

# Hazards XXI and workshops programme

9–12 November 2009 – Manchester, UK



# Process safety and environmental protection

9–12 November 2009

**Weston Building  
Manchester Conference Centre, UK**

The symposium theme is process safety and environmental protection in a changing world. Globalisation is creating new supply chains, putting pressure on established companies to innovate and improve efficiency. New suppliers are emerging and expanding their operations. They need to achieve high safety and environmental standards, learning the lessons of historical failures and adapting systems and technologies to fit their different cultures and business practices. Well-established industries have to adapt and evolve to meet new challenges such as maintaining old plant, managing ageing workforces, introducing new technology and implementing organisational change.

Regrettably, accidents continue to happen. Improved safety and environmental management practices are being developed in a wide range of industries in the post Buncefield and Texas City era. New laws are being proposed and implemented in response to these incidents. For example, major changes to the EU Seveso II Directive are being considered, the regulatory regime for pipelines is being revised, and REACH is being implemented.

New industries continue to emerge, bringing with them new hazards and EHS challenges. This can generate unforeseen safety risks and environmental impacts, as new technology introduces unforeseen ways of causing failures. Organisations also still fail to address foreseeable risks, as the lessons from established industries are not learnt. It is important that we improve our understanding of all these risks, in areas such as nanotechnology, food technology, clean coal power supply, oil sands, next generation biofuels, renewable energy, nuclear power and decommissioning, and LNG supply.

The aim of this symposium is to bring together international experts and practitioners in process safety and environmental protection to present and discuss the latest technical advances and developments in safety and environmental management techniques.

Following the success of the optional one-day workshops at previous Hazards symposia, it has once again been decided to include them on Monday 9 November 2009, immediately preceding the three-day symposium. They are entitled:

- *Safety instrumented systems: You've talked the talk, are you walking the walk* – ABB Engineering Services – half day
- *Equipment and procedures that cannot do what we want them to do* – Trevor Kletz – half day
- *Reactive chemicals* – Kevin Dixon-Jackson, Ciba Expert Services – half day
- *Classification, labelling and packaging (CLP): What's changed and what you need to know* – Chemicals North West and The REACH Centre – half day
- *How to carry out Human Factors risk assessments in COMAH* – David Embrey, Human Reliability Associates

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# Workshop programme

Monday 9 November 2009



## Workshop 1

### Safety instrumented systems: You've talked the talk are you walking the walk?

ABB Safety function workshop, Conference Room 1, Weston Building

09:30 Registration, tea and coffee

10:00 Workshop

Over the last number of years you've heard a lot of talk about IEC61508 and the process industries' interpretation IEC61511, and by now you should be a long way through managing compliance with the functional safety lifecycle, ie you should have:

- identified your hazardous events and quantified the risk they impose;
- assessed these risks to determine if they are intolerable;
- performed a SIL determination exercise to quantify the target SIL of the safety instrument function (SIF) to reduce the risk to a tolerable level;
- defined the functional and integrity requirements of the SIF;
- designed the SIF to meet the target SIL and determine the proof test interval.

Now after all the talk you must walk that walk and ensure that these instrumented safety systems are operated, tested and maintained over their full life to ensure they continue to achieve the required SIL and risk reduction.

So in doing so:

- How do you demonstrate that you continue to be in control of your ongoing testing and maintenance of your safety systems?
- Can you identify any systematic and persistent failures within your safety system?
- Do you have the information to perform the necessary ongoing reviews to confirm the initial risk and design assumptions are valid?
- Are you confident that your achieved SIL is providing the necessary levels of risk reduction?

This Hazards XXI workshop will provide a reminder of the hazard and risk management requirements that you should have performed and discuss the issues associated with the ongoing design performance and maintenance activities of your SIS.

11:30 Questions

12:00 Buffet lunch

13:00 Close

This workshop is free of charge, but please book early as places are limited – contact Gillian Form on Tel: +44 (0)1642 372064 or Email: [gillian.form@gb.abb.com](mailto:gillian.form@gb.abb.com)

## Workshop 2

### Equipment and procedures that cannot do what we want them to do

Trevor Kletz will lead a discussion on Monday 9 November at 14:00 in Conference Room 1.

Chemical and other engineers are sometimes surprised to find that the equipment, including instrumentation, they have designed and the procedures they have drawn up, are unable to do what they want them to do. This may occur because the design defies the laws of science, does not take practicalities into account or because the designer is not aware of some of the features of the plant or process. Examples will be described and the reasons why the failures were not foreseen will be discussed.

- 13:00 Registration and lunch in the Weston restaurant
- 14:00 Workshop
- 17:00 Close

This workshop will be limited to 30 places maximum, so please book early via Rosemary Cragg, IChemE.  
Tel: +44 (0)1788 578214 Email: [rcragg@icheme.org](mailto:rcragg@icheme.org)

## Workshop 3

### Reactive chemicals



Kevin Dixon-Jackson, Ciba Expert Services, Weston Room II, Weston Building

Which are the reactive chemicals? How can you recognise them? What tests are available and what works? This workshop is designed to train chemists, chemical engineers and safety specialists in the science of recognising and testing of reactive chemicals, up front in the development process. Delegates will see the chemical types that give rise to problems, and the particular hazards of commonly-used reagents/reactions will be taught in depth (nitro, diazo, ethoxy, monomers etc). The methods of testing and identification of high hazard materials will be detailed.

