Lessons learned

Paper 01 Learning from dangerous occurrences in the chemical industries .....1
John Hare, Richard Goff & Justin Holroyd (HSL, UK)

Paper 02 Guidance on learning from incidents, accidents and events .....11
Edward Smith & Richard Roels (DNV GL, UK), Stuart King (Energy Institute, UK)

Paper 03 What can we learn from the various non-technical accident causation theories? .....22
Kehinde Shaba (DNV GL, UK)

Paper 04 Learning lessons from eight gas explosions .....29
Simon-Mark Egan (Solvay, France)

Safety culture I

Paper 05 Making the practical side of process safety management work for you .....41
Rod Prior (SHEXcellence, South Africa)

Paper 06 The contribution of fatigue and shift-work to the Buncefield explosion and key lessons for the chemical and allied high hazard industries .....53
John Wilkinson (The Keil Centre, UK), Julie Bell (HSL, UK)

Paper 07 An analysis of safety culture across international societies, and the implications for corporate management systems – a Bulgaria plant case study .....59
John Huckstepp & Khalida Suleymanova (ARMSA Consulting, UK)

Paper 08 Whistleblowing – avoiding the hazards .....71
Keith Plumb (Integral Pharma Services Ltd, UK), Cathy James (Public Concern at Work, UK)

Consequence assessment

Paper 09 QRA method for land-use planning around natural gas production, processing and transportation sites in the Netherlands .....84
Eelke Kooi, Gerald Lacheij & Paul Uijt de Haag (RIVM, the Netherlands)

Paper 10 Consequence assessment for weapon impacts on process plant .....95
Colin Rettie, Matthew Vickers & Douglas McKechnie (Abbott Risk Consulting Ltd, UK)

Paper 11 A review of damages observed after catastrophic events experienced in the mid-stream gas industry compared to consequences modelling tools .....107
Karim Osman, Baptiste Geniaut, Nicolas Herchin & Vincent Blanchetiere (GDF SUEZ, France)

Paper 12 The importance of testing in developing consequence and vulnerability models to support personnel risk calculations and to quantify potential risk mitigation .....119
Karen Vilas & Rob Magraw (BakerRisk, UK)

Hazard & risk I

Paper 13 Laser-based gas detection technology and dispersion modeling used to eliminate false alarms and improve safety performance on Terra Nova FPSO .....129
Rajat Barua (Senscient Inc, USA), Edward Sharpe & Zona Bath (Suncor Energy Inc, USA), Are Bratteteig (Gexcon, USA)

Paper 14 Vision 20/20 implementation tools .....148
Jack McCavit (CCPS, USA), Cheryl Grounds (BP, USA)

Paper 15 Managing the hazards of flare disposal systems .....158
Paul Denham (GMS Technical Safety Ltd, UK), Alan Donnelly (Donnelly Process Engineering Ltd, UK)

Paper 16 Improved visualisations of offshore QRAs .....170
James Pickles & Brian Bain (DNV GL, UK)

Human factors

Paper 17 Understanding precursors to major accident hazard events using safety critical task analysis .....181
George Petrie (Consultant, UK), Ann Rosbrook (Total E&P UK)

Paper 18 Applying human factors engineering to control room upgrade projects and to the design of new build control rooms .....191
Janette Edmonds (The Keil Centre, UK)

Paper 19 Why human error matters more than non-compliance in the major hazard sector .....199
John Wilkinson (The Keil Centre, UK)

Fire & explosion

Paper 20 The influence of explosion relief vent layouts on explosion overpressures in large biomass storage vessels .....209
Rohan Samaraweera, Chris Coffey, Dave Price & Prankul Middha (GexCon UK Ltd, UK)

Paper 21 Influence of solvent admixture on explosibility of a pharmaceutical powder at laboratory and industrial scale .....217
Md Nur Hossain & Paul Amyotte (Dalhousie University, Canada), Faisal Khan (Memorial University, Canada)

Paper 22 EI15 4th edition, improvements and application .....229
Steve Sherwen (ABB, UK)

CO2 hazards

Paper 23 Prediction of the consequences of a CO2 pipeline release on building occupants .....235
C.J. Lyons (Newcastle University, UK), J.M. Race (University of Strathclyde, UK), H.F. Hopkins (Pipeline Integrity Engineers Ltd, UK), P. Cleaver (DNV GL, UK)

