

SAFETY & LOSS  
PREVENTION  
SUBJECT GROUP

# S & LP S G *Newsletter*

ISSUE 6

SPRING 1996

## *A PLEA FROM THE EDITOR*

As I write this in early January 1996 the weather is cold and grey and Spring is but a distant thought. The winter lethargy must have gripped you, our readers, who are also our potential contributors. If I say that I have not exactly been deluged with articles full of your wit and wisdom then a Civil Servant could correctly accuse me of being "economical with the truth."

An editor can only edit what he/she receives, so please keep the meeting reports, notes, book/software

reviews, accident case studies, brain teasers, etc. flowing.

The Newsletter is now also on the IChemE home page.

The address is:  
<http://www.icheme.chemeng.ed.ac.uk>.

Items for inclusion in the Summer Newsletter should reach me by 15th July 1996.

*With best wishes for 1996.*

*Simon Waldram  
- S & LP Newsletter editor*

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## **REVIEW OF THE S & LP SG "HAZOP WORKSHOP"**

On 15th September 1995 the IChemE S & LP SG ran a HAZOP workshop, held at Zeneca Pharmaceuticals, Alderley Edge. The aim was to meet and discuss the problems associated with HAZOP, to extract views on current practice and to discuss application of the HAZOP technique. Most of the delegates were experienced in the application of HAZOPs and had previously received appropriate training. The day was structured with formal presentations in the morning followed by workshop sessions in the afternoon to discuss chosen topics. These were selected via an electronic voting system. Syndicates discussed their subjects and then presented their conclusions to the whole meeting for further debate. There was a follow-up questionnaire to highlight the consensus on current issues and to

identify changes of delegates views as a consequence of attending the workshop. The general findings of the workshop underlined the importance of the role of auditing and the necessity of an experienced HAZOP team. Views were also expressed on how best to record HAZOPs. A summary of the general conclusions of the workshop should by now have appeared in the 22nd February 1996 issue of the Chemical Engineer. A more detailed report is due for publication in the IChemE Loss Prevention Bulletin and there is also a delegates workshop pack held by the IChemE Library and Information Service.

*Simon Turner,  
Foster Wheeler Energy Ltd,  
Workshop Chairman and Organiser*

### **S & LP SG ACTIVITIES – "IN THE PIPELINE"**

- |               |   |
|---------------|---|
| 26 March 1996 | Risk Assessment and Tolerability, BP Sunbury            |
| 14 May 1996   | Computer Software for Safety, University College London |
| June 1996     | Safety Implications of Fluids Separation Processes      |
| ?             | Case Studies Day  |
| ?             | Inherent Safety Workshop                                |
| ?             | Crisis Management                                       |
| ?             | Corporate Liability                                     |
| January 1997  | Importance of following up Safety Recommendations       |

Any expressions of interest in organising, presenting or participating will be welcomed.  
Please contact: Dr A G Rushton, Secretary, S & LP SG

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## **REVIEW OF THE S & LP SG MEETING: “RISKS ASSOCIATED WITH THE TRANSPORTATION OF HAZARDOUS CHEMICALS”**

In opening the meeting Hedley Jenkins observed that, although the magnitude of the hazards associated with chemical manufacturing might be greater, the management of the risks associated with the transportation of raw materials and products is often more difficult. This contention was supported by Nigel Riley who, in describing how the HSE were further exploiting QRA to assess alternative modes of transport and their interactions, noted that the competence of the driver/crew is typically of more significance than the quality of the vehicle/vessel. Both Peter Zeeuwen and Alan Robinson cautioned that undue reliance on materials classification could result in complacency. Chilworth have found a number of instances where blind application of classification criteria to solids would seriously understate their vapour evolution and dust explosion hazard potential. Burgoynes had identified inappropriate mixed cargo arrangements as the cause of a number of marine incidents where classification guidelines

had apparently been correctly applied. Colin Gibbs and Howard Crowther described the PC package developed by BP Chemicals to assess the relative risk associated with cargo movements. Mark Semple demonstrated how this tool could be used to adjust both transport mode and routings to minimise risk.