- 09:00 Registration and coffee
- 09:30 Reactive substances: Types, categories and hazards
- 10:00 The legacy of J L Gustin:
  - Nitro compounds
  - Vinyl acetate
  - Ethoxylation
- 10:30 Coffee
- 10:45 Exercise: Spot the hazardous chemical and feedback.
- 11:15 Diazotisation: The lessons learned
- 11:30 Handling monomers: Principles and best practice
- 12:30 Testing of and for reactive substances
- 13:00 Questions and close out, followed by lunch in the Weston restaurant

## Workshop 4

### Classification, labelling and packaging (CLP): What's changed and what you need to know

The Cockcroft Theatre, Weston Building

- 12:30 Arrival, networking and buffet
- 13:30 **CLP session** – This workshop will give attendees an insight of a company's obligations under the new EU Regulation on Classification, Labelling and Packaging (CLP)
- Delivered by Andrew Fasey
- Introduction to the CLP regulation
  - Key changes from DSD/DPD (Dangerous Substances Directives/ Dangerous Products directives) to CLP
  - A few examples
  - Implementation timetable
- 14:45 Coffee and networking
- 15:15 **SVHC session** – This workshop will provide attendees with the relevant information they need to comply with REACH in respect of SVHC (Substances of Very High Concern) and to assess the business and commercial impact of these substances
- Delivered by Simon Brearley
- SVHC – definition, categories
  - Authorisation
  - The candidate list
  - SVHC and article producers
    - supply chain communication
    - notification
    - concentration and tonnage calculation
    - analysis
  - Commercial implications
- 16:30 Networking and close
- For more details of this event please contact Alex Heys of Chemicals North West on  
Tel: +44 (0)1928 515678 Fax: +44 (0)1928 515677  
Email: [alex.veys@chemicalsnorthwest.org.uk](mailto:alex.veys@chemicalsnorthwest.org.uk)
- The cost of the workshop is £65 + VAT.



## Workshop 5

### How to carry out human factors risk assessments in COMAH

Presenters: Dr David Embrey, Managing Director, Jamie Henderson, Senior Consultant

Recent high profile incidents in the process industries have emphasised the importance of the proactive management of the risks arising from human error. The application of a systematic, risk-based approach ensures that valuable resources are directed at the most safety critical tasks on a site.

Health & Safety Executive (HSE) guidance indicates that sites subject to the control of major accident hazard (COMAH) regulations should use predictive qualitative assessment techniques to identify potential human factors issues. (See Health & Safety Executive core topic 3: Identifying human failures <http://www.hse.gov.uk/humanfactors/comah/core3.pdf>). The guidance acknowledges that 'this will be a relatively new area for many dutyholders' and explains that 'our expectation is that they conduct qualitative analyses of human performance – identifying what can go wrong and putting remedial measures in place'.

Human Reliability Associates has considerable experience of undertaking assessments of this type. In this workshop we will offer practical advice based on our experiences in helping clients to meet regulator expectations in this area. This half-day session will:

- discuss the expectations of the regulator with regard to human factors in risk assessment
- show how analysis effort can be targeted at the most relevant tasks for the control of Major Accident Hazards
- demonstrate how these analyses can be undertaken by means of interactive workshops
- discuss how planning can ensure a site gets the maximum benefit from this type of work
- discuss how this work can be integrated with existing safety reports

At the end of the workshop an optional 30 minute presentation will describe the Human Factors Workbench, a software tool for supporting risk assessments, designing procedures, analysing incidents and performing human reliability analyses.

The workshop will run from 13:00 to 17:00 on Monday 9 November 2009, with a mid-session break for tea and coffee. The cost of the workshop is £75 +VAT

Please reserve your place by contacting Human Reliability Associates directly on Tel: +44 (0)1257 463121, or by Email to: [henderson@humanreliability.com](mailto:henderson@humanreliability.com)

Postal applications should be sent to:  
Human Reliability Associates, 1 School House, Higher Lane, Dalton Wigan Lancs, WN87RP

# Tuesday 10 November

- 08:30 Registration, coffee
- 09:10 Welcome by R F Evans, Chairman of the *Hazards XXI* organising committee
- 09:15 Welcome and introduction by M I Essa – Health and Safety Executive  
Chairman of the IChemE North West Branch

## Plenary session 1 – Keynote papers

### Chair – R F Evans – Consultant

- 09:25 The Burgoyne Memorial Lecture  
From sugar refineries to oil refineries: lessons learned from chemical process incident investigations performed by the US Chemical Safety Board  
*J Bresland – Chairman and ceo, US Chemical Safety Board, Washington DC, US*
- 10:00 Prescription – a step on the road to dependence, or a cure for process safety ills?  
*P Webb – Basell Polyolefins UK, Manchester*
- 10:30 Governance of process safety within a global energy company  
*M McBride, G Collinson – Centrica, Windsor, Berks*
- 11:00 Coffee – exhibition
- 11:30 Achievements of the EC Network of Excellence HYSAFE  
*T Jordan et al – Forschungszentrum Karlsruhe*  
(Together with approximately 120 researchers from 25 Institutions)
- 12:00 Four years on from Texas City  
*M Broadribb, S Flynn – BP International, Sunbury-on-Thames*
- 12:30 ICI's contribution to process safety  
*T A Kletz – Department of Chemical Engineering, Loughborough University*
- 13:05 Lunch – Poster viewing/exhibition

