

S & L P S G Newsletter

ISSUE 11

SPRING 1999

FROM THE EDITOR:

S&LP SG Committee Offices will be vacant in May 1999 and elections will be held at the 26 May 1999 Committee Meeting at Gayfere Street, London, at the same time as election of Committee members. Nominations for Officers and Committee members to be advised to Subject Groups Officer prior to the meeting. The vacancies are:

**Chairman • Secretary • Treasurer
Newsletter Editor**

On a different matter, the Accident Database, co-ordinated by John Bond is seeking people to help in abstracting accident reports for the database. If you are interested in this important work, please contact the institution.

Lucy Johnson, January 1999

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Newsletter

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MANAGING THE RISKS ARISING FROM HUMAN ERROR – AN INTEGRATED APPROACH

It is widely accepted that human error constitutes one of the major sources of risk in the chemical industry. However, it is not an area that always receives significant attention. A major reason for this neglect is that there is a belief amongst many engineers and managers that human error is both inevitable and unpredictable. However, human error is only inevitable if people are placed in situations that emphasise human weaknesses and that do not support human strengths. In addition, tools and techniques have been developed and applied in the chemical industry to predict and prevent human error.

A common belief is that increasing automation of process plants will make the human unnecessary. However, numerous accidents have occurred in computer controlled plants and considerable human involvement will always be required in the critical areas of maintenance and plant modification.

The traditional view of human error is that such errors are due to factors under the control of the individual worker; for example, negligence, a lack of commitment to working safely or a failure to follow rules or procedures. From such a perspective, it is considered that people can avoid making errors by choosing to behave 'correctly'. Since this view of errors perceives them to be partly deliberate, they attract blame and sanction, or the demand to 'be more careful next time!' However, this approach clearly has fundamental problems, because it fails to recognise that many of the

underlying causes of error are outside the control of the individual worker. For example, impractical procedures, poor design of process information or inadequate training systems are all as much the responsibility of the organisation as the individual worker. A 'blame culture' that focuses solely on the individual causes of errors does not encourage the reporting of other incidents or near misses. Fundamental failures in management policy are therefore likely to remain unaddressed and resources may be squandered on ineffective initiatives. Therefore, similar or more serious incidents are likely to occur.

Human Reliability Associates are advocates of what has become known as the Systems Approach to human failures. A central principle of this approach is the need to consider the organisational factors that create the preconditions for errors, as well as their immediate causes. This perspective incorporates the crucial concept of Performance Influencing Factors (PIFs). These are characteristics of people, tasks and organisations that influence human performance and therefore the likelihood of human error.

Some PIFs are at the operational level, such as training, availability of procedures and the quality of process information displays. These will directly influence the probability of errors occurring. PIFs at the management level, such as policies for training and procedures, will determine the quality of operational PIFs, which in turn

have an effect on the likelihood of errors. Importantly, inadequacies at the management level have the potential to influence a number of operational situations.

Evaluating and improving PIFs is a primary approach for maximising human reliability and reducing errors. When all of the PIFs relevant to a particular situation are optimal, then error likelihood will be minimised.

Human Reliability Associates have developed a tool that audits PIFs to identify problem areas giving rise to increased error potential. In addition to this proactive approach to error reduction, PIFs can also be assessed in incident investigation through a systematic framework for evaluating the direct and organisational factors contributing to an incident.

This approach to the assessment of PIFs has been used successfully by non-specialists in field studies world-wide to identify human factors deficiencies and generate workable strategies for improvement. The close involvement of the workforce in the application of the tools has encouraged a culture of ownership, reducing perceptions that the approach is a 'quick fix'. The adoption of such an approach by industry to improve human performance will produce continued benefits to plant and personnel in the areas of safety, quality, and production.