Paper 24 Discharge and dispersion for CO2 releases from a long pipe: experimental data and data review .....246
Hamish Holt, Jock Brown, Henk W.M. Witlox, Keith Armstrong & Dan Allason (DNV GL, UK)

Paper 25 Modelling releases of carbon dioxide from buried pipelines .....258
Phil Cleaver, Ann Halford & Tim Coates (DNV GL, UK), Harry Hopkins (Pipeline Integrity Engineers (PIE) Limited, UK), Julian Barnett (National Grid, UK)

Asset integrity

Paper 26 Creeping changes .....272
Richard Goff, Jill Wilday & Justin Holroyd (HSL, UK)

Paper 27 Data trending to support Aging and Life Extension (ALE) in the United Kingdom Continental Shelf (UKCS) oil and gas industry .....283
Colin Chambers (HSL, UK), Howard Harte (HSE, UK)

Paper 28 Risks associated with caissons on ageing offshore facilities .....292
Michael Johnson & Paul Murray (DNV GL, UK), Peter Joyce, Sumeet Pabby & Innes Lawtie (BG Group, UK)

Hazard & Risk II

Paper 29 Human dependency in tanker offloading operations .....299
Graeme Ellis (ABB Consulting, UK)

Paper 30 An investigation into chemical tanker offloading and loading processes – do they protect against the full range of predicted human error types? .....305
Paul Lucas (ABB Consulting, UK)

Paper 31 Using HAZOP to address the problem of repeated plant accidents: delayed coker units .....314
Alfredo Verna (Arthur D. Little, UK), Sonny Clark (Amec Foster Wheeler, USA), Geoff Stevens (Risk Simulation, UK)

Safety culture II

Paper 32 High reliability organising and mindful leadership .....324
Nadine Mellor, Jill Wilday, Jennifer Lunt & Justin Holroyd (HSL, UK)

Paper 33 Inherent safety – it's common sense, now for common practice! .....330
David Edwards, John Foster, Daniel Linwood, Mark McBride-Wright & Peter Russell (Granherne Ltd, UK)

Paper 34 Organisational amnesia – is there a cure? .....344
Jonathan Berman & Michael Wright (Greenstreet Berman Ltd, UK)
LNG

Paper 35  Large scale pressurised LNG BLEVE experiments .....353
Steven Betteridge & Lee Phillips (Shell Research Ltd, UK)

Paper 36  Explosion risks at small scale LNG sites .....365
Graham Atkinson & Jacqueline Patel (HSL, UK), Edmund Cowpe & David Painter (HSE, UK)

Paper 37  Improvement of modelling of LNG pool fires on water .....383
Karim Osman, Sabrina Belkaid, Nicolas Herchin & Vincent Blanchetiere (GDF SUEZ, France)

Process safety management

Paper 38  Bottom-line benefits through innovation in process safety KPI management .....396
Martin Sedgwick (Scottish Power, UK), Alec Harley (Lockheed Martin, UK)

Paper 39  Creating an effective bowtie barrier based process safety management system (and how to avoid getting tied up in knots in the process) .....405
Ian Baulch-Jones & Paul McCulloch (EON, UK)

Paper 40  Internal auditing of process safety .....416
Lee Allford (EPSC, UK)

Legislation & standards

Paper 41  The evolution of process safety standards and legislation following landmark events – what have we learnt? .....423
Trish Kerin (ICHEME Safety Centre, Australia)

Paper 42  Seveso III – the public participation challenge .....429
Pat Swords (PM Group, Ireland)

Paper 43  COMAH 2015: classification issues in determining whether establishments are in scope .....442
Maria Mallafre Garcia, Susan Fraser & Jill Wilday (HSL, UK)

Paper 44  6007-32-1 The new standard on avoidance of electrostatic hazards .....447
Jeremy Smallwood (Electrostatic Solutions Ltd., UK)

Environmental protection

Paper 45  Lesson learned from the coastal flooding of process industry sites on Teesside and Humberside by the storm surge on 5–6 December 2013 .....459
Aidan Whitfield & Chris Dickinson (Environment Agency, UK), Mike Cook & Paul Jobling (Inter Terminals, UK), Daren Smith (SABIC UK Petrochemicals Ltd., UK), Paul Fletcher (CEMEX, UK)