**13:05 – 15:00 Poster paper viewing in Conference rooms 4/4A**

**15:00 – 17:30 Four parallel sessions (Sessions 2, 3, 4 and 5)**

## Parallel session 2 – Safety management

### Chair – Dr S J Hawkworth – Health and Safety Laboratory

- 15:00 Common lessons learned from an analysis of multiple case histories  
*M Mannan, X Yang, L Dinh, D Castellanos, C Osorio, D Ng*  
*Mary Kay O'Connor Process Safety Center, Artie McFerrin Department of Chemical Engineering, Texas A&M University System, US*
- 15:30 The Baker report – How findings have been used by Johnson Matthey to review their manufacturing operations  
*E Campbell, C Lynas, H Koornhof – Johnson Matthey Catalysts*
- 16:00 Tea – Poster viewing/exhibition

- 16:30 Risks to process safety in a contracted out environment (contractors, consultants & corporate responsibility)  
*A Ennis – Haztech Consultants Ltd, Winsford*
- 17:00 Process safety leadership, worker involvement and learning organisations  
*J Wilday, J Lynne Saw, C Sugden – Health and Safety Laboratory, Buxton*  
*M Kumasaki – Yokohama National University, Kanagawa, Japan*

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### Parallel session 3 – New process safety technology

#### Chair – Dr B Fullam – Health and Safety Executive

- 15:00 Explosion properties of nanopowders  
*P Holbrow – Health and Safety Laboratory, Buxton*
- 15:30 A software system to check designs automatically against process safety and best practice  
*P Chung – Loughborough University*  
*J McDonald, B Rieley, J Madden, J de Brugha – Hazid Technologies, Beeston*
- 16:00 Tea – Poster viewing/exhibition
- 16:30 DART – the future of explosion protection technology  
*T Klatt – Pepperl-Fuchs, Mannheim, Germany*
- 17:00 Nanotechnology: Results of a survey of the public perception of safety  
*I McConvey – Warrington, Cheshire*  
*J Wand – EPSRC, Swindon*

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### Parallel session 4 – Sharing safety knowledge

#### Chair – K Dixon-Jackson – Ciba Expert Services

- 15:00 Learning from successes and failures  
*R Turney – Consultant*
- 15:30 Accelerating learning through cross-sector peer reviews  
*G Sellers – Safety management consultant*  
*D Mason – Consultant – Eskdale*
- 16:00 Tea – Poster viewing/exhibition
- 16:30 Learning from process safety incidents  
*J Hare, M Johnson – Health and Safety Laboratory, Buxton*  
*B Fullam – Health and Safety Executive, York*
- 17:00 Learning lessons from accidents : an industry view of the opportunities and difficulties  
*K Patterson – Yule Catto & Co, Harlow*

Or

### Parallel session 5 – HAZOP

Chair – Professor T A Kletz – University of Loughborough

- 15:00 Introduction – Professor T A Kletz
- 15:15 Hazop studies – a new approach?  
*D Limb – Consultant, Alberta, Canada*
- 15:40 Common problems and recent trends with HAZOPs  
*A Munn – Aker Solutions, Warrington*
- 16:05 Tea – Poster viewing/exhibition
- 16:30 Improving the performance and consistency of HAZOP facilitation and recording  
*G Stevens, A Verna, S Fernandez – Arthur D Little, Cambridge*
- 16:55 Is HAZOP worth all the effort it takes?  
*A Foord, S Whitty – 4-Sight Consulting, Harpenden*
- 17:20 Question and answer session to the panel of authors
- 17:40 Poster viewing/exhibition

### Reception and buffet

Conference centre Weston Room 1

- 18:00 Welcome by sponsors  
*N Blackhall – Managing director, ABB Engineering Services*



# Wednesday 11 November

08:30 Registration, coffee and exhibition

**09:00 – 13:00 Four parallel sessions (sessions 6, 7, 8 and 9)**

## Parallel session 6 – Safe process design

**Chair – K Dixon-Jackson – Ciba Expert Services**

09:00 Reducing the hazards associated with spray drying from laboratory through to larger scale including considerations for outsourcing and secondary containment  
*I McConvey, M Hoyle – AstraZeneca, Macclesfield*  
*O Nulty – Containment Service Providers UK, Middlewich, Cheshire*

09:30 Repeated accident causes – can we learn?  
*P Waite – Entec UK*

10:00 Safety in design of thermal fluid heat transfer systems  
*A Ennis – Haztech Consultants, Winsford*

10:30 Coffee – Poster viewing/exhibition

11:00 A simple, swift and pragmatic approach in the use of small-scale laboratory tests to define safe drying conditions for manufacturing scale pressure filters  
*K Anderson, D Maude, S Wagner – AstraZeneca, Macclesfield*

11:30 The effect of reduced oxygen levels on the electrostatic ignition sensitivity of dusts  
*G Ackroyd, M Bailey, R Mullins – Syngenta, Huddersfield*

12:00 Chemical reaction hazards – an evolving approach  
*D Dale – Pfizer Global Research Division, Sandwich*

12:30 Ignition of bulk solid materials by a localised hotspot  
*P Caine, S Puttick – Syngenta, Huddersfield*  
*J Brindley, A McIntosh, J Griffiths – School of Process, Environmental and Materials Engineering, University of Leeds*

Or

## Parallel session 7 – Safety performance indicators

**Chair – Dr G Sellers – Consultant**

09:00 OECD guidance on safety performance indicators – an international approach to assessing the success of industry, public authorities and communities in managing major accident hazards  
*M Hailwood – LUBW, Karlsruhe, Germany*  
*K Jennings – Environmental Protection Agency, Washington DC, US*

09:30 Developing KPIs that drive process safety improvement  
*M Brown – Lloyd's Register EMEA, Aberdeen*

10:00 Process safety performance indicators – experience gained from designing and implementing a system of PSPI's for different chemical manufacturing operations  
*C J Beale – Ciba Expert Services, Macclesfield*