*Martin Anderson,
Human Reliability Associates*

**LONDON,
MARCH 16 – 19TH 1999**

**MANCHESTER,
MAY 18-21ST 1999**

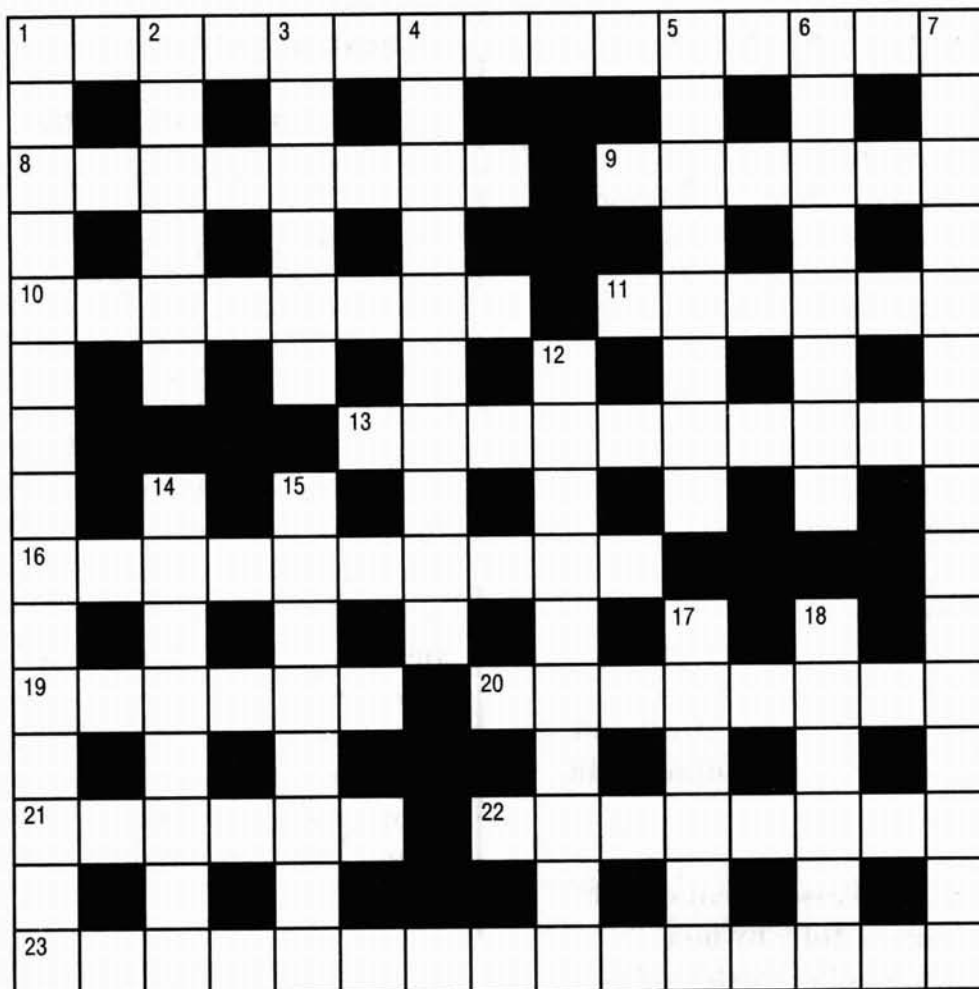
**“MANAGING THE RISKS ARISING
FROM HUMAN ERROR”**

Human error is widely acknowledged as the major source of quality, production and safety risks in many industries. This training course is designed to give engineers and managers an introduction to the tools and techniques available for managing the risks arising from human error. The course uses a combination of lectures, videos and workshops together with real life case studies to provide a comprehensive introduction to this important topic.

Human Reliability Associates (HRA) are an international consulting company specialising in the human aspects of systems. For the past 17 years the company has provided consultancy, research and training services to over 100 companies in a range of industries such as rail and marine transport, chemical processing, aviation, offshore oil production and power generation.

HRA wrote the definitive text “Guidelines for Preventing Human Error in Process Safety” for the IChemE.

CROSSWORD PUZZLE No. 2



ACROSS

1. Response to a prison breakout? (7, 8)
8. Mid-blues are purified. (8)
9. With soda it's a short bread making ingredient. (6)
10. Formless pickling agent is volatile and smelly. (8)
11. Three-quarters of e.g. St. Peter's is of sandstone. (6)
13. Even a covenanter can breach the rules. (10)
16. Underground activity in the gulag. (4, 6)
19. The gums produce mother's spasm. (6)
20. Does American spelling stick in English throats? (8)
21. Loops the loop with nothing in front end of aircraft. (6)
22. A hookah is still part of the Middle East scene. (8)
23. Steve's fatty veal pie won't pass the inspection. (6, 5, 4)

DOWN

1. Take a chance on some wartime Nazis in your capital. (4, 11)
2. What's wrong with adulterated wine? (6)
3. It's said you have to hang around for an atomic one. (6)
4. Give way over the sharp end to get things moving. (5, 5)
5. If a church service is thus censorious an explosion is 15. (8)
6. Supposes they are fully developed butterflies. (8)
7. Is 2. responsible for this kind of incident? (2, 5, 8)
12. Stop fidgeting – you'll come to a grinding halt. (10)
14. Be the final astronaut to leave earth. (5, 3)
15. See 5. (8)
17. Helium, sulphur, rhenium and phosphorus have a ball. (6)
18. A miner all at sea. (6)

Answers will appear in the next issue.

