

Short Course on

Improving Mixing Processes for Industrial Applications

Cranfield, Bedfordshire, UK

23 – 25 November, 2010

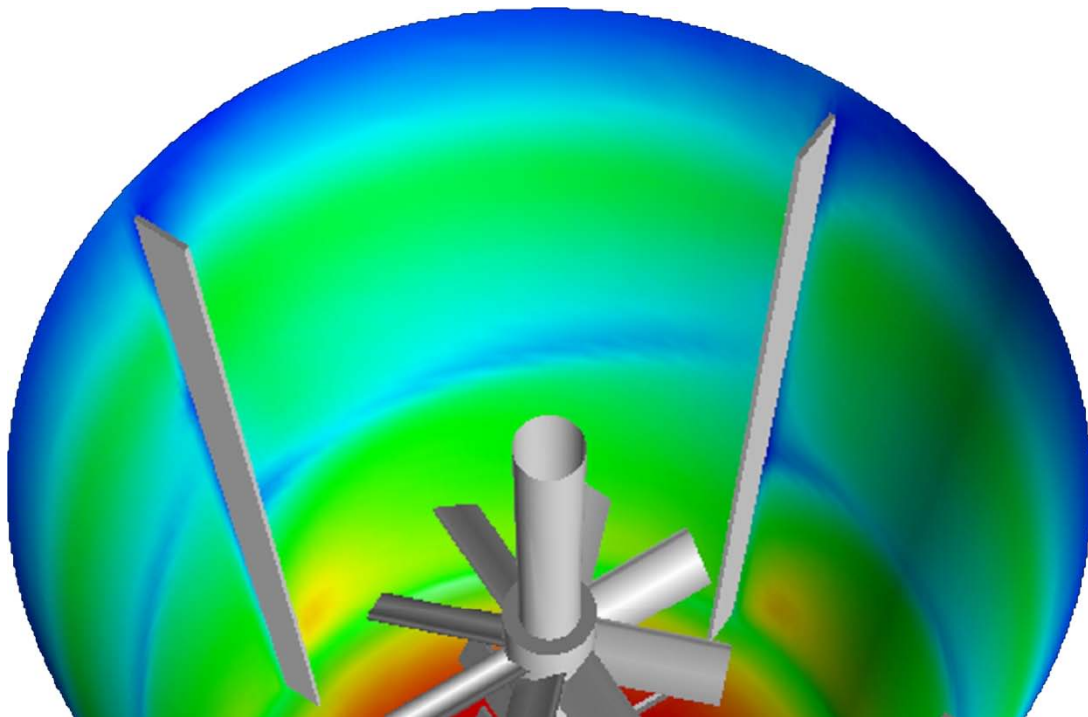
Ideal for:

Experienced engineers and scientists as well as graduates:

- From the chemical and related industries (biochemical, pharmaceutical, personal care)
- Who are involved in process development, design operation, research
- Who need to know more about the subject

Why should one attend?

- To understand the importance of mixing in industrial processes
- To learn more about design and scale-up
- To discuss mixing related problems
- To be able to identify and solve mixing related problems



Introduction

Improved Mixing Processes

Mixing is fundamental to process efficiency and product quality.

- Flexibility in operation (multiple products from one plant; variable batch sizes)
- Product consistency and repeatability
- Success in scale-up/scale-down

These are some of the mixing related concerns of industrialists, which require a good understanding of the underlying mechanisms and principles. BHR Group, who developed this specialist course, have used feedback from the previous sixteen courses to ensure that it meets the evolving requirements of industry. For 2010 the course continues to be a two-and-a-half day event allowing for a greater focus on Reactive Mixing and CFD.

Course description

The course aims to communicate the principles of fluid mixing, provide recommendations for process design and scale-up, enable participants to apply these principles and recommendations to their mixing processes/problems, enable participants to discuss specifications for the selection and operation of mixing equipment.

Day One (Introduction to Industrial Mixing Processes) emphasises the importance of mixing in the process industries, introduces mixing equipment and concepts relevant to mixing applications. Day One is designed as a stand-alone day for delegates requiring only an introductory insight into Mixing Technology.

Day Two and Day Three – Morning (Advanced Industrial Mixing) covers single and multiphase mixing applications in more detail: liquid blending, solid-liquid mixing, liquid-liquid dispersions and gas-liquid mixing, in-line & high intensity mixers, reactive mixing, heat transfer and computational fluid dynamics.