10:30 Coffee – Poster viewing/exhibition

- 11:00 Determining process safety performance indicators for major accident hazards using site process hazard information  
*J Fearnley, S Nair – Aker Solutions, Stockton-on-Tees*
- 11:30 Safety performance indicators in the explosives sector  
*C Sugden, N Healey – Health and Safety Laboratory, Buxton*  
*K Howard, P Rushton – Health and Safety Executive, Bootle*
- 12:00 Assessing the impact of ageing safety critical elements in offshore installations and how the ageing processes impact the role of SCEs to act as barriers to major accidents  
*E Terry – Sauf Consulting*  
*K Hart – Energy Institute*  
*J Sharp – University of Cranfield*  
*J Wintle, S Smith – TWI*  
*D Galbraith – Sigma Offshore*  
*G Ersdal – Petroleum Safety Authority Norway*
- 12:30 Question and answer session to the panel of authors

Or

### Parallel session 8 – Compliance with standards

#### Chair – M I Essa – Health and Safety Executive

- 09:00 Lessons from re-licensing major hazard facilities in Victoria, Australia  
*G Cooke – Worksafe Victoria, Australia*
- 09:30 Area classification of natural gas installations  
*R Santon, M Ivings – Health and Safety Laboratory, Buxton*
- 10:00 Implementing EU industrial safety legislation in Central and Eastern Europe  
*P Swords – PM Group, Dublin*
- 10:30 Coffee – Poster viewing/exhibition
- 11:00 Cultural hazards: Thoughts and experience to guide integration of corporate EHS standards in China and other countries  
*N Gardener – Elementis*
- 11.30 High flash point liquids: are they outside ATEX?  
*N Allen – Chilworth Technology, Southampton*
- 12:00 Occupied buildings: building on our past improvements  
*J Coates – UK Chemical Industries Association, London*  
*K Patterson – Yule Catto & Co, Harlow*
- 12:30 The preparation of a set of process safety procedures for a global chemical company  
*M Brown – Huntsman*

Or

### Parallel session 9 – Risk assessment and analysis

#### Chair – M Hoyle – AstraZeneca

- 09:00 SIL determination and problems with the application of LOPA  
*A King – ABB Engineering Services, Billingham*

- 09:30 A tool to estimate the failure rates of cross-country pipelines  
*G Pettitt – Sotera Risk Solutions*  
*B Morgan – Morgan Safety Solutions*
- 10:00 Application of LOPA and SIL assessment to a new COMAH installation  
*J Mullins – Abbott Risk Consulting, Manchester*
- 10:30 Coffee – Poster viewing/exhibition
- 11:00 New UK pipeline risk assessment codes, PD 8010 part 3 and IGEN TD/2  
*R McConnell – United Kingdom Onshore Pipeline Operators Association*  
*J Haswell – Pipeline Integrity Engineers, Newcastle upon Tyne*  
*N Jackson – National Grid, Warwick*  
*G Goodfellow – Penspen, Newcastle upon Tyne*
- 11:30 Correcting the predictions by Baker-Strehlow-Tang (BST) model for the ground effect  
*Y Xu, D Worthington, A Oke – DNV Software, London*
- 12:00 Towards large eddy simulation of LNG pool fires  
*J Wen, Z Chen, S Dembele – Faculty of Engineering, Kingston University, London*
- 12:30 Towards a computational fluid dynamics methodology for studies of large-scale LNG releases  
*J Melheim, M Ichard – Gexcon AS, Bergen, Norway*  
*M Pontiggia – Politecnico di Milano, Milan, Italy*
- 13:05 Lunch – Poster viewing/exhibition

## 14:00 – 17:30 Four parallel sessions (Sessions 10, 11, 12 and 13)

### Parallel session 10 – Safe process design (continued)

#### Chair – Dr S R Beattie – Syngenta, Huddersfield

- 14:00 Flame arrestors for plants handling acetylene and ethylene oxide  
*D Long – Protego UK, Lichfield*  
*T Heidermann – Braunschweiger Flammenfilter*
- 14:30 Inherently safer design – case study – rapid blow down  
*A Lyon, A Bird – DNV Energy*  
*V Edwards – bpTT, Trinidad and Tobago*
- 15:00 Mitigation of the lightning hazard for above-ground hydrocarbon storage tanks  
*S Haigh, P Leichauer – Cobham Technical Services, Abingdon*  
*M Scanlon – Energy Institute, London*  
*B Burrows – Brian Burrows Lightning Consultancies*
- 15:30 Tea – Poster viewing/exhibition
- 16:00 Taking the control system for granted – ensuring the integrity of sub-SIL instrumented functions  
*P Lucas, J Walkington, T Atkinson – ABB Engineering Services*
- 16:30 Mist fires and explosions – an incident survey  
*R Santon – Health and Safety Laboratory, Buxton*
- 17:00 Development and evaluation of experimental calorimetric systems for the simulation of an external heat input on reactive chemicals and monomers  
*L Vechot, L Cusco, J Hare – Health and Safety Laboratory, Buxton*  
*M Bishopp – Health and Safety Executive, Edinburgh*