HAZOP – PAST, PRESENT AND FUTURE

It is almost inconceivable that any professional chemical engineer anywhere in the world has not heard of HAZOP.

Recently Paul Baybutt, CEO Primatch, commented that HAZOP is most likely the pre-eminent technique globally for Process Hazards Analysis (PHA as defined in the US OSHA PSM regulations).

What is interesting is that the IEC (International Electrotechnical Committee) have decided to better define HAZOP by way of one of their international standards (IEC 61882), currently in draft and due for ratification later this year and possible issue in 2000. As such it will also command an identical British Standard (BS) – a British Standard for HAZOP produced outside of the process industries.

I am grateful to Trevor Kletz and Ellis Knowlton (TCE Jan and Dec) ex ICI HAZOP giants on whose shoulders, along with Barry Gibson, John Gillett, Jeremy Illidge, and generations of their tutelage, I now find myself standing, for reminding us that it was indeed ICI who both invented and innovated HAZOP in the 1960s and 70s and gave it with the help of the CIA and IChemE to the world.

Countless ICI led courses (the famous two-weeker) and others spread the HAZOP antibody around the world in the 70s and 80s and by the 90s not only were the process industries immune, so were several other industries including medical, aerospace, defence, electronics (hence the IEC connection) and even the railways.

Much of the early history is captured in Trevor Kletz's excellent work 'HAZOP and HAZAN'. Countless other articles and books have also been written including an update on ICI's position ("25 years of HAZOP, J. Loss

Prevention) confirming HAZOP is active and well and still evolving.

So why all the interest?

Unfortunately HAZOP's success and strength has also become its failing and weakness. It is in danger of becoming a generic and as such abused and misleading eg

"let's do a mini-HAZOP"

"we do HAZOP1 and HAZOP2 before full line by line HAZOP"

"is CHAZOP a computer HAZOP?"

"yes, it's been thoroughly HAZOPed"

and more ...

So what is a HAZOP? How would you recognise one, how could you tell how thoroughly it had been done. How are the best HAZOPs conducted? How should leaders be trained and accredited?

For the process industries in Europe, the best known guidance is still arguably the 1977 CIA Booklet, and its translation and adaptation into other languages. Twenty years on this guidance is recognised by both the Chemical Industries Association (CIA), IChemE, and the European Process Safety Centre (EPSC) and others of needing rewriting for the next Millennium.

There are of course other excellent handbooks on HAZOP including Ellis Knowlton's 1992 'A Manual of Hazard Operability Studies' and from the same year CCPS's 'Guidelines for Hazard Evaluation Procedures'.

The intersection between the process and computer/electronic industries becomes increasingly evident in the burgeoning use of programmable electronic systems (PES)

in many aspects of process plant operation and the IEC standards IEC 61508 and IEC 61511 for PES's have been well heralded. The proposed IEC 61882 standard for HAZOP is in support of these, presumably not intended to constrain the inventors, innovators and adapters of the methodology in its process industry development and application.

To test the "HAZOP Standard" or not question, a workshop was arranged by Andy Rushton and held at Loughborough University in June 1998, the findings of which have been recorded earlier by Brian Tyler in S&LP news. This encouraged a two prong strategy:

- 1) to support EPSC in their proposed benchmark of HAZOP best practice across their members in the European process industries.
- 2) to take the findings of this and link with CIA, IChemE and EPSC in the reworking of the guidance booklet on HAZOP.

Things are moving apace.

The EPSC have completed their benchmark and convened a meeting chaired by Robin Turney at IChemE, London when representatives from across Europe, plus guests from HSE, CIA and IChemE, sieved the questionnaire results and refined the required contents of the new guidance. This was taken away by Brian Tyler, Frank Crawley and myself to produce a draft for comment and the final review by a core EPSC/CIA/IChemE editorial panel for publication in June 1999.

