 2-day course is £895.00 + VAT for delegates 1 and 2, and £447.50 + VAT for the 3rd and further delegates.

What past delegates have said about these courses……

"A comprehensive overview of all aspects of slurry handling"

Washington Group International

"Gained tools for design and sizing of slurry / solids handling equipment.

Dow Chemical

"Good overview of slurry handing systems, and the course notes are a good resource for information"

"A great course with lots of relevant information"

Hatch Associates

"A good appreciation of the basics, theory and practice of slurry instrumentation"
Sellafield Ltd

Lecturers

Nigel I Heywood

Dr Heywood is a chartered chemical engineer and Fellow of the Institution of Chemical Engineers with a first class honours in chemical engineering, an MSc with Distinction in Advanced Chemical Engineering, and an Executive MBA and DIC from Imperial College, London. After researching air injection into slurry flow in pipes at the University of Wales, he received a PhD. He researched multiphase pipeflow at Toronto University, Canada before returning to England. He worked at Warren Spring Laboratory, AEA Technology, and Aspen Technology before joining BHR Group. At BHR Group he provides consultancy, research and training. He has written over 100 articles and reports and a book: “Slurry Handling: Design of Solid-Liquid Systems”.

Neil J Alderman

Dr Alderman obtained a PhD in Chemical Engineering in 1986 from Bath University before joining Cambridge University’s Department of Chemical Engineering for postdoctoral research. After working for Schlumberger Cambridge Research Ltd, he joined Warren Spring Laboratory in 1991. His work has included research in rheology and cross-flow filtration of oil-well drilling fluids, filtration and de-watering of sewage and industrial sludges, rheo-optic characterisation of thermotropic liquid crystal polymers, electrochemical mass transfer applications and fouling of heat transfer equipment. At BHR Group he provides pilot-plant and lab-based consultancy and research services and lectures on slurry courses. He has published over 100 papers and reports.

Customised Courses

Tailored courses, chosen to meet your specific requirements, are available from our lecturers at our premises, or at your premises or other venue world-wide. Please see the website for the full brochure of topics we offer, and contact us to discuss the detailed content you might require.

More Information

Website: www.bhrgroup.com/Slurry_Handling_Courses.aspx
Bookings: Ms Debbie Carrington, Administrator, books2@bhrgroup.co.uk
Technical: Dr. Nigel Heywood, Senior Consultant, nheywood@bhrgroup.co.uk

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Course Outlines

Slurry Viscosity: Fundamentals and Measurement

19 April 2010

Viscosity and the Flow Curve – definition of viscosity, effect of temperature and pressure, and Newtonian and non-Newtonian behaviour

Estimating Shear Rates and Shear Stresses in Processes – estimation methods for defining relevant ranges specified for viscometric tests.

Viscosity and non-Newtonian Flow Curve Measurement using co-axial cylinder and tube viscometers

Chemical Basis of Slurry Viscosity - nature of the solid-liquid interface and various attractive and repulsive interactions existing between suspended fine particles described. Resulting non-Newtonian behaviour discussed.

Physical Basis of Slurry Viscosity - main factors determining slurry viscosity discussed. Effects of variations in particle concentration, size, and size distribution on slurry viscosity considered.

Yield Stress Measurement – behaviour under applied shear stress and shear rate. Dynamic and static yield stresses. Description of vane rheometry, cone penetrometry and slump test.

On-line Slurry Instrumentation

22 April 2010

Sampling –effective sampling strategies, ensuring that samples are representative of the heterogeneous multi-component mixtures, are discussed

Analysis – standard commercially available techniques and techniques involving adapting standard equipment are presented

Volumetric and Mass Flow Measurement - a wide variety of non-invasive commercially-available flowmeters with their inherent advantages and disadvantages are reviewed and guidelines for flowmeter selection are given.

Density Measurement – density is often needed for solid concentration or mass flowrate measurement. A review of the various commercially available density meters, their advantages and disadvantages and guidelines for density meter suitability for slurry applications are given.

Viscosity Measurement – a range of commercially-available process viscometers is reviewed with reasons for the not-so-widespread industrial application of on-line rheological measurement and a strategy towards process control is given.

Level Measurement - outline of the techniques best suited for on-line measurements with slurries, with their operating principles, advantages and disadvantages

Slurry Handling: Pumping and Pipeline Design

20 - 21 April 2010

Laboratory Measurement of Slurry Properties – measurement of the flow curve and the effect of viscosity, and other physical properties such as concentration, settling rates and particle size and distribution

Pipeline Design for "Non-Settling" Slurries – the estimation of frictional pressure drop/flow rate relationships for pipeline flow in laminar and turbulent flow and the effect of pipe fittings.

Pipeline Design for Settling Slurries – how to calculate pressure drop/flow rate relationships and the limit deposit velocity for settling slurries, covering both existing empirical correlations and the newer two-layer model approach.

Frictional Pressure Losses in Fittings – how to calculate frictional pressure losses for a wide variety of pipe fittings will be presented. These fittings include elbows, bends, tees, sharp expansions and contractions, and some valve types. The estimation of losses apply to both Newtonian and non-Newtonian slurries, in either laminar or turbulent flow.

Slurry and Paste Pump Types – a wide variety of pump types are reviewed

Slurry Pump Selection and Sizing – various methods for selecting a generic pump type based on the key slurry properties and operating parameters, and methods for derating pumps for Newtonian, non-Newtonian non-settling, and settling slurries

Slurry Valve Types – a summary of generic types of slurry valves with their operating ranges, advantages and limitations. Guidelines for valve selection.

Pipe Clearing Methods and Systems – a variety of pig designs and attachments can be used to clean pipework, recover valuable product, minimise effluent streams and switch cleanly from one product to another.

Wear in Slurry Transfer Systems – wear mechanisms, and testing for wear and minimising wear by the correct selection of materials and operating conditions

Slurry Storage Vessel Design and Operation – an overview of the various theories of slurry tank design and the designs that result