Or

### Parallel session 11 – Emerging energy technologies

#### Chair – T Clayton – Environment Agency

- 14:00      What is the overall global lifecycle cost of a project in terms of SHE?  
*F Crawley – Dept of process and chemical engineering, University of Strathclyde*
- 14:30      A comparison of hazard and risks for carbon dioxide and natural gas pipelines  
*J Wilday, A McGillivray, M Wardman – Health and Safety Laboratory, Buxton*  
*P Harper – Health and Safety Executive, Bootle*
- 15:00      Towards minimising hazards in hydrogen and fuel cell stationary applications: key findings of modelling and experimental work in the HYPER project  
*S Brennan – HySAFER Centre, University of Ulster*  
(Together with 21 other researchers from nine Institutions)
- 15:30      Tea – Poster viewing/exhibition
- 16:00      CO<sub>2</sub> pipeline systems: assessment of the risks and health & safety regulations  
*I Chrysostomidis, T Geyer – Environmental Resources Management, London*  
*A Smith – ERM Southwest, Houston, Texas, US*  
*J Fedorowick – ERM Northeast (US) & Canada, Toronto, Ontario, Canada*  
*M Bohm, E Beynon – Suncor Energy, Calgary, Alberta, Canada*  
*C Little – BP Alternative Energy – CCS Technology, Houston, Texas, US*  
*A Lee – Chevron Corporation, San Ramon, California, US*
- 16:30      Investigations into the effects of carbon dioxide and nitrogen on the flammability limits of gas mixtures  
*A Thyer, J Kay, S Gant – Health and Safety Laboratory, Buxton*  
*S Connolly – Health and Safety Executive, Bootle*
- 17:00      CO<sub>2</sub> pipelines material and safety considerations  
*H Mahgerefteh, S Brown – Dept of chemical engineering, University College, London*  
*M Bilio – Offshore Safety Division, HID, HSE, Bootle*  
*M Fairweather – School of process, environmental and materials engineering, University of Leeds*

Or

### Parallel session 12 – Human factors and behaviour

#### Chair – H Conlin – Pegasus Consulting Support

- 14:00      Looking across industries to improve human reliability data for quantitative risk analyses  
*R Schneider – The Center for Chemical Process Safety, AIChE, New York, US*
- 14:30      A practical application of "human-hazop" for critical procedures  
*G Ellis – ABB Engineering Services, Warrington*  
*A Holt – Chemtura Manufacturing UK, Trafford Park, Manchester*
- 15:00      A human factors approach to managing competency in handling process control disturbances  
*D Embrey – Human Reliability Associates, Wigan*
- 15:30      Tea – Poster viewing/exhibition
- 16:00      Development of a process safety climate tool  
*C Butler, C Lekka, C Sugden – Health and Safety Laboratory, Buxton*

- 16:30 Maintaining a strong safety culture in a COMAH development facility with rapid changeover  
*S Harding, S Whittingham, B Fox, C Blyth – AstraZeneca, Macclesfield*
- 17:00 Equipping the next generation – risk management training  
*P Ackroyd – Greenstreet Berman, Reading*  
*S Wisniewski – Wizard Associates*  
*N Eden – AstraZeneca*  
*K Williams – Syngenta Int.*  
*G Gibson – Magnox Generation*

Or

### Parallel session 13 – Risk assessment and analysis (continued)

Chair – Dr I F McConvey, AstraZeneca

- 14:00 Retrospective hazard identification and assessment of ageing plant  
*M McBride – Centrica, Windsor, Berks*  
*C Marsh – Centrica Storage, Hedon, E.Yorks*  
*I Herbert – ABB Engineering Services, Warrington*  
*C Robinson – Vectra Group, Solihull*
- 14:30 A semantic approach for incident database development  
*R Batres – Toyohashi University of Technology, Japan*  
*Y Shimada – National Institute of Occupational Safety and Health, Japan*  
*T Fuchino – Tokyo Institute of Technology, Japan*
- 15:00 Comparison of the subsurface migration of LPG and natural gas  
*R Bettis, J Fletcher – Health and Safety Laboratory, Buxton*
- 15:30 Tea – Poster viewing/exhibition
- 16:00 Recent developments in the use of societal risk assessment for land use planning for UK non-nuclear, on-shore major hazard installations.  
*K O'Donnell – Health and Safety Executive, HID, Bootle*
- 16:30 Interpretation of overpressure markers and directional indicators in full-scale deflagrations and detonations  
*G Atkinson, L Cusco – Health and Safety Laboratory, Buxton*  
*D Painter – Health and Safety Executive, Bootle*  
*V Tam – BP Exploration & Production Technology Group, Sunbury-on-Thames*
- 17:00 Using predictive risk assessments to develop user-friendly tools for on- and off-site emergency planning  
*J Fearnley, S Nair – Aker Solutions, Stockton-on-Tees*

### Symposium dinner – Midland Hotel

18:30 for 19:00 in the Trafford Suite

After dinner speakers:

*Judith Hackitt CBE, chair – Health and Safety Executive*

*Dr John Field, process group director – Vectra Group*

Presentation of the Frank Lees Medal for Safety and Loss Prevention



# Thursday 12 November

08:30 Registration, coffee and exhibition

## 09:00–13:00 Three parallel sessions (Sessions 14, 15 and 16)

### Parallel session 14 – Human factors and behaviour (continued)

#### Chair – Dr G Sellers – Consultant

- 09:00 Links in the chain – a new paradigm for thinking about safety  
*D Irvine – Epiphanies LLP, Alton, Hampshire*  
*G Sibbick – Centrica Storage, Hedon, East Yorks*
- 09:30 The human elements of a nuclear incident  
*K Hemmings – Sellafield*
- 10:00 Process safety fundamentals training for first level leaders  
*U Bruyere – BP International, Sunbury-on-Thames*  
*M Fox – Kineo, Brighton*  
*C Watson – Watson Integrity, Linlithgow*
- 10:30 Coffee – Poster viewing/exhibition
- 11:00 To err is human – a case study of error prevention in process isolations  
*R Lardner – The Keil Centre, Edinburgh*  
*J Maitland – BP Exploration and Production*
- 11:30 Safety culture; cornerstone of the nuclear safety case  
*R Cullen – Pöyry Energy, Warrington*
- 12:00 Human error analysis at a refinery  
*J Gould, S Lovell – Environmental Resources Management, Manchester*
- 12:30 Human failure in the assessment of major hazard risk: A case study for the human factors safety critical task analysis (HFSCTA) methodology  
*E Butterworth – Human Engineering*  
*S Murphy – Syngenta*