Example calculations, case studies and a tour of mixing facilities with demonstrations of physical and numerical models are also included in the course. An industrial workshop session will be held on Day Three. This will provide delegates with the opportunity to discuss various mixing related problems and attendees are encouraged to bring examples to the workshop. If required, appointments can be arranged to discuss these privately with the engineers from BHR Group.

The **Course Director** is Dr. Firoz Khan, BHR Group Limited and Course Lecturers are Senior Consultants and experts in Fluid Mixing in BHR Group Limited.

Attendees can choose to register for either Day One or for the full 2½ day course to suit their specific requirements.

What previous attendees said:

“This was a well presented course which provided a thorough understanding of mixing fundamentals and practice in a short timeframe. The set of notes that accompany the course will provide a comprehensive reference in the future”

Darren Gobby and Neil Turner, Lucite International UK Ltd.

“We found the process mixing course provided an excellent overview of the fundamentals surrounding industrial scale mixing. The insights gained during the course have resulted in an improved understanding of the controlling factors in our mixing applications. This fundamental approach has provided opportunities to improve the efficiency of our mixing equipment resulting in improved product quality”.

Ian Taylor and James Bruce from Dow Corning, Barry, UK

“This course exceeded my expectations”

Dr Chris Guske, Tate and Lyle, USA

Course Programme

Introduction to Industrial Mixing Processes

23 November 2010

Why mixing matters – Introduction

Objectives and layout of course. Importance of mixing in industrial processes, consequences of failures in mixing processes, energy savings and social benefits, examples of capital and operating cost savings.

Mixer types and associated equipment

Different types of mixers (top, submerged and bottom entry mixers, static mixers, jet mixed systems and associated equipment), flow patterns, general guide to impeller selection, mechanical design.

Mixing Concepts I

Process requirements, dimensionless groups, flow regimes (laminar, turbulent, transitional), power requirements for mixing processes, rules for scale-up and scale-down.

Mixing Concepts II

Introduction to rheology: Newtonian, non-Newtonian fluid flow;
Blending liquids: industrial needs, mixing time, techniques, design considerations and recommendations for design;
Liquid-liquid dispersions: industrial needs, definitions (coalescence, break-up, phase inversion, just dispersion conditions), design considerations.

Mixing Concepts III

Solid-liquid mixing: industrial applications and needs, different states of solid suspensions, factors that affect solid suspension, draw down of floating solids (including video demonstrations).
Gas-liquid mixing: industrial applications and needs, techniques, gas-liquid hydrodynamics and gas filled cavities (including video demonstrations), design considerations.

Tutorial – Example calculations, case studies

Tour of laboratories and mixing pilot plants at BHR Group)

Course Dinner

Advanced Industrial Mixing Fundamentals of mixing processes

24/5 November 2010

Liquid Blending

Mechanisms of blending; blending regimes; blending liquids of low-to-medium viscosity (turbulent and transitional regimes); scale-up and down; blending high viscosity liquids (laminar regime); blending liquids of different properties (including video demonstrations); CSTRs; blending with jets.

In-line and High Intensity Mixing

Blending, gas-liquid mixing and liquid-liquid mixing using in-line equipment (static mixers, ejectors and rotor stator mixers).

Solid-liquid Mixing

Solid suspension: mechanistic and empirical models for solid suspension, power requirements, scale-up and down, jet solid suspension; solids distribution: multiple impellers; solid draw-down.

Liquid-liquid Dispersions

Phase continuity, deformation and break-up of drops (including video demonstrations), coalescence phenomenon, impeller section, mass transfer in liquid-liquid dispersions.

Industrial Workshop/Questions and discussion of case studies from Course Attendees.

Gas-liquid Mixing

Gas-liquid mixing design guidelines for low-to-medium viscosity liquids; power requirements and effect of scale on gas dispersion; hold-up and mass transfer; scale-up and down; multiple impellers.

Heat Transfer

Introduction to concepts related to heat transfer in mixing equipment.

Computational Fluid Dynamics (CFD)

How and why CFD is used to solve single and multiphase mixing and reaction problems.