Links have been made with the IEC drafting committee to ensure this new definitive process industries HAZOP guidance will be referred to and acknowledged as representing best practice in our industry.

*Malcolm L Preston
(The views in this note
are those of the author)*

NEW SUBJECT GROUPS OFFICER

Following the departure of Carmela Lo Presti in November last year, the IChemE has appointed a new Subject Groups Officer. He is John Picken and is based in Rugby.

John's background is in administration and he has several years experience of working for professional institutions. At the Royal Institution of Chartered Surveyors, he was involved in the administration of the RICS Assessment of Professional Competence and later transferred to a policy role as Education Officer. He then moved to the Institute of Revenues, Rating and Valuation as Secretary to the Institute's Examining Board.

The main features of the SGO are likely to remain unchanged. John will be responsible for maintaining Subject Group membership lists, co-ordinating the distribution of publicity material and newsletters, acting as a point of contact for SG members with the IChemE and attending meetings of the various SGs, including the Subject Groups Forum.

If you need any further information on Subject Group activities, please contact him on tel: 01788 578214; fax: 01788 560833; e-mail jpicken@icheme.org.uk

CORE-DATA DATABASE OR HUMAN ERROR PROBABILITIES

What is CORE-DATA and why is it needed?

It is essential (as demonstrated by accidents such as Piper Alpha and Bhopal) that risk assessments include consideration of the contribution of human error to risk. Commonly, a weak link in incorporating human error into risk assessment is the probabilities that should be assigned to human actions. However, CORE-DATA is a database which contains human error probabilities. Current work on CORE-DATA is sponsored by the Health and Safety Executive. Data collection has included projects for the nuclear (3 studies), offshore (3 studies), power generation and manufacturing sectors.

Invitation to join an industry consortium for further data collection

It is recognised that if CORE-DATA is to become a widely used resource it is necessary to continue to collect data with which to expand its scope. Therefore, a consortium of relevant industry groups is being established to sponsor further data collection. Currently we have support from a number of industries (e.g. Rail and Aviation). We are particularly keen to include chemical companies in the consortium. Benefits to joining the consortium will be collection of data tailored to your specific requirements and privileged access to the data of other consortium members.

If you would like to see CORE-DATA in action, then we are carrying out demonstrations in London, Liverpool and Aberdeen in February.

For further information regarding CORE-DATA, joining the consortium, or the demonstration meetings, please contact:

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“Accidents are the invasion of the Unaware by the Unknown”

Does anyone know the origin of this quote, which is believed to be from a Greek philosopher?

I would appreciate knowledge of where it comes from. Please e-mail to:

johnbond@safety98.org

John Bond

THE SIGNIFICANCE OF RISK ASSESSMENT IN INFLUENCING RISK PERCEPTION

JOINT MEETING OF THE ICHEMÉ ENVIRONMENTAL PROTECTION AND SAFETY & LOSS PREVENTION SUBJECT GROUPS

DNV TECHNICA TRAINING CENTRE, LONDON, 18 DECEMBER 1998

Some 15 of us met at DNV Technica in London for a meeting which was vigorous and perhaps a little surprising in its discussion. There was a consensus that there was no true difference between protecting the environment and protecting human safety, only a rough divide at the plant boundary for effects that did or did not reach beyond it.

David Slater (OXERA Environmental) - spoke on "Environmental Risk Assessment" but opened up the much broader issues of communication and decision making. Beth Morgan (Genesis Consultants) - spoke on "Safety Risk Assessment" but echoed and enlarged on a number of points. Workshop groups discussed the issues arising from the talks and were chaired by Steve Billington (Entec UK Ltd) for the Environmental Subject Group and Martin Pitt (Sheffield University) for the Safety & Loss Prevention Subject Group.

A clear message was that other people may not think like we do, but they are not necessarily wrong. A parent near a major hazard site may be understandably sceptical of reassurances from an expert employed by the company. People without a scientific background do not have the same regard for numbers, but can be less naive than some risk assessors. The issue for many is not risk but

uncertainty. The public and some decision makers (typically politicians) are more averse to uncertainty than pure risk.

Communication is too often seen as the expert persuading the public to accept the risk assessment, whereas there should be more dialogue. This should give more understanding of public perception and allow genuine participation in the balance between desired benefits and tolerable risks.