Or

### Parallel session 15 – Safety management (continued)

#### Chair – C J Beale – Ciba Expert Services

- 09:00 Delivery of a global control of work system  
*R Morgan – BP Lubricants, Swindon*  
*M Carter – RAP International, Swansea*
- 09:30 Safety in the oil and gas industries in Qatar  
*S Waldram, T Olewski – Texas A & M University Qatar, Doha, Qatar*  
*M Mannan – Mary Kay O'Connor Process Safety Center, Texas A&M University System, US*
- 10:00 Implementing improvements in process safety in Corus  
*A Ormond – ABB Engineering Services*  
*M de Klerk – Corus*
- 10:30 Coffee – Poster viewing/exhibition

- 11:00 Corrosion management offshore – resolving the problems and complying with the law  
*A Duncan – Offshore Division, Health and Safety Executive*
- 11:30 Managing fire and explosion hazards on offshore ageing installations  
*J Wilday, J Hare, T Holmes, P Walsh – Health and Safety Laboratory, Buxton*  
*S Connolly – Offshore Division, Health and Safety Executive, Bootle*
- 12:00 Consideration of the effectiveness of the safety management system in QRA calculations  
*A Acikalin – BAM Federal Institute for Material Research and Testing, Berlin*

Or

### Parallel session 16 – Risk assessment and analysis (continued)

#### Chair – Dr M A Persaud – Shell Global Solutions

- 09:00 Modelling the dispersion of spills in buildings  
*S Puttick – Syngenta, Huddersfield*
- 09:30 Two-phase jet releases and droplet dispersion: scaled and large-scale experiments, droplet-size correlation development and model validation  
*H Witlox, M Harper, A Oke – DNV Software, London*  
*P Bowen, P Kay – Cardiff University*  
*D Jamois, C Proust – INERIS, France*
- 10:00 Real time follow up of leaks and dispersion accidents  
*S Tripathi, M Leguellec, L Ait Hamou, C Souprayen – Fluidyn*
- 10:30 Coffee – Poster viewing/exhibition
- 11:00 Numerical study of large-scale hydrogen explosions and detonation  
*V Tam – BP Exploration & Production Technology Group, Sunbury-on-Thames*  
*V Madhav Rao, A Heidari, J Wen – Faculty of Engineering, Kingston University, London*
- 11:30 Leak frequency modelling for offshore QRA based on the hydrocarbon release database  
*B Bain – DNV Energy UK*  
*A Falck – DNV Energy Norway*  
*L Rødsætre – StatoilHydro ASA, Norway*
- 12:00 A software model for assessing fatality risk from explosion hazards using the multi energy method and Baker Strehlow Tang approach  
*N Cavanagh, Y Xu, D Worthington – DNV Software, London*
- 12:30 Quantifying the tolerability of potential ignition sources from uncertified mechanical equipment installed in hazardous areas  
*S Sherwen – ABB Engineering Services, Warrington*
- 13:05 Lunch – Poster viewing/exhibition

## Plenary session 17

### Chair –R F Evans – Consultant

- 14:00    *A technical analysis of the Buncefield explosion and fire*  
*M Mannan – Mary Kay O'Connor Process Safety Center, Artie McFerrin dept. of chemical engineering, Texas A&M University System, US*
- 14:30    *ICL Plastics: the lessons from the tragedy*  
*A Tyldesley – Haztech Consultants, Winsford*
- 15:00    *ICL Plastics investigation, Glasgow, May 2004*  
*S Hawksworth, D Pritchard, J Hodges, R Parrot, G White, T Mellor – Health and Safety Laboratory, Buxton*
- 15:30    *A tribute to John Bond*  
*M Considine – BP, Sunbury-on-Thames*
- 15:50    *Close of symposium*

To see this programme in electronic format, complete with embedded synopses for all papers, go to the symposium website <http://www.icheme.org/hazardsxxi>

# Poster presentations

*Please note that the programme may be subject to alteration*

These will be displayed throughout the symposium in Conference Rooms 4/4A

1. **Practical process safety management in chemical manufacturing**  
*A Fowler – HFL Risk Services, Manchester*  
*I Walker, R Wall – Nufarm, Bradford*
2. **Chemical reaction hazards of distillation processes**  
*G Arthur, M Luginbuehl, C Williams – Syngenta, Huddersfield*
3. **Good safety – a cost to the business or a positive benefit to the bottom line?**  
*C Lakin – Artenius UK*
4. **Safety feedback – the real thing**  
*S Kovacs – INCDPM, Bucharest, Romania*
5. **Improving the understanding of process safety management**  
*R Turney – Consultant*  
*I Thorpe – IChemE*
6. **Risk assessment for major hazards and project evaluation – assessing thermal risks in subsea production operations**  
*P Ellerton, C Chauvet – Prospect UK*
7. **Risk management in the operations of a subsea pipeline**  
*G.McIntosh – iicorr, Aberdeen*
8. **The assessment of major accident risks in Tallinn, Estonia**  
*P Tint, Õ Paas, M Järvis – Tallinn University of Technology, Estonia*
9. **Inherently safer design activities over the past decade**  
*P Amyotte – Dept of process engineering and applied science, Dalhousie University, Nova Scotia, Canada*  
*T Kletz – University of Loughborough*  
*F Kahn – Memorial University, St John's, Newfoundland, Canada*

# General information

## Location

Situated centrally in mainland UK, Manchester has a population of 2.5m and is one of the largest economic regions outside London.

