Process Safety Academy

Training and Competence Development

DEKRA Process Safety

DEKRA

On the safe side.

The Global Learning Centre for Sustainably Improving Process Safety Competency

Excellence in Process Safety performance requires the right people, with the right skills, implementing appropriately designed Process Safety programs, motivated by the right organisational culture, in the right way.

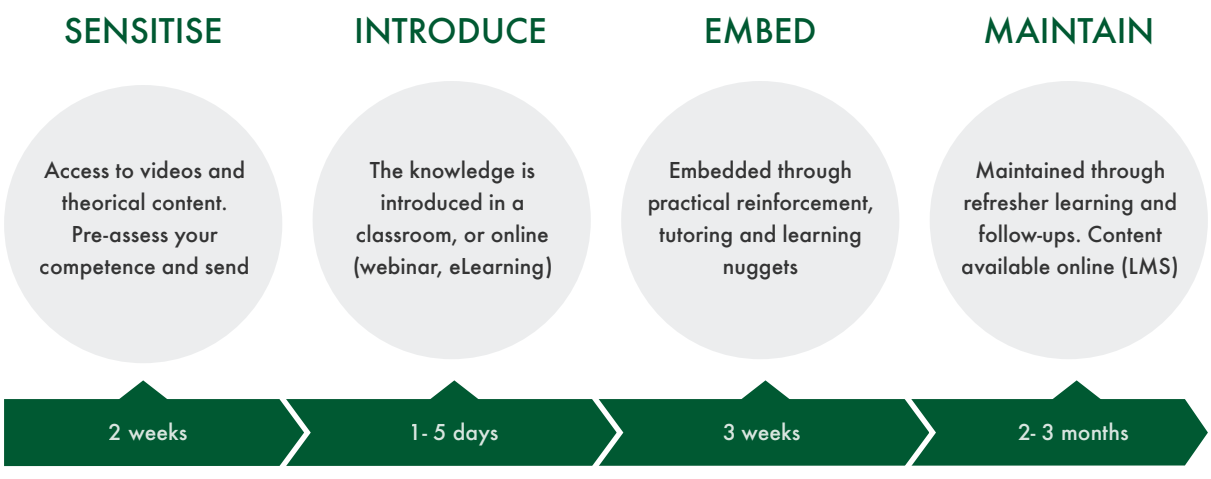
DEKRA Process Safety Academy introduces, embeds and maintains competency in Process Safety in your organisation. With more than 30 years of expertise, our highly qualified team of learning experts, senior practitioners and scientists make us the global experts in process safety who partner with you to identify and meet all your learning requirements.

Multi-level audience	Operators, Technicians, Supervisors, Engineers, Managers and Contractors
Competence levels	Awareness, Basic Application, Proficiency, Expert
Multiple languages	English, German, Spanish, French, Italian, Chinese, Portuguese, Hindi
Our training programmes are	Effective, Impactful, Globally Consistent, Sustainable
Our delivery methods	In-house, Public Courses, eLearning, Competence Development Programs
Our trainers	Highly experienced Process Safety practitioners in industry

Our Competence Development Programs

We know how to turn training into competency

Training alone does not drive competency. Humans tend to forget very quickly and can only retain a small percentage of knowledge after some weeks have passed. Real learning needs experience, support and mentoring, verification and monitoring over time. Our competence development programs are based on the important learning principles:



All to sustain the knowledge over time

Training That is Fully Tailored to Your Plant & Process

Developing the core competencies required for excellence in Process Safety relies on expert knowledge, imparted in the correct way for maximum retention. This is why we offer all of our courses as fully tailored, in-house programmes, taking into account the specific requirements of your situation. Within this guide, you will find a selection of our key topics, alongside a typical programme layout within that specific area of competency. Off the shelf options provide a basic framework, with our course leaders working alongside you to understand how best to run a programme that not only fits your specific requirements, but also that will ensure long term retention within your organisation.