Mehdi Laftavi reminded the meeting that a mariner is invariably better at dealing with the hazards of the sea than those of his vessel's cargo. He should be provided with sufficient training to deal with chemical cargo emergencies. In some instances when C-MIST had been called in to assist, not only had no training been provided but no information on characteristics of the materials was available.

Chemical manufacturers who have signed up to Responsible Care need to consider if they are paying sufficient attention to the transportation of their products.

*Hedley Jenkins,  
BP Chemicals Ltd, Meeting organiser.*

## **ENVIRONMENTAL PROTECTION & PROCESS SAFETY**

A couple of months ago I received information on this monthly journal, formerly "Safety, Environmental Protection, and Analysis." It is being produced jointly by the Royal Society of Chemistry and DECHEMA and monitors over 500 journals and many more worldwide sources. The 1996 annual subscription is £132/DM 370/\$244. It will also be available on line and via CD-ROM

as part of the Chemical Engineering and Biotechnology Abstracts database.

Has anybody been receiving this publication? Is it good value for money? How about writing a review of it for the next Newsletter? Are better alternatives available?

*Simon Waldram  
Newsletter Editor*

**BREThERICK'S HANDBOOK OF  
REACTIVE CHEMICAL HAZARDS  
5TH EDITION, EDITED BY PETER URBEN,  
COURTAULDS.**

**BUTTERWORTH HEINEMANN**

A few scientific text books and references become so important and widely accepted that their titles need no longer be referred to. Thus Perry, The Rubber Handbook and Sax are all convenient handles for books with longer names. Bretherick belongs to this distinguished group of publications.

From its origins in 1975 this new 5th Edition has grown to a 2 volume, 2100 page format with hardback, (ISBN 0 7506 1557 5, £150), CD ROM (ISBN 0 7506 2140 0, £395) and 3 1/2" floppy disk (ISBN 0 7506 2141 9, £395) versions. There is no VAT in the UK but elsewhere within the EEC (e.g. in Denmark) you may have to pay VAT up to 25%. For the software versions you will require an IBM compatible PC with at least a 386 processor running at 25 MHz. Ideally you should have PC-DOS version 5 or later, Microsoft Windows 3.1 or later and Microsoft Extensions 2.1 or later. You will probably want 8 Mb of RAM and up to 20 Mb of free hard disk space for the floppy version.

Volume 1 is devoted to specific information on the stability of the listed compounds, or the reactivity of mixtures of two, or more, of them under various circumstances. Each chemical is

classified on the basis of similarities in structure or reactivity and these groups are listed alphabetically in volume 2.

If you are concerned with developing or scaling up process chemistry in an academic or industrial environment then you must have this reference to hand. Even if you think your operations will involve only mixing or blending then use Bretherick to help identify any reaction hazards which may be present. You can't be serious about identifying reaction hazards unless you have it.

For more complete reviews, see many of the popular, and academic, journals covering chemistry and chemical engineering.

Am I alone in being surprised and disappointed at the high price of the CD ROM and floppy disc versions? Marginal production costs must be tiny compared with the hard copy form. A more enlightened publishing policy might be to make software versions available at a much reduced cost to those who have already purchased the printed form?

*Simon Waldram  
Newsletter Editor*

**CONTENTS OF ISSUE 126, DECEMBER 1995, OF THE LOSS PREVENTION BULLETIN**

<b>EDITORIAL</b>	<b>2</b>	<b>EFFECTIVE HAZOP STUDIES</b>	<b>19</b>
<b>ACRYLIC ACID RUNAWAY</b>	<b>3</b>	Allen Ormond joins the debate on the effectiveness and value of the Hazop technique.	
A large fire in a German chemical plant is described, followed by a general discussion on precautions for handling and using acrylic acid		<b>FORTHCOMING EVENTS</b>	<b>21</b>
<b>RAILCAR ACCIDENT INVOLVING VINYL CHLORIDE MONOMER</b>	<b>7</b>	<b>NEW PUBLICATIONS</b>	<b>23</b>
A summary of a report into an incident involving the rail transport of VCM in Canada is used to provide some more general lessons on the transport of hazardous chemicals.			
<b>EXPLOSION OF SUBSTATION DUE TO INADEQUATELY TIGHTENED PUMP SEAL</b>	<b>10</b>		
A short account of an explosion of liquefied natural gas vapours which found a way into a transformer substation with devastating effects.			
<b>VANDALISM AND SITE SAFETY</b>	<b>11</b>		
Discussion of the possible implications vandalism has to site safety and the measures which can be taken to minimise the problem.			
<b>OIL MILL EXPLOSION</b>	<b>15</b>		
Most unusual plant design, coupled with a set of 'classical' failures of procedure lead to a large hexane explosion in a soya bean processing plant.			
<b>CATASTROPHIC FAILURE OF A LIQUID CARBON DIOXIDE STORAGE VESSEL - RECORD OF FAILURES</b>	<b>18</b>		
A table of past CO2 vessel failures is provided as a supplement to the article in Loss Prevention Bulletin 125.			