The city has recently undergone one of the most ambitious urban regeneration projects ever undertaken in Britain and innovative new buildings have won the acclaim of architects world-wide.

Excellent transport links connect Manchester with the UK and Europe. Manchester Airport, sited only 20 minutes from the city centre, serves over 200 worldwide destinations directly and offers flights from 22 British and Irish destinations. London is only two hours away by train.

## Venue

The Manchester Conference Centre enjoys a privileged position only minutes away from Manchester Piccadilly Station with its 15-minute rail shuttle to the airport, just eight miles away, making the Centre ideally placed for meetings in Manchester.

As well as being conveniently situated in Manchester city centre, the Manchester Conference Centre is a compact self-contained site and there is a multi-storey car park adjacent to the venue.

## Accommodation

Rooms are currently available in the Weston Building (in which the Conference is being held), and at the IBIS Hotel, Charles St, which is close to the Weston Building.

Delegates must make their own arrangements directly with either the Manchester Conference Centre, or the IBIS hotel, and should do so early to secure this convenient accommodation, as availability is limited.

### Weston Building

Hotel standard room

Single occupancy £78.50 per night

Double occupancy £88.45 per night

Inclusive of VAT, and full English breakfast

Enquiries and bookings/reservations should be directed to:-

The Manchester Conference Centre, Weston Building,  
Sackville Street, Manchester, M1 3BB

Tel: +44 (0)161 955 8062 Fax: +44 (0)161 955 8050

Email: [clarea@days-mcc.co.uk](mailto:clarea@days-mcc.co.uk)

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### Ibis Hotel

Hotel standard room £59.00 per night  
Inclusive of VAT. Buffet breakfast £5.50 each.

Booking reservations should be sent directly to:  
IBIS Hotel, Charles Street, Manchester, M1 7DL

Tel: +44 (0)161 272 5000 Fax: +44 (0)161 272 5010  
Email: [H3143@accor.com](mailto:H3143@accor.com)

## How to get to Manchester

**By air:** Manchester's international airport serves over 200 overseas destinations and most of the world's major airlines – including nearly every major intercontinental and European scheduled carrier. Manchester has become a major hub for low-cost airlines, reducing the cost of hundreds of short haul routes to continental Europe.

The average flight time to Manchester from Europe is 1–3 hours.

**By train:** Most major cities in the UK have direct train services into Manchester. Virgin Trains now runs a fleet of high speed trains which sees journey times between Manchester and London of just over two hours.

**By road:** Manchester's ring road connects Manchester to motorways north, south, east and west.

## Documentation

All delegates who are fully registered to attend the conference will be issued with an electronic copy of the manuscripts and posters. All presentations given at the conference will be available (subject to the author's permission) on the conference website after the conference.

## Sponsorship and exhibition

A large number of prestigious companies have already taken up sponsorship opportunities for the event, but there are still a limited number of opportunities available. Alternatively, you could take exhibition space to take advantage of the unique opportunity to promote your products to the key names in the process safety field in Europe.

If you would like to receive further information on the remaining sponsorship opportunities or exhibition space, contact:

Technical manager: MJ Adams

Tel/Fax: +44 (0)1539 732845,

Email: [mikeadams@rawgreen.fsworld.co.uk](mailto:mikeadams@rawgreen.fsworld.co.uk)

## Social programme

**Welcome reception:** To welcome you to the conference, on the evening of Tuesday 10 November delegates are invited to attend a welcome reception sponsored by ABB Engineering Services, which will take place in Weston Room 1 commencing at 18:00. The reception will include a selection of drinks and canapes. There is no charge for this event, please indicate on the registration form if you wish to attend.

**Conference dinner:** A conference dinner will take place on the evening of Wednesday 11 November at the Midland Hotel. The evening will start at 18:30 with pre-dinner drinks followed by a three course dinner with wine. Vectra Group is sponsoring the pre dinner-drinks and wine during the meal. The cost of the dinner will be £35.00+ VAT per person. Please indicate on the registration form if you wish to attend.

# Registration Fees

## Workshops Monday 9 November 2009

### Workshop 1: "Safety instrumented systems: You've talked the talk, are you walking the walk"

Free of charge to attend

### Workshop 2: "Equipment and procedures that cannot do what we want them to do"

£75.00 + VAT = £86.25

### Workshop 3: "Reactive chemicals"

£75.00 + VAT = £86.25

### Workshop 4: "Classification, labelling and packaging (CLP): What's changed and what you need to know"

£65.00 + VAT = £74.75

Book direct with workshop organiser: Alex Heys, Tel: +44 (0)1928 515678, please indicate on the registration that you are attending this workshop and have booked direct with the organiser.

### Workshop 5: "How to carry out human factors risk assessments in COMAH"

£75.00 + VAT = £86.25

Book direct with workshop organiser: Jamie Henderson Tel: +44 (0)1928 515677, please indicate on the registration that you are attending this workshop and have booked direct with the organiser.