Reactive Mixing:

Effect of mixing on multiple reactions, micro and meso mixing models, effect of process parameters on reaction productivity, optimisation and scaling of reactive systems to increase productivity and reduce waste in the reactor

Close of Course

Reservations

FULL PAYMENT MUST ACCOMPANY THE RESERVATION FORM

An invoice will be issued on receipt of payment.

Please submit one form for each delegate. Photocopies of a blank form may be used.

Cheques should be made payable to BHR Group Limited.

Bank transfers should be paid to our account at:

National Westminster Bank plc

Cranfield University Branch

Wharley End

Cranfield, Bedford, MK43 OSR, UK

Account number: 36565466

Bank sort code: 60-06-56

IBAN: GB40 NWBK 6006 5636 5654 66

SWIFT BIC: NWBK GB 2L

Credit card payment details should be entered on the Reservation Form by completing the appropriate boxes and signing the form. Please quote **Mix 10** and **name of delegate and company** on all transactions.

Fee

The total cost for two and a half days tuition, course notes, lunch, refreshments and course dinner is **£925 plus VAT (£1086.87), for one day £550 plus VAT (£646.25), course dinner included.**

Discounted rates

A discount is offered for **multiple bookings** from the same Company, information on request. A discount is offered for **FMP Members**, see reservation form.

Cancellations

Before 24 October 2010	– Full refund
24 October – 6 November 2010	– £50 (Admon)
After 6 November 2010	– No refund

Substitutions may be made at any time.

Enquiries

Please contact:

Debbie Carrington

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Bedfordshire MK43 0AJ, UK

Tel: +44 (0) 1234 756561, Fax: +44(0) 1234 750074

Email: confx3@bhrgroup.co.uk

Venue and Accommodation

The course will be held at the Management Development & Training Centre, Cranfield University, Bedfordshire, UK. Cranfield is situated some 50 miles north of London between Bedford and Milton Keynes, close to Junctions 13 & 14 of the M1.

Accommodation is not included in the fee but the Centre is holding a number of rooms for delegates until early November. As accommodation in Cranfield is limited, attendees are recommended to book their overnight accommodation at the Centre, **quoting Reservation Reference 6460**, as early as possible. The Bed & Breakfast rate is £103.50 (VAT inclusive).

Contact details for the Centre are: Tel +44 (0)1234 752707; Fax +44 (0)1234 751707

For enquiries email: cmdcreervations@cranfield.ac.uk

A timetable and joining instructions will be forwarded to delegates upon registration.

About BHR Group

Founded over 60 years ago, BHR Group is an independent contract research, development and consultancy company. Dealing in all aspects of engineering with fluids, BHR Group is recognised, in particular, as the world leading authority on mixing processes.

Invoice and registration form

Improving Mixing Processes for Industrial Applications

Cranfield, Bedfordshire, UK: 23 - 25 November 2010

Your details

Please complete in block letters ticking appropriate boxes

Prof

Dr

Mr

Mrs

Miss

Ms

Surname

Forename

Position

Company

Address

Post/Zip Code

Country

Telephone

Fax

email

Signature

Date

Return to:

BHR Group Limited
The Fluid Engineering Centre
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VAT Reg No. 536 4271 46



Invoice and registration form

Improving Mixing Processes for Industrial Applications

Cranfield, Bedfordshire, UK: 23 - 25 November 2010

Registration

CONFERENCE CODE: MIX10 VAT is charged at 17.5%	Amount due	For Office Use Only
Full 2½ Day Course: 23-25 November 2010 2 Day Delegate Fee: £925 + VAT (£1086.87) FMP Members: £875 + VAT (£1028.12) <i>Includes tuition, lecture notes, course dinner, lunches and refreshments</i>		
Introductory Day 23 November 2010 Only 1 Day Delegate Fee: £550 + VAT (£646.25) FMP Members: £500 + VAT (£587.50) <i>Includes tuition, lecture notes, lunch and refreshments. Course dinner not included.</i>		
TOTAL (full payment must accompany this form)		

Payment (Please tick box and complete as appropriate)

Please find enclosed my cheque for £ or,

The fees will be settled by Bank Transfer direct to the BHR Group account (see details – back page) a Purchase order or number should accompany this form.

Purchase order number:

Please debit my credit card No: CVC Code:

Mastercard Visa Eurocard Expiry date /

Cardholder's name and address:

Signature:

Date:

Delegate No:

Tax Point:

On receipt of payment a letter of acknowledgement and confirmation will be sent.

