Fundamentals of Process Safety training

Celebrating 10 years of our flagship process safety course.
In the beginning

Robin Turney was one of the originators of the Fundamentals of Process Safety training course. Here he discusses the incident that triggered the development of the course and how it came together:

Following the explosion at the Texas City refinery in 2005 which resulted in 15 deaths and 170 injuries, BP established an independent panel to review process safety at its US refinery operations, the Baker Panel. One of the panel’s ten recommendations related to the understanding of Process Safety Management:

**Recommendation # 3: Process Safety Knowledge and Expertise:**

BP should devise and implement a system to ensure that its executive management and all refinery personnel including managers, supervisors and contractors, possess an appropriate level of process knowledge and expertise.

The requirement for a sound understanding of process safety is not restricted to BP and in 2007 IChemE’s Safety & Loss Prevention Special Interest Group established a small working group to review the Institution’s training portfolio, paying attention to the above findings.

We identified courses, offered by IChemE and others, covering specific process safety elements. Attending some of these courses would go a long way towards providing a broad understanding of process safety management. However, the courses would inevitably overlap and it was unlikely a non-process safety specialist would be able to attend more than one or two courses.

This thinking led the Institution to develop a new course, Fundamentals of Process Safety. Whist initially aimed at chemical engineers it was recognised that success in process safety requires input from scientists and engineers from many different disciplines, all of whom need to appreciate the basic principles and how their contribution interacts with that of others.

The concept was shared with the Health & Safety Executive who agreed on the need and offered technical support in course development. A working party of Institution members was then formed with representatives from the following organizations; HSE, BP, Yule Cato, Ineos, GSK, Cambridge University and IChemE. I acted as chair of the working party.

After agreeing the course aims and learning outcomes – which remain largely unchanged today – we agreed to limit the course’s duration to one week, enabling as many delegates to attend as possible. Anything less than five days would not give us adequate time to cover the required syllabus.

It was considered important to provide a basic understanding of technical aspects of process safety, including ways in which the engineers’ scientific and engineering training could be applied to process safety. It was however recognized that such an understanding would, by itself, be insufficient to ensure that the knowledge was applied.

It needed to be accompanied by an understanding that most accidents are not attributable to engineers or others who are ‘bad guys’, but by those who fail to apply the necessary diligence and thought to their actions.

The best way of demonstrating this was seen to be through the detailed discussion of case studies. Those used were carefully selected to demonstrate the catastrophic consequences which can arise from failings in process safety, the different failure mechanisms involved, the importance of multiple layers of protection, interdependence and the reliance on the contribution of many people in achieving safe operations. This approach was used successfully by Trevor Kletz and was helped by the extensive library of material available from the Loss Prevention Bulletin as well as detailed material on the Texas City explosion which was made available to the Institution by BP.

We also decided that some form of assessment was important and included an end-of-course exam of approximately one-hour duration. Whilst the exam provides an important baseline, process safety is essentially a practical topic and its important that delegates continue to receive appropriate support and mentoring after the course, including if possible, an assignment.

The pilot course took place in October 2008. The course was a success and the feedback we received from delegates helped us further improve the course, simplifying some modules and expanding others.

I strongly believe that by attending the Fundamentals of Process Safety training course, together with effective Process Safety Management systems, has helped reduce the likelihood of further incidents. Ten years on, the growth of the course both in the UK and internationally, as well as the feedback from attendees, more than justifies the effort invested.

www.icheme.org/fundamentals
Going global

Rod Prior delivers the *Fundamentals of Process Safety* training course on behalf of IChemE in South Africa. Here he shares his experience of teaching the course:

I attended the IChemE Hazards process safety conference in 2009 where I saw a poster about the new IChemE course. I also spoke to Robin Turney and it was clear to me that there was a great need and potential market for a course like this in South Africa.

We decided to give it a go and we received three times as many requests to participate than we could comfortably manage for the first iteration of the training! Since then, we have delivered the course in South Africa at least twice a year.

I have delivered the course alongside Nigel Coni since 2010 and the course continues to attract delegates from throughout the region. Zambia, Namibia, Mozambique have all been well represented as well as likes of Nigeria, the Democratic Republic of Congo, Ivory Coast and Mauritania. We’ve even had delegates attend the South Africa training from as far away as Kazakhstan, a 20,000km round trip.

We typically hold the course in Boksburg and our preferred venue is on the flight path to Johannesburg’s major international airport. The main runway is no more than 2km away and the planes come over very low. On virtually every course there is a discussion about the probability of a plane crashing within 5km of an airport. Luckily, the probability is very low!

Like elsewhere in the world, we also run in-house courses. On one occasion at a local refinery, half of our attendees suddenly left the course and rushed off. The refinery had just experienced a major propane leak and needed attention. A very timely reminder of why we hold the course.

The course continues to be well received locally and is seen as essential training for those in a process safety role locally.

Did you know IChemE delivers the public *Fundamentals of Process Safety* training course every year in Australia, Malaysia, New Zealand, South Africa and the UK?

Find out more at [www.icheme.org/fundamentals](http://www.icheme.org/fundamentals)
About the course

Fundamentals of Process Safety references the six functional safety areas of IChemE’s process safety framework: knowledge and competence, engineering and design, systems and procedures, assurance, human factors and culture.

The course features a mix of interactive exercises and workshops, case studies and theory covering the core areas of a process safety framework.

Course outline

Day 1
- importance of process safety
- a model for process safety
- hazard and risk
- hazard identification and evaluation

Day 2
- consequences – toxicity and fires
- consequences – explosions
- chemical reactions
- flammable atmospheres

Day 3
- project development
- design safety
- risk assessment
- operations
- asset integrity

Day 4
- management of change
- management systems
- human factors
- leadership and culture
- process safety performance

Day 5
- multi-stage case study
- emergency response
- course review
- course assessment

Who is it for?