## Symposium Registration Fees

### Member of IChemE

3 days £699.00 + VAT = £803.85

### Sponsoring organisation

2 days £599.00 + VAT = £688.85

1 day £325.00 + VAT = £373.75

### Non Members

(includes Affiliate membership  
IChemE for all of 2010)

3 days £799.00 + VAT = £918.85

2 days £699.00 + VAT = £803.85

1 day £365.00 + VAT = £419.75

### Corporate attendance

A 15% discount is applicable for 2 or more delegates from the same organisation when registered at the same time.

### Full time undergraduate student

(Proof of study required)

£50.00 + VAT = £57.50

### Presenting author (Member)

3 days £374.00 + VAT = £430.10

2 days £274.00 + VAT = £315.10

Free on day of presentation

### Presenting author (non member)

(includes Affiliate membership  
IChemE for all of 2010)

3 days £434.00 + VAT = £499.10

2 days £334.00 + VAT = £384.10

Free on day of presentation

# Registration form

**Please return this form with your remittance to:  
Accounts department, IChemE, Davis Building, Railway Terrace, Rugby CV21 3HQ, UK  
Tel: +44 (0)1788 578214 Fax: +44 (0)1788 460833**

I am a member of IChemE:  Yes  No Membership number: .....

I am a member of a co-sponsoring organisation  Yes  No

Co-sponsoring/organisation name: .....

Last name: ..... First name: .....

Preferred name on badge: .....

Title (Dr/Mr/Miss/Mrs/Ms/ Prof/Eur Ing): ..... Gender:  Male  Female

Work details – company: .....

Job title: ..... Department: .....

Country: ..... Post/zip code: .....

Address: .....

Town/city: ..... County/state: .....

Direct telephone: ..... Direct fax: .....

Email: .....

Special dietary requirements: .....

## Symposium and workshop registration fees

Workshops on Monday 9 November 2009

- Workshop 1** – " Safety instrumented systems: You've talked the talk are you walking the walk?"  
by ABB Engineering Services – FREE of charge
- Workshop 2** – "Equipment and procedures that cannot do what we want them to do" by Trevor Kletz  
£75 + VAT = £86.25
- Workshop 3** – "Reactive chemicals" by Kevin Dixon-Jackson, Ciba Expert Services. £75 + VAT = £86.25
- Workshop 4** – "Classification, labelling and packaging (CLP): What's changed and what you need to know"  
by Chemicals North West and The REACH Centre. To book contact Alex Heys on  
Tel: +44 (0)1928 515678, Fax +44 (0)1928 515677 Email: alex.heys@chemicalsnorthwest.org.uk
- Workshop 5** – "How to carry out human factors risk assessments in COMAH" To book contact  
Jamie Henderson on Tel: +44 (0)1257 463121 Email: henderson@humanreliability.com

## I wish to register for the following days: (Please tick the relevant boxes)

- Monday 9 November  Tuesday 10 November  
 Wednesday 11 November  Thursday 12 November

\* PLEASE NOTE – The fees for 3-day delegates and authors already include the cost of the Symposium dinner on Wednesday 11 November.

- I wish to attend the symposium dinner (11 November) as an optional extra of £35.00 + vat = £40.25  
 I will require a vegetarian meal

Any special dietary requirements .....

- I plan to attend the FREE reception and buffet on Tuesday 10 November

# Registration form

## Parallel sessions

As seen in the programme, there will be parallel symposium sessions for part of Tuesday and Thursday, and all day Wednesday. In order to assist with the room allocation, please indicate which sessions you plan to attend.

**Tuesday 10 November** after lunch

Session 2  Session 3  Session 4  Session 5

**Wednesday 11 November**

Morning Sessions: Session 6  Session 7  Session 8  Session 9

Afternoon Sessions: Session 10  Session 11  Session 12  Session 13

**Thursday 12th November** before Lunch:

Session 14  Session 15  Session 16

Author

Free on day of presentation

## Method of payment

(Payment must be received in full before the event date otherwise admission cannot be guaranteed). All fees shown in sterling + VAT @15% is applicable.

Your booking will be confirmed by IChemE on receipt of one of the following:

- Official purchase order
- Cleared funds

Please debit my credit/debit card:

Cardholder name (as it appears on the card): .....

Billing address (if different from overleaf): .....

.....

Post/Zip code: .....

Mastercard  Visa  Visa debit/delta  Maestro  Amex  Debit Mastercard

Card number:

Valid from date:   /   Expiry date:   /   Issue number:

Security code

Card holder's signature: .....

Card holder's telephone number: .....

Cheque enclosed (made payable to Institution of Chemical Engineers)

Please invoice my company quoting purchase order number ..... (attach copy)

Please note that registration cannot be processed unless a copy of your purchase order is received with your registration form. If your company does not use purchase order numbers, please attach a formal request to invoice on your company's letterhead.

## Cancellation policy

Cancellations received in writing 28 days prior to the event will be subject to an administration charge of 10% of the fees + VAT. No refunds will be given for non-attendance or cancellations received less than 28 days prior to the event. Substitutions will be welcome at any time. We reserve the right to cancel or alter the programme.

## Please send or fax this completed form with remittance to:

Accounts department, IChemE, Davis Building, Railway Terrace, Rugby CV21 3HQ

Late registration on/after Monday 2 November can be accepted by telephone/fax: +44 (0)1788 578214/560833

## Data protection

In accordance with the Data Protection Act, IChemE (and companies processing data on its behalf) will hold and use the data contained on this form for administration purposes, to keep you informed of its activities and offer goods and services provided by the Institution.

If you would prefer not to receive IChemE product and service literature please mark the box.

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