The provisional content for issue 127 of the Loss Prevention Bulletin will have a "pipeline focus" and is listed below.

- Liquid natural gas pipeline rupture and fire
- Natural gas compressor station explosion
- Propane pipeline rupture and fire
- More about bellows
- A tale of two tanks
- Fault tree analysis of a chlorine vessel

# ***BRAIN TEASERS, PAST AND PRESENT:***

## ***PAST:***

Our last brain teaser was entitled “Relief Dilemma” and received not a single reply. Too trivial or too confusing? It is reprinted below:

A pressure vessel to contain about 10 tonnes of LPG is being designed by Simple Simon (No relation to the editor!) He would like to increase the margin of safety by being able to reduce the pressure inside the vessel if the relieving pressure is reached during a fire.

Simple Simon thinks this can be done easily by using a relief line but still approaches his colleague, Tim Dim, for guidance on the pressure reduction measures he might employ. Tim Dim says “Pressure reduction for a fire engulfed pressure vessel cannot be achieved. The LPG will be boiling when the relief valve lifts so it does not need any more heat to vaporise it. If you try to reduce the pressure, vapour will keep flashing off and you will not be able to reduce the pressure until the fire stops or all the LPG has been removed.”

Simple Simon could not resolve his problem because he was unsure of his facts but still thinks he should be able to reduce the pressure once the relief valve lifts.

Who is right, and why?

## ***ANSWER:***

Continual venting of LPG vapour will cool the liquid LPG as this must supply the required latent heat of vaporisation. Thus the liquid LPG temperature (and hence vapour pressure) will fall. In parallel with this the fire will be heating the vessel and hence the contents. Whether the vessel pressure (and temperature) actually fall in practice will depend on the relative magnitude of these heating and cooling effects with a larger relief line being more likely to effect the desired pressure reduction.

## ***PRESENT:***

Maybe you have had enough of safety matters so here are two problems unrelated to safety. As usual the prize of free attendance at one of our subject group meetings goes to the most lucid/brief/entertaining and correct answers to both questions: the Editor’s decision is final .

- i) If  $i$  is the square root of  $-1$  then what is the  $i$ th root of  $i$ ?
- ii) The year 1961 was called topsy turvey because it looked the same upside down. 1991 was the last palindromic year. What is the next year which is both topsy turvey and palindromic?