Paper 46  The drinking water crisis in West Virginia – a process safety failure and a lesson for the chemical industry .....471
John S. Bresland (Safety Risk Assessment LLC, USA), Evan Hansen (Downstream Strategies, USA), Andrew Whelton (Purdue University, USA)

Paper 47  New environmental risk assessment guidance for COMAH facilities: Effective application of an integrated risk management approach .....480
Katy Baker, Wendy Owen, Benjamin Raine & Sarah Grainger (Arcadis, UK)

Paper 48  Cost effective approaches to industrial noise control .....486
Nathan Thomas (Xodus Group, UK), Kenneth Dibben (University of Southampton, UK)

Chemical reaction hazards

Paper 49  Fire protection concept for the storage of pyrophoric materials .....494
Armin Heyn (Bayer Technology Services GmbH, Germany)

Paper 50  Screening protocol to identify potentially explosive compounds in early stage development .....508
Christopher Tickner, Paul Gillespie & Mark Hoyle (AstraZeneca, UK)

Paper 51  Analyzing phenol-formaldehyde resin reactions for safe process scale-up .....520
David Dale (SciMed/Fauske and Associates, UK)

Paper 52  Liquid hydrogen cyanide polymerisation hazards .....526
Craig Williams & Niklas Schwarz (Syngenta, UK)
**Hazard & risk III**

**Paper 53**  
Flare gas recovery – a consideration of the benefits and issues associated with sizing, installation and selection of the most appropriate technology .....538  
Peter Angwin & Stuart Leitch (*Amec Foster Wheeler, UK*)

**Paper 54**  
Functional safety management in greenfield offshore projects .....547  
Jasjeet Singh (*DNV GL, UK*)

**Paper 55**  
Suppression of overpressure during a vapor cloud explosion – a new approach .....558  
Norbert Baron (*Process Safety Consulting, Germany*), Chris Buchwald (*ExxonMobil Research and Engineering, USA*)

**Paper 56**  
How many process safety engineers does it take to change a light bulb culture? .....568  
Mike Broadribb & Stephen Wheeler (*Baker Engineering and Risk Consultants, Inc., USA*)

**Education & training**

**Paper 57**  
Best practice approaches to retrospective HAZOPs .....580  
Graeme Laughland (*ABB Consulting, UK*)

**Paper 58**  
Engaging the workforce – communicating major accident hazards – making a difference! .....587  
Fiona FitzGerald, Brian Bain, Hamish Holt, Jelena Borisevic & Lisa Tang (*DNV GL, UK*)

**Paper 59**  
Chemical process safety education: Joint industry-academic venture .....599  
Pat Kennedy & Noel Duffy (*Cork Institute of Technology, Ireland*), Shane Horgan & Michael Lynch (*Pfizer Ireland Pharmaceutical, Ireland*)

**Pipelines**

**Paper 60**  
Development of a risk based asset management tool for gas transmission pipelines .....607  
M. Acton, K. Dimitriadis, T. Manns & S. Martin (*DNV GL, UK*), D McCollum & S. Potts (*National Grid, UK*)

**Paper 61**  
Pipeline failure rate calculation using PIPIN .....615  
Zoe Chaplin (*HSL, UK*)

**Paper 62**  
Development of a fault tree approach for quantifying the effectiveness of protective measures for underground pipelines .....626  
M Acton & M Rogers (*DNV GL, UK*), M Lecchi (*GDF SUEZ, France*), G Pognonec (*GRTgaz, France*)

**Fire & explosion II**

**Paper 63**  
Dispersion modelling for explosion risk analysis .....639  
Tim Jones (*MMI Engineering, UK*)

**Paper 64**  
The effect of the transient stages of an accidental release on gas cloud formation .....652  
T. Coates & C.G. Robinson (*DNV GL, UK*)

**Paper 65**  
Characteristics of elongated vapor cloud explosions .....661  
Jihui Geng, Kelly Thomas & Quentin Baker (*Baker Engineering and Risk Consultants, USA*)

**Alarms**

**Paper 66**  
Measuring the human response to alarms .....672  
Tony Atkinson (*ABB Consulting, UK*)

**Paper 67**  
LOPA: friend or foe? .....682  
Alan King (*ABB Consulting, UK*)

**Paper 68**  
Development of an alarm analysis process for use within the process industries .....694  
Neil Hunter, Jamie Henderson & David Embrey (*Human Reliability Associates Ltd., UK*)

