

## WORKSHOP TUTORS

**Dr Stephen Rowe** BSc, MRSC, AMIChemE, CChem, Ph.D, graduated from Portsmouth University with a BSc First Class Honours Degree in Applied Chemistry. He undertook a project developing the adiabatic Dewar calorimeter system in 1989 – 1990 within the ICI Hazards and Process Studies Group (Blackley, Manchester) before joining Chilworth Technology in 1991. Stephen gained his PhD in 1997 under Prof. Philip Nolan at South Bank University (University of London). The project investigated the application of reaction inhibition techniques in the control of exothermic runaway reactions.

Stephen is currently Operations Manager at Chilworth Technology and regularly attends, and presents at, international conferences on process safety. His expertise encompasses all areas of Chemical Reaction Hazards and Flammability (dusts, vapours and gases). Stephen has full responsibility for the management and technical development of the testing and consulting operations at Chilworth Technology's headquarters in Southampton.

**Dr Andrew Starkie** B.Sc, Ph.D, C.Chem, MRSC, is the Business Development Manager at Chilworth Technology, covering all areas of process safety. Prior to this, he was Group Leader of the Company's Chemical Process Evaluation Group. Andy's areas of expertise include the development of experimental programs for identification and assessment of chemical reaction hazards, in particular with the design of emergency relief systems using DIERS techniques. In addition Andy's expertise covers the testing of highly energetic chemicals.

Andy has conducted extensive research into new calorimetric methods for the characterisation of exothermic processes under both sub-reflux and reflux conditions and has been course director for a number of international training courses and symposia on chemical reaction hazards.

**TO REGISTER FOR THIS COURSE**  
Please faxback on +44 (0)23 8076 7866

## HOW TO REGISTER?

Telephone Tracy Bramall on +44 (0)23 8076 0722 to confirm availability AND Fax or post this registration form together with a company cheque or official company purchase order to Chilworth Technology Ltd on +44 (0)23 8076 7866 or Chilworth Technology Ltd, Beta House, Southampton Science Park, Southampton, Hants, SO16 7NS

Call +44 (0)23 8076 0722  
to reserve your place

## REGISTRATION

I wish to reserve a place on Runaway Reactions on the 19th May 2009 (£295+VAT) .....

I cannot attend the course but would like a FREE consultation with a Process Safety Specialist .....

Dr/Mr/Mrs/Ms/Miss: .....

Name: .....

Job Title: .....

Company Name: .....

Address: .....

.....

Postcode: .....

Country: .....

Telephone: .....

Fax: .....

Email: .....

I am a Chilworth website subscriber and I wish to claim my 5% discount (please tick) .....

I am attending the HAZOP course on the 20th&21st May 2009 at this venue and wish to claim an extra 10% discount (please tick) .....

Signature: .....

Date: .....

*Cancellations: All reservations in writing are subject to cancellation conditions. Written cancellations received up to 5 working days before the course date will be subject to an admin charge of £50. No refunds will be made for cancellations received after this date, or for non-attendance, but course notes will be sent. Substitutions may be made at any time. Chilworth Technology reserves the right to modify or cancel the course up to 5 working days prior to the start date.*

## RUNAWAY REACTIONS



a one-day course, from 9am to 5pm

**Tues 19th May 2009**

De Vere Hotel  
Warrington  
WA4 4BB

**Chilworth**  
Technology  
the experts in process safety



## PROTECTING AGAINST RUNAWAY REACTIONS- Thermally Unstable Substances and Exothermic Reactions- Assessment Procedures and Mitigation Strategies

Many materials and reactions handled in industry can generate heat and / or gas. There have been many incidents in industry involving such materials when control is lost and a material decomposes uncontrollably or a runaway reaction occurs. Safety legislation to force assessment and control of these hazards is implemented in the EU via the Chemical Agents Directive (CAD) which is in turn incorporated into UK legislation in Dangerous Substances and Explosive Atmospheres Regulations, 2002 (DSEAR). The legislation places a responsibility on operating companies to conduct a full and thorough risk assessment of reactive processes and materials. Serious (fatal) incidents involving runaway exothermic chemical reactions continue to occur around the world highlighting the significance of this topic. It is vital that companies understand the risks as well as the procedures that must be followed to operate safe chemical processes.