An interesting point was that some risk assessment practices may just be 'going through the motions'. We carry out certain procedures because we know how to do them and so that we can say a risk assessment has been carried out. There may be occasions when time could be better spent on other things. For example an assessor may carry out a careful quantification of a known but obviously low risk with available data and procedures rather than a serious search for other less easy hazards.

I was impressed by the openness of the discussion and the way in which people were prepared to ask fundamental and self critical questions about what we are doing and why.

Martin Pitt

EUROPEAN PROCESS SAFETY CENTRE

It is around this time of year that organisations review their activities for the previous twelve months, and someone sits down to write an Annual Report. This year this task falls to me, and it gives me an opportunity to outline some of EPSC's recent activities – and also give a flavour of those planned for the year ahead – with readers of the S&LP Subject Group Newsletter. At the outset, it is clear that the work programme of EPSC has grown a great deal over the last 12–18 months, and it is also clear that there have been staff changes too – do read on!

Technical programme

1998 saw the start of the following strands of technical work for the Centre:

- *Safety decisions and safer designs – probabilistic and deterministic methods.* A new group was set up focusing on the benefits, drawbacks and commonalities between various approaches to making design decisions for safety.
- *Safety and batch processing.* This group is focusing initially on management of change issues in multi-product facilities.
- *Best practices in Hazop* – looking at best practices with a view to publishing a guide in 1999 in conjunction with IChemE and UK CIA.
- *Designing to meet specified in-plant exposure criteria.* This new group has started to look at the quantitative knowledge required to design to specified exposure criteria using typical types of equipment. This group is now planning an internal seminar on this topic for 1999.
- *Safety-related failure frequencies.* The details for a project to gather accurate population and associated failure

history data in order to establish accurate chlorine pipework failure rates have been agreed by this group. Euro Chlor has been approached, and an application for funding for this major project is being made to the UK HSE

- *Mitigation of gas dispersion.* A detailed study of the water curtain designs used across Europe for mitigation of one toxic and one flammable duty has been commissioned. An internal seminar will be held and a report circulated to members in 1999.
- *Process safety computer systems network.* This network of members and researchers is examining how computers can effectively be used in the safety field.

In addition, work was continued in the existing fields of:

- *Safety Management Systems and risk management issues*
- *Fire protection of pressurised LPG storage*
- *Incident data reporting*, with EPSC jointly organising a major seminar on *Accident databases as a management tool* with ESReDA and K-VIV in Belgium in November.

During 1998, the Centre has maintained its close involvement with – and considerable technical input to – the European Commission and its Guidelines related to the SEVESO II Directive on:

- *Inspection Systems (TWG2):* EPSC was involved with the EU seminar *Inspection systems and the examination of the safety report* in Rome on 23–25 September. Presentations were made by EPSC members at this seminar. EPSC has made two sets of

written input to the Commission on these Guidelines during 1998. Publication of the final Guidelines is expected soon.

- *Safety Reports (TWG3)*. The final *Safety Report Guidelines* were published by the Commission and were circulated.
- *Safety Management Systems (TWG4)*. The final *Safety Management Systems Guidelines* were published by the Commission in December 1998. The Guidelines include large elements of the EPSC position statement on the Major Accident Prevention Policy.
- *Land-use planning (TWG5)*. EPSC supports a representative on TWG5 and has made several inputs to the Commission. Publication of the final guidelines is expected soon.
- *Major hazards arising from pipelines*. The Commission is developing an instrument for the control of major accident hazards arising pipelines. EPSC is actively involved in making technical input to this activity.

You can also download the text of the *Safety Reports* and *Inspection Systems* EU Guidance from the recently-updated web site of the Major Accident Hazards Bureau of JRC: <http://mahbsrv.jrc.it/>

Whilst most of the work on drafting Guidelines for SEVESO II has been completed, EPSC is now planning to monitor progress with its implementation across Europe. EPSC is making input to national SEVESO II implementation conferences in the various Member States, wherever possible. We will also continue to monitor legislators to make sure that members are aware of any new proposals that might arise.

EPSC Award

1998 saw the inaugural EPSC award for contribution to the field of process safety. It was presented to Dr Stuart Duffield of

the Joint Research Centre in Italy. The award was presented in May at the EFCE Loss Prevention in the Process Industries symposium in Barcelona. This was in recognition of his work on the RELIEF computer tool which models the complex phenomena associated with emergency pressure relief.