**SCHEDULE OF MEETINGS/COURSES ON SAFETY RELATED TOPICS**

<b>Topic/Title</b>	<b>Date/ Duration</b>	<b>Venue</b>	<b>Contact Person/ Phone/Fax/Address</b>
Fire safety legislation	21/02/96, 1 day	London	The School of Business & Industrial Management Tel: 01233 622101 Fax: 01233 611771
Successful project risk management	26/02/96, 2 days	London	Hawksmere plc Tel: 0171-824 8257 Fax: 0171-730 4293
Hazard and operability studies	26/02/96, 3 days	Lancashire	Liz Massey, AEA Technology Tel: 01925 254345 Fax: 01925 254569
Safety & Health at work exhibition	27/02/96, 2 days	Olympia 2 London	Paramount exhibitions & conferences Tel: 0181-207 5599 Fax: 0181-207 2598
An introduction to risk management	28/02/96, 1 day	London	May Husseyin, Training Administrator, LPC Tel: 0181-207 2345 Fax: 0181-236 9701
2nd World Seminar on the explosion phenomenon and on the application of explosion protection techniques in practice	04/03/96, 5 days	Gent, Belgium	EuropEx events Tel: 00-32-3-458 2948 Fax: 00-32-3-458 2902
Explorisk 96 – International exhibition on explosion safety and related risk control	05/03/96, 3 days	Gent, Belgium	EuropEx events Tel: 00-32-3-458 2948 Fax: 00-32-3-458 2902
Applied fault tree analysis	11/03/96, 3 days	Lancashire	Liz Massey, AEA Technology Tel: 01925 254345 Fax: 01925 254569
Successful emergency management	19/03/96, 4 days	Derby	Katrina Williamson, Link Associates Tel: 01332 677 229 Fax: 01332 679 609
Safety of electrical equipment	19/03/96, 3 days	Bromley	Sira Test & Certification Ltd Tel: 0181-467 2636 Fax: 0181-467 7258
Risk Management	22/03/96, 1 day	Royal Automobile Club, London	School of Business & Industrial Management Tel: 01233 622101 Fax: 01233 611771

**SCHEDULE OF MEETINGS/COURSES ON SAFETY RELATED TOPICS**

<b>Topic/Title</b>	<b>Date/ Duration</b>	<b>Venue</b>	<b>Contact Person/ Phone/Fax/Address</b>
Human reliability analysis	25/03/96, 3 days	Lancashire	Liz Massey, AEA Technology Tel: 01925 254345 Fax: 01925 254569
Hazardous Area Classification	26/03/96, 1 day	Bromley Court Hotel, Kent	Sira Test & Certification Ltd Tel: 0181-467 2636 Fax: 0181-295 3005
Risk Assessment and Tolerability	26/03/96, 1 day	BP, Sunbury	Dr A G Rushton, S & LP SG Secretary Tel: 01509 222 505 Fax: 01509 231 746
Hazardous Area Technology – Static Electricity	27/03/96, 1 day	Bromley Court Hotel, Kent	Sira Test & Certification Ltd Tel: 0181-467 2636 Fax: 0181-295 3005
1996 Process Plant Safety Symposium	01/04/96, 2 days	Sheraton Astrodome Hotel, Texas, USA	Mr Stan Rubashkin, GDS Engineers Inc, Tel: 001-713 860 4881 Fax: 001-713 860 4095
Hazardous Area Technology – Legislation Changes	16/04/96, 1 day	Bromley Court Hotel, Kent	Sira Test & Certification Ltd Tel: 0181-467 2636 Fax: 0181-295 3005
SASMEX International 1996 – Safety at sea & marine electronics	30/04/96, 3 days	Brighton	International Trade Publications Ltd Tel: 01737 768611 Fax: 01737 760564
Insurance & Risk Management 96 Conference – Formulating & Implementing Effective Risk Management Strategies Workshop	13/05/96, 2 days	Hotel Meridien Etoile, Paris	Insurance & Risk Management - ICBI Tel: 0171 915 5103 Fax: 0171 915 5101
Health & Safety in mining & metallurgy	14/05/96, 3 days	London	Institution of Mining & Metallurgy Tel: 0171 580 3802 Fax: 0171 436 5388
Computer Software for Safety	14/05/96 1 day	University College London	Dr A G Rushton Tel: 01509 222 505 Fax: 01509 231 746
Risk Assessment	15/05/96, 1 day	Risley	Les Rawlingson Tel: 01925 838372
European Society of Risk Analysis – ESRA 96	03/06/96, 3 days	Guildford	Mrs J Libaert, University of Surrey Tel: 01483 259096 Fax: 01483 259394