Fundamentals of Process Safety is aimed at process industry practitioners seeking to expand or refresh their process safety knowledge across a broad range of topics. It is also for anyone involved in the design, operation, modification or maintenance of a major hazard or other process plant. The course will also benefit engineers en-route to achieving Chartered status and anyone who would like to develop an understanding of process safety.

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Learning outcomes

- understand the key principles of process safety and its management
- understand the human, environmental and business consequences of poor process safety
- be aware of the key factors influencing the basis of process safety
- understand the hazards associated with process plant and how the risks can be controlled
- understand the key process safety requirements at each stage in the life cycle of process plant from conceptual design through to operation, maintenance and modification
- understand the interdependence and the need for overall organisation process safety management capability
- understand how to acquire further knowledge and understanding of process safety management
Working with industry employers: a case study

Alongside our public courses, IChemE regularly delivers the Fundamentals of Process Safety training course in-house for clients all over the world. In-house training allows for content to be customised to meet a company’s specific needs and feature case-studies directly applicable to the participants’ day-to-day work.

Synthomer is one of the largest chemical companies on the UK stock exchange, specialising in the production of aqueous polymers, but with a varied portfolio of other products and processes. It operates mainly in the UK and Europe but has sites across the world from the US to South East Asia.

15 years ago process safety was not embedded in Synthomer’s processes or practice (the company was then Yule Catto). The company did not have a bad accident record but, as an amalgam of different companies, in different countries with different histories, performance was variable and process knowledge even more so. A change of company leadership brought a change in emphasis: safety became a key company - and individual site - metric and a start was made on systematising the chemical process safety knowledge required for safe operation. There was also an understanding that company staff across the world needed a common knowledge of process safety and the Group SHE manager joined IChemE’s team producing the Fundamentals course.

Three Synthomer staff took part in the first public course, which was run to test how useful participants found the material. All three were positive and their feedback to IChemE helped tweak the course into essentially the form that has been used ever since. Their feedback into Synthomer helped persuade the company to adopt the course as a key element in the competency expected of operational, engineering, safety and technical management - and other appropriate staff. Since that first course several hundred staff, approximately 10% of the group’s personnel worldwide, have attended the course. This has been mostly through a tailored in-house course but a good number on public courses too. Passing the assessment at the end of the course has been an expected part of the competency suite of staff with significant process safety responsibility - a wide group of people.

Derivatives of the course have been given to both the Board, who regularly see the company’s process safety metrics, and to the senior management team who had a special day-long session on process safety. Of course, no one thing is responsible for changing a company’s attitude to anything. However, Synthomer’s current focus on process safety - embedded in the way the company operates and given equal prominence to environmental and occupational safety throughout the Group - has undoubtedly been helped by the wide understanding of process safety and by the common language of process safety the company and its staff now have. Both have been greatly facilitated by at using IChemE’s Fundamentals of Process Safety course over the last 10 years.

Some of the original attendees of the course have now been promoted to SHE Director, SHE Global Manager for Functional Solutions and many contribute to Synthomer’s annual SHE conference, as well as auditing and leading process safety at all levels throughout the company.

Want to know more about in-house training? Contact courses@iche.org

www.iche.org/fundamentals
Looking to the future

Trish Kerin is IChemE Safety Centre Director. Here she explains how IChemE ensures the course remains fit for purpose and its alignment with the ISC.

Before I joined IChemE I had sent several staff on the Fundamentals of Process Safety course in Australia. For me it was a fantastic way to build knowledge very quickly in the field of process safety, so they could go back to work and start practicing what they had learnt. The Fundamentals of Process Safety course was recognised in Australia as the premier training package for process safety, and it lived up to the hype. I saw significant growth in the staff that attended and it helped contribute to a safer environment. Fast forward to January 2014 and I had joined IChemE and had a role in bringing together all the vast process safety heritage in IChemE under one banner, the IChemE Safety Centre (ISC). That is not to say ISC controls IChemE’s process safety agenda, but it provides a unique linkage between all the work we do.

One of my first tasks was to work with the ISC partners to establish an agreed terminology that we could use to communicate with, as every company and industry has their own process safety language that they use. This led to the development of what is now called the ISC framework. The framework focuses on leadership at the heart, across six functional aspects of process safety (see ‘About the course’). The framework is not a management system, and does not seek to replace a management system, but rather is a different way to look across an organisation and communicate about safety. The concept is that these work somewhat like a chain of safety, a breakdown in any one can result in an incident, so all must be managed across the whole organisation. When the Fundamentals of Process Safety programme was reviewed and updated three years ago, it was decided to incorporate the framework, as all elements in the program fit into one or more of these elements. It also creates some consistency in communication from IChemE, as you will see all LPB articles reference the failed element in case histories, as well as forming the basis for the topics in our Hazards process safety conferences internationally. We have completed a similar exercise on our two-day Introduction to Process Safety and our one-day Process Safety Leadership and Culture training courses.

By creating this consistency on how we communicate process safety, through Fundamentals of Process Safety, Hazards and other areas, we are reinforcing key messages and helping to advance process safety.

This year we’ll be initiating another review of the course content to ensure it continues to represent good practice and current thinking. We’ll be inviting input from our course tutors and industry employers to ensure the course remains a market-leader. We will also review feedback from the hundreds of course delegates that have participated in the course since it was last updated. You’ll be able to read more about our work in The Chemical Engineer and on the IChemE website in due course.