DEKRA Process Safety Academy

Training and Competence Development Programs

1. UNDERSTANDING PROCESS SAFETY HAZARDS

- The Essentials of Managing Process Safety
- Process Safety Information - The Cornerstone of PSM
- Dust Explosions: Theory, Prevention & Protection
- Gas/Vapour Explosions: Theory, Prevention & Protection
- Chemical Reaction Hazards and Thermal Stability of Materials
- Ignition Sources including Electrostatics Hazards

2. HAZARD IDENTIFICATION & RISK ANALYSIS

- Practical Process Hazards Analysis
- Consequence Modeling
- Quantitative Risk Assessment (QRA)
- Facilities Siting Risk Assessment

3. HAZARD MITIGATION AND MANAGEMENT PROGRAMS

- Functional Safety Management, LOPA & SIL Assessment
- Emergency Relief Systems, Blowdown & Pressure Vessels
- Process Safety Management (PSM)
- Process Safety Metrics & Leading Indicators
- Process Safety Management System Auditing
- Management of Change
- Incident investigation

4. MEASURING SUCCESS

- Efficient Process Safety Management System Auditing
- Process Safety Metrics & Leading Indicators
- Incident Investigation: Methods & Case Studies
- Lessons from Accidents in the Process Industries

For an informal discussion on our tailored in-company solutions, elearning or competence development programs, please call +44 (0)23 8076 0722

Practical Aspects of ATEX / DSEAR Compliance Success

The flagship four day course from DEKRA Process Safety, Practical Aspects of ATEX / DSEAR Compliance Success, covers Hazardous Area Classification (HAC), Dust, Gas and Vapour Explosion Hazards, Industrial Electrostatic Hazards and Non-Electrical (Mechanical) Ignition Risk Assessment. The course can be booked as a complete four day package, or as individual/multiple days dependent on personal requirements.

- Duration: 4 days
- Type: Classroom training
- In-company: Contact us
- CPD Hours: Up to 26

Learning Outcomes

- The purpose of EU ATEX Directives and equivalent national regulations.
- Responsibilities under EU ATEX Directives and equivalent national regulations.
- Materials data requirements for ATEX assessments.
- How materials data are obtained and its practical significance.
- The philosophy of hazardous area classification.
- How to undertake hazardous area classification for gases, vapours (liquids) and/or powders.
- How to specify new equipment for use in hazardous areas.
- About different combustion events and explosions, their characteristics and the hazards they represent.
- Methods for controlling flammable atmospheres to prevent or reduce fire and explosion hazards.
- About the range of ignition sources for flammable atmospheres.
- How to undertake an ignition risk assessment.
- Methods for controlling ignition sources to prevent or reduce fire and explosion hazards.
- The fundamental mechanisms of electrostatic charge generation, dissipation and its effects.
- How to undertake an electrostatic ignition risk assessment.
- How to control static electricity to prevent or reduce fire and explosion hazards.
- How to protect against the effects of explosions when control measures may not be fully effective.
- How to assess non-electrical equipment for use in hazardous areas.
- How to prepare and maintain documentary evidence of having undertaken the above assessments.

Day 1

- Legislative background and requirements.
- Flammability (fire and explosion) properties of materials.
- Hazardous area classification for gases, vapours and liquids.
- Hazardous area classification for powders.
- Selection of new equipment for use in hazardous areas.

Day 2

- Understanding explosions.
- Further properties of materials.
- Prevention of fires and explosions by control of flammable atmospheres and ignition sources.
- Protection against those explosions which could still occur.

Day 3

- Fundamentals of static electricity.
- Properties of materials relevant to static electricity.
- Systematically assessing electrostatic ignition hazards.
- Controlling static electricity to avoid fires and explosions.
- Problems (as distinct from hazards) due to unwanted static electricity in industry.

Day 4

- Incidents and consequences of unsuitable or poorly maintained equipment.
- Assessment of mechanical equipment for use in hazardous areas

Who will benefit?

Engineers and engineering managers (and those with similar responsibilities) from companies storing, handling, using or processing flammable liquids, gases and/or powders, including those materials generated as waste streams (e.g. flammable dust collected in a filter). Many operators and senior managers have also benefited from attending this course.