**SCHEDULE OF MEETINGS/COURSES ON SAFETY RELATED TOPICS**

<b>Topic/Title</b>	<b>Date/ Duration</b>	<b>Venue</b>	<b>Contact Person/ Phone/Fax/Address</b>
Flammable & toxic gas – hazards & detection	04/06/96, 2 days	Bromley	Sira Test & Certification Ltd Tel: 0181-467 2636 Fax: 0181-467 7258
Successful emergency management	18/06/96, 4 days	Derby	Katrina Williamson, Link Associates Tel: 01332 677 229 Fax: 01332 679 609
Hazardous area overview	26/06/96, 1 day	Bromley	Sira Test & Certification Ltd Tel: 0181-467 2636 Fax: 0181-467 7258
Intrinsic safety certification guide for manufacturers	27/06/96, 1 day	Bromley	Sira Test & Certification Ltd Tel: 0181-467 2636 Fax: 0181-467 7258
Auditing – calibration & testing	03/09/96, 1 day	Bromley	Sira Test & Certification Ltd Tel: 0181-467 2636 Fax: 0181-467 7258
25th International Congress on Occupational Health (ICOH)	15/09/96, 6 days	Stockholm	ICOH Congress, National Institute of Occupational Safety Tel: 00-46 8 820556 Fax: same
Safety of electrical equipment	01/10/96, 3 days	Bromley	Sira Test & Certification Ltd Tel: 0181-467 2636 Fax: 0181-467 7258
International conference & workshop on process safety management & inherently safer processes	08/10/96, 4 days	Orlando, USA	Mr S Schreiber, CCPS Tel: 001-1-212 705 7727 Fax: 001-1-212 838 8274
Hazardous Area Classification	08/10/96 1 day	Bromley Court Hotel, Kent	Sira Test & Certification Ltd Tel: 0181-467 2636 Fax: 0181-295 3005
Hazardous Area Technology – Legislation Changes	09/10/96, 1 day	Bromley Court Hotel, Kent	Sira Test & Certification Ltd Tel: 0181-467 2636 Fax: 0181-295 3005
Hazardous Area Technology – Static Electricity	22/10/96, 1 day	Bromley Court Hotel, Kent	Sira Test & Certification Ltd Tel: 0181-467 2636 Fax: 0181-295 3005
Flammable & toxic gas – hazards & detection	04/12/96, 2 days	Bromley	Sira Test & Certification Ltd Tel: 0181-467 2636 Fax: 0181-467 7258

## **BACK PAGE COMMENT**

*In January 1996 Dr Jasbir Singh moved to New Jersey as President of Hazard Evaluation Laboratories Inc. He has agreed to provide a regular view from across the water and here is his first in the form of our "back page comment."*

### **"LETTER FROM AMERICA"**

(with apologies to Alistair Cooke)

Even after only a few short trips to the USA last year and now three weeks in the new job, similarities and differences between the Loss Prevention scenes in the USA and Europe are becoming apparent. The striking similarity is the major role that some professional bodies play. (IChemE in the UK and AIChE in the USA). Just as the Royal Society of Chemistry (RSC) plays little active role in the UK, so too the American Chemical Society (ACS) is not a major player. The AIChE promotes safety issues in a number of ways including dedicated sessions at its regional and national meetings, continuing education courses and major national and international symposia. The Centre for Chemical Process Safety (CCPS), essentially a "Subject Group" of the AIChE formed after the Bhopal accident in 1985, promotes research and debate but is probably better known for the "Guideline" publications which it has produced over the years. Another AIChE related group that has had an international impact is DIERS (Design Institute for Emergency Relief Systems), originally a research group sponsored by multi-nationals, but now an active and vibrant users group which promotes and extends the DIERS technology.

Although the AIChE is committed to the promotion of safety it does not play an active role in formal accreditation of departments. Perhaps as a result of this, safety does not feature prominently in undergraduate chemical engineering courses. So for most engineers safety essentials are learned "on the job." (Or not, as the case may be, Ed!)

On a lighter note, the communications revolution is further developed in the USA than the UK, but not with entirely satisfactory consequences. Answering messages on telephones are everywhere and making human contact is almost impossible. There is a set-up that is particularly favoured by government agencies and utility companies, namely to offer you a list of numbered options once you get through. You punch in appropriate digits with the impression that you are homing in on your quarry and continue this for several minutes only to find that the final options do not satisfy your needs. This means that you are unable to make an appointment to see the person you need to speak to despite the fact that earlier recordings have stressed that you need to make an appointment by phone to see the person in question! Maybe the UK can learn from this and retain the human touch? Is this simply a method of operation which telephone companies promote so as to maximise income?

My thoughts end there. I must return to shovelling snow from the driveway.

*Dr Jasbir Singh,  
President, Hazard Evaluation Laboratories Inc*