**Posters**

**Poster 01**  
MORE FLOW!! What HAZOPs need to know about flow assurance and process control dynamics .....700  
John Evans, Laurent Gazeaud and John Gill (*g3baxi Partnership, UK*)

**Poster 02**  
A model evaluation protocol for Computational Fluid Dynamics (CFD) models used in safety
analyses for hydrogen and fuel cell technologies .....709
S. Coldrick & A. Kelsey (HSL, UK), B. Chernyavskiy, D. Makarov & V. Molkov (Ulster University, UK), D. Baraldi & D. Melideo (European Commission Joint Research Centre, the Netherlands), S.G. Giannissi, I.C. Tolias & A.G. Venetsanos (National Center for Scientific Research Demokritos, Greece)

Poster 03 Demonstrating management competence in process safety .....720
Sarah Grindrod & Julian Hought (HFL Consulting, Ltd., UK), Deborah Grubbe (Operations and Safety Solutions, USA)

Poster 04 Review of source term modelling for hydrocarbon releases using process dynamic simulation .....728
Conor Crowley & Mrudhul Raj (Atkins Limited, UK), Andrew Ross (University of Edinburgh, UK)

Poster 05 A practicable approach to environmental risk assessment for sites with multiple hazards.....738
Harvey T. Dearden (Time Domain Solutions Ltd., UK)

Poster 06 Hazards and operability study of the chemical injection system of the UK Pressurised Reactor .....742
Mersiha Rozic (Electricité de France – Generation and Engineering Branch, France)

Poster 07 Gas detection in process industry, the practical approach .....754
Murtaza Gandhi, Jef Rowley, Derek Nelson & Casey Campbell (Baker Engineering and Risk Consultants, Inc., USA)

Poster 08 Lessons learned from practical implementation of CDOIF environmental risk tolerability guideline for COMAH establishments .....762
Fiona Parsons (ABB Ltd, UK)

Poster 09 CFD modelling of leak of liquid CO$_2$ from high pressure containments and subsequent atmospheric dispersion .....771
Anjaneyulu Lankadasu (Fluidyn Consultancy (P) Ltd, India), Amita Tripathi (Fluidyn France, France), Samuel Saysset & Angeles Yackow (GDF Suez, France), Bruno De La Roussiere (Entrepose Contracting, France)

Poster 10 A unified 3D CFD model for jet and pool fires .....783
Chenthil Kumar K & Anil Kumar K. R. (Fluidyn Consultancy (P) Ltd, India), Amita Tripathi (Fluidyn France, France)

Poster 11 Impact of water content in hydrocarbons using consequence modelling .....798
Emoshoriamhe Erua (Process Safety Engineer, UK)

Poster 12 Legislation and compliance including Seveso III .....809
Barbora Kubascikova (Bureau Veritas, UK)

Poster 13 Guidelines for simulating cryogenic film boiling using volume of fluid (VOF) method .....814
Monir Ahammad, Yi Liu, Samina Rahmani & Sam Mannan (Texas A&M University, USA), Tomasz Olewski & Luc Véchot (Texas A&M University at Qatar, Doha)

Poster 14 Performance Indicators as monitoring tool for PSM .....824
Mohamed Elbanhawy (Methanex corporation, Egypt)

Poster 15 Walk To Work (W2W) – helping to enhance safety and extend the economic life of offshore infrastructure .....835
Hamish Holt, Chris Walker & Mike Simms (DNV GL, UK)

Poster 16 HSE design reviews and action close-out .....837
Simon Round (Amec Foster Wheeler, UK)

Poster 17 Modelling of Transition and Nucleate Boiling of Liquid Nitrogen Spill on Concrete .....843
Syed Quraishy, Asma Sadia, Tomasz Olewski & Luc Véchot (Texas A&M University, Qatar)

Poster 18 Understanding Process Safety Culture Disease Pathologies - How to Prevent, Mitigate and Recover from Safety Culture Accidents .....857
Steve Arendt (ABS Group, US), Mark Manton (ABS Group, UK)

Poster 19 How to Ensure Sustainable Process Safety Performance – Strategies for Managing, Maintaining, and Improving PSM Systems .....876
Steve Arendt (ABS Group, US), Mark Manton (ABS Group, UK)