Preventing Reaction Runaway

Integrating Safety Assessment Into Process Life Cycle and Practicalities of Emergency Pressure Relief Design

The loss of control of exothermic or gas generating chemical reactions, on plant scale, can have devastating primary and secondary consequences. Strategic assessment practices should be embedded to ensure that chemical reaction hazards are identified early in process development by chemists with a good understanding of risk identification such that the development process seeks to systematically and reliably eliminate or reduce the risk potential.

This course is designed to equip staff with the necessary tools to be able to identify chemical reaction hazards, interpret test data correctly and develop a robust basis of safety. A special focus is provided on the design of emergency relief systems as a primary safeguard in asset protection and life preservation. It is a multidisciplinary course straddling chemistry and chemical engineering to seek to close the gap between the disciplines which often results in processes being scaled up that could have been inherently safer.

Objectives

- Equip chemists with tools to identify and quantify process safety risks – and hence make decisions which promote inherently safer processes.
- Provide chemists and engineers with a systematic assessment process and knowledge to identify appropriate testing strategies.
- Enable chemists and engineers to understand calorimetric and thermal stability data interpretation and application.
- Gain awareness of safety measures available for safe scale-up, including relief system design concepts

- **Duration:** 2 days
- **Type:** Classroom training
- **In-company:** Contact us
- **Audience:** Personnel involved with process safety, EH&S, process design, operations and maintenance from the chemical & processing industries:
  - Management
  - Technical
  - Operations
  - Maintenance

Day 1

Delegates will learn to identify significant sources of hazard in existing plants, understanding the latest techniques for assessing risk and measuring and quantifying chemical process hazards in the workplace. An understanding of established best practice in reducing the hazards of exothermic reaction systems, with particular emphasis on emergency relief design, will be taught (in conjunction with Day 2.)

Day 2

The provision of emergency relief systems for runaway chemical reactions and decompositions requires a detailed design approach that takes into account the dynamics of the uncontrolled reaction and the potential for multi-phase flow in the vent system. The DIERS (Design Institute for Emergency Relief Systems) methodology provides a practical framework for such studies, which is different to vent sizing for purely physical contingencies. This short course will examine the characterisation of runaway behaviour and the vent design approach. Data requirements, sizing equations and practical aspects will be discussed. Case studies and workshops are included.

Process Safety Management (PSM)

Major process accidents (Flixborough, Bhopal, Longford, Texas City, Buncefield, Deepwater Horizon) were all caused by inadequate management of process risks, often because process safety was given insufficient attention by line managers. As a result, effective PSM is now recognised as vital to the control of major process hazards, and this is reflected in legislation; for ex ample, the Seveso I I Directive in the EU and the OSHA 1910.119 standard in the USA. This course aims to give delegates an understanding of Process Safety Management, so that they can develop, improve and implement systems within their own organisation.

Learning Outcomes

- How PSM failures cause process accidents
- How PSM relates to and differs from other safety management systems
- The importance of leadership and culture to process safety performance.
- About key aspects of PSM; e.g. procedures, training and competence, process hazard analysis, process safety
- information, change management, plant integrity etc.
- Techniques for monitoring process safety performance and auditing PSM systems

DSEAR & Pilot Plants

Pilot plants are operated in many sectors of the process industries, particularly in the specialty chemicals and pharmaceutical sectors. They are used for operations handling gases, liquids and powders such as chemical reactors, filtration, centrifugation and drying. Many of the materials handled are flammable and / or reactive and so in the UK, the DSEAR regulations will apply. Although the scale of operation is usually small, the fire, explosion and reactive chemical risks can be of a disproportionate scale due to factors such as:

- Developing chemistry
- Use of glassware
- Changing equipment configuration
- Inadequate appreciation of the hazards at this scale
- Less rigorous standards often applied as for the production plant e.g. Management of Change
- Inappropriate siting of operations and less developed emergency procedures

Learning Outcomes

- Pilot plants vs. production scale – what are the unique hazards and what can go wrong
- Hazardous area classification applied to pilot plant operations – when to apply and when alternative control measures can be used
- Fire and explosion hazards with common pilot scale operations and basis of safety options for changing plant
- Ignition source controls in pilot plant operations including electrostatic ignition sources
- How to manage reactive chemical hazards in pilot plant operations
- What safety data should be available at this stage and how it is used