This course aims to provide a solid technical overview of assessment procedures and test methods, including data interpretation, and appropriate mitigation strategies so that companies can develop a coherent procedure for preventing runaway reactions and decompositions.

### BACKGROUND

Exothermic chemical reactions in batch and semi-batch processes can result in serious injury to people and can cause major production problems. These reactions cause thermal runaway leading to:

- Violent loss of containment (severe explosion).
- Flammable material release (and secondary fire or explosion).
- Toxic release.

This course has been designed to show how potential chemical reaction hazards in manufacturing processes can be systematically identified and assessed. It will explain the uses of the latest techniques available for measurement of exotherm onset temperature, heat of reaction, gas evolution, etc. and will provide the methodology necessary to select and design the most appropriate safety measures.



### OBJECTIVES

The aim of this course is to enable attendees to identify and assess chemical reactivity hazards and to explain the methodology necessary to select and design appropriate safety measures. The following stages of assessment are described and discussed:

- Process and material characterisation.
  - o Literature and computational methods for hazard estimation.
  - o Thermal stability screening and explosivity testing.
  - o Reaction calorimetry.
  - o Adiabatic calorimetry.
- Hazard identification.
  - o Techniques for hazard identification.
- Consequence analysis.
  - o Adiabatic calorimetry and computational tools and methods for assessing the consequences of a failure.
- Safety measure selection.
  - o Including a full discussion of emergency relief system design incorporating DIERS methodology for two-phase discharge.

The course uses a workshop and numerous case study examples to highlight methods and examples of good (and bad) practice.

### WHO SHOULD ATTEND?

The course is designed for chemists (specifically process technologists, R&D chemists and pilot plant chemists), chemical engineers and plant operators. It also provides an excellent overview of the topic for HS&E, plant and operations staff and management. The course is suitable for staff of the chemical and processing industries including bulk and fine chemicals, pharmaceuticals, soaps and detergents, plastics and rubber, agrochemicals, dyes, paints and inks

### VENUE

A location map will be sent to you with course confirmation once we receive your completed application form.



### COURSE PROGRAMME

- Introduction - An overview of reported incidents, their causes and the lessons that were learnt.
- Characteristics of a Runaway Reaction - Defining a runaway reaction - what is the hazard? What are common terms and phrases used.
- Case Study - The study of a potential runaway reaction resulting from a process deviation.
- Development of a Strategic Evaluation Procedure - Determining the level at which an assessment should be conducted. When should assessments begin and what parameters should be investigated.
- Introduction to Testing Methods - Screening tests characterisation of the normal process - characterisation of a runaway - determination of gas generation.
- Introduction to Testing Methods (continued).
- Safety Measure Selection - Options available for safe operation.
- Reactor Vent Design - A brief overview of reactor venting as a basis of safety.
- Case Studies.
- Discussion and Close.

### CHILWORTH TECHNOLOGY LTD

Chilworth brings together leading experts in the field of process safety with state-of-the-art GLP compliant safety laboratories to provide a single point of contact for all your process safety needs. Our GLP compliant laboratories cover four areas of process safety, fire and explosion hazards, chemical reaction hazards, electrostatic properties and regulatory testing.

Supporting our laboratories and providing independent and impartial advice is our consultancy team. A group of dedicated engineers and scientists who specialise in the field of industrial explosion hazards, chemical process evaluation, vent sizing (DIERS), HAZOP, electrostatic hazards and production problems, incident investigation, SIL studies, expert witness and process safety training.



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