Publications

December saw the publication of EPSC's third book. It is a major work on atmospheric dispersion, and was published on our behalf by IChemE.

Staff

It gives me great pleasure to announce that EPSC has appointed Robin Turney as our new Technical Director. Robin took up his post from 1st October 1998 from Professor Alan Duxbury, who stepped down following a long and extremely fruitful association with the Centre since its inception. Robin is probably known to many of you. He has had a long and broad career within ICI and has, for the last 14 years, specialised in process safety. Robin is an active member of IChemE and is Chairman of the IChemE Loss Prevention Panel, as well as being a member of the S&LP Subject Group. In 1997 he was appointed to the UK Health and Safety Commission to advise the UK Government on safety matters.

And finally, I have taken over the post of Manager – EPSC Operations, following a two-year stint working exclusively on the technical programme of the Centre. If you have any questions about the Centre, why not get in touch with me?

Simon Jones, 20 January 1999

Manager – EPSC Operations

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HSE PUBLISHES WORKBOOK ON CHEMICAL REACTOR RELIEF SYSTEM SIZING

The need for more information on emergency relief system sizing was identified over 20 years ago. In particular, in the US, the Design Institute for Emergency Relief Systems (DIERS) (a consortium of companies and organisations) was set up to fund research on the subject. Work has continued on a voluntary basis by both US and European DIERS Users Groups. Many papers have been published on the subject and, for those particularly interested in the subject, there is a DIERS project manual which summarises the research programme.

In spite of these many papers, and the manual, a recent HSE survey on standards of relief system design found that design engineers need more practical guidance. This was particularly the case in small and medium sized companies. In response to this need, HSE has recently published a workbook on methods available for the sizing of emergency relief systems for exothermic runaway reactions in liquid-phase chemical reactors. Written by Janet Etchells and Jill Wilday of HSE, the Workbook summarises the main hand calculation methods available and their limits of applicability. The Workbook is available from HSE as a contract research report. Further information on the Workbook is given in an article for the Chemical Engineer, dated 28 January 1999.

The Workbook is written mainly for chemical engineers or applied chemists with a good basic knowledge of chemical reaction kinetics and fluid flow. Because many companies do not wish to design a relief system themselves, the Workbook helps them ensure that the correct procedures have been followed during

relief system design. Worked examples are given to help the reader understand the application of these methods.

The Workbook is intended to be self sufficient for sizing calculations for the more straightforward applications. Decision trees direct the reader to the most appropriate method. The emphasis is on relatively simple (yet adequate) equations, rather than the more complex computer model. A number of worked examples are included. For computer models, readers are referred to the recently published CCPS "Guidelines on Pressure Relief and Effluent Handling Systems" [available from IChemE].

HSE plan to hold a Symposium in Manchester on 23 March on the Workbook. The symposium will outline the main design procedures featured in the Workbook and give the industry an opportunity to discuss its impact. Alternatives to venting will also be discussed.

Janet Etchells is a Principal Specialist Inspector in HSE's Directorate of Science and Technology. She can be contacted for further information on the issues raised in this article on tel 44 151 951 4000.

Copies of Contract Research Report 136 "Workbook for chemical reactor relief system sizing" (ISBN 07176 1389 5), priced £70.00, are available from HSE Books, PO Box 1999, Sudbury, Suffolk, CO10 6FS, tel: 01787-881165 or fax: 01787-313995. Also available from good booksellers. Details of the symposium can be obtained from Brian Kemble (tel 44 151 951 4000).

S&LP SG ACTIVITIES - 'IN THE PIPELINE'

14 April 1999

**Importance of Following up Safety
Recommendations**

One of the 20th Anniversary Meetings

Venue: Zeneca, Alderley Park

Organiser: Noel Stack/David Graham

May/June 1999

Safe Process Scale-up

Venue: TBA

Organiser: Simon Waldram

16, 17, 18 June 1999

Forum for Fire Hazard Management

Venue: Moreton in the Marsh

**Organiser: Interface with the Fire
Service College Co-ordinated by
John Atherton**

September 1999

**Guidelines for design and location of
occupied buildings in chemical plants**

Venue: TBA

Organiser: Hedley Jenkins

For information about any of these meetings, please contact the IChemE's Subject Group Officer:

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