Ignition Sources; Myths and Realities

Whenever you handle flammable liquids, gases or powders, ignition sources are never far away. The consequences of ignition can be devastating resulting in loss of life, business and bad publicity to name a few. In Europe, the importance of ignition source management is recognised in the ATEX Directives. This has resulted in an array of guidance for end user operators and equipment manufacturers. Despite ATEX now being a mature Directive, Chilworth continue to find sites where ignition source management is poor. Examples are many but some include:

- Poor understanding of electrostatic ignition hazards
- 'Run to failure' non-electrical equipment maintenance in hazardous areas
- Deficiencies in management of hot work
- 'Ex' electrical equipment poorly maintained or installed
- No data on safe powder drying and storage temperatures
- Insufficient understanding of dust ignition characteristics

Learning Outcomes

- What ignition sources are common and how and where they can occur
- Data required for properly assessing ignition sources and application in ignition risk analysis
- Managing electrostatic hazards – common misconceptions and pitfalls
- How to deal with mechanical ignition sources
- Common problems with electrical installations in hazardous areas
- What is really important with ignition source management
- Avoidance of Ignition Sources as a Basis of Safety - when can this be justified?
- Avoidance of Ignition Sources

Problem Solving Through Static Measurement & Assessment

Static causes a wide range of problems and hazards in many industrial processes and operations. Appropriate measurements properly and carefully undertaken can aid the necessary understanding of mechanisms leading to such problems to maximise effectiveness in controlling them. These same measurements can also be used for active monitoring of those variables which control or exacerbate the problems. Hence, this short course will benefit process and process development engineers, quality assurance and quality control scientists, product development scientists and technical personnel managing these roles wherever raw materials, products or process plant can acquire static charge. The course will include a number or practical demonstrations.

Learning Outcomes

- The Fundamentals of static electricity
- About the types of problem & hazard caused by static in a wide range of situations
- Techniques for measuring static
- Methods for measuring static-related phenomena
- How real problems have been addressed with the aid of appropriate measurements
- Common pitfalls when making and interpreting static measurements
- Practical guidance on effective measurements

Waste Compatibility

A number of unexpected, reportable adverse reaction incidents have occured in the waste treatment industry in recent years. The incidents have been caused by the mixing of incompatible wastes in bulking vessels which have reacted together to generate heat and / or gas. The waste industry is particularly prone to such incidents due to several unique sector features:

- Handling wastes of varying and often uncertain composition
- Large scale bulking operations often involving large (un-agitated, often poorly instrumented) vessels
- Wide variety of wastes received on a day-to-day basis
- General lack of themochemical knowledge and understanding to implement robust compatibility testing procedures.

Learning Outcomes

- Latest legislation and best practice in compatibility testing
- The fundamental principles of adverse reactions
- An overview of tools and procedures for desktop adverse reaction screening
- Laboratory calorimetry methods; how to set-up tests, what equipment to use and how to conduct good tests

Ignition Sources

Whenever you handle flammable liquids, gases or powders, ignition sources are never far away. The consequences of ignition can be devastating resulting in loss of life, business and bad publicity to name a few. In Europe, the importance of ignition source management is recognised in the ATEX Directives. This has resulted in an array of guidance for end user operators and equipment manufacturers. Despite ATEX now being a mature Directive, DEKRA continue to find sites where ignition source management is poor. Examples are many but some include:

- Poor understanding of electrostatic ignition hazards
- Run to failure' non-electrical equipment maintenance in hazardous areas
- Deficiencies in management of hot work
- 'Ex' electrical equipment poorly maintained, wrongly specified or installed
- No data on safe powder drying and storage temperatures
- Insufficient understanding of ignition characteristics of combustible dusts.

Learning Outcomes

- What ignition sources are common and how and where they can occur
- Data required for properly assessing these ignition sources and how to use in the ignition risk analysis
- Managing electrostatic hazards – common misconceptions and pitfalls
- How to deal with mechanical ignition sources, eg sparks & mechanical friction
- Common problems with electrical installations in hazardous areas
- What is really important with ignition source management
- Avoidance of Ignition Sources as a Basis of Safety - when can this be justified?
- Avoidance of Ignition Sources

EPD/DSEAR Documentation

Since the ATEX Directives and DSEAR became a legal requirement in the EU in 2003, DEKRA have completed many fire and explosion risk assessments for a range of industrial sectors. One common issue is the lack of understanding (and available guidance) on what constitutes a 'suitable and sufficient' documentation package to demonstrate compliance. Documents are also frequently treated as 'one offs' rather than 'living documents' requiring regular review, update and re-training of staff of the updated content.

Aimed at those with responsibility or involvement in implementing ATEX / DSEAR on their site, the course will provide an overview of Explosion Protection Documents (EPDs) describing their legislative background, their implementation, correct format, acceptable content and using them as living documents. The course provides an overview of the detailed risk assessments required by EPD / DSEAR docs.

Learning Outcomes

- The legislative background for EPD documents
- What an EPD / DSEAR documentation should contain, suggested format, level of detail necessary and how it links to more detailed risk assessment documents
- EPDs/DSEAR as 'living documents': updating, implementing re-training
- About the risk assessments and studies required in support of EPD/DSEAR docs
- Common mistakes made in EPD/DSEAR documentation and common shortfalls in DSEAR / ATEX risk assessments.

Process Safety Information, the Cornerstone of PSM

Many chemical and related process accidents and incidents have occurred because organisations did not recognise the hazards and risks associated with the activities they were undertaking; for example, when operating, changing or maintaining processes, plants and equipment. Recognising these hazards and risks requires that an organisation develops and maintains a "corporate memory" through the efficient and effective management of Process Safety Information (PSI). Management of PSI is therefore recognised as a cornerstone of Process Safety Management (PSM), as without it organisations are essentially ignorant of the process hazards and risks for which they are responsible; for example, in PSM guidelines from the US Center for Chemical Process Safety (CCPS), and Seveso II guidance (in the UK the Control Of Major Accident Hazards Regulations 1999, as amended).

Learning Outcomes

- Why PSI is important to the management of process risks
- Significant elements of PSI management
- Who is typically responsible for PSI management, along with their level of competency
- What PSI information to generate, including legal requirements and document examples
- How PSI could be archived and then retrieved
- When PSI should be used and by whom
- How to interpret PSI e.g. Chemical Hazard data
- What to include in a PSI procedure.

Safe Drying of Powders on an Industrial Scale

In an average year in the UK, dryers have caused one explosion and 30 serious fires. Many of these could have been avoided if a systematic assessment of the fire and explosion hazards had been carried out. In particular, many incidents are caused by a poor understanding of safe drying temperatures or incorrect use of thermal test data. This seminar aims to give delegates an insight into possible causes of these fires and explosions and how to assess and control them. The potential incidents hazards that will be covered, include explosions caused by:

- Flammable vapour ignition when charging/ drying
- Ignition of flammable dust clouds when drying
- Decomposition of unstable powders at high temperature

Learning Outcomes

- How and when explosive dust or vapour atmospheres can be created in a dryer
- What ignition sources can occur in a dryer
- About dryer explosion risk assessments
- Preventing fires & explosions in dryers e.g.inerting / vacuum & ignition source controls
- Employing explosion protection on dryers
- Generating appropriate powder thermal stability information for each type of dryer
- How thermal stability data determines fire & explosion risks & safe operating conditions
- Preventing powder thermal decomposition
- How fire & explosion hazards associate with operations e.g. filling, discharging etc

DSEAR & Pilot Plants

Pilot plants are operated in many sectors of the process industries, particularly in the specialty chemicals and pharmaceutical sectors. They are used for operations handling gases, liquids and powders such as chemical reactors, filtration, centrifugation and drying. Many of the materials handled are flammable and / or reactive and so in the UK, the DSEAR regulations will apply. Although the scale of operation is usually small, the fire, explosion and reactive chemical risks can be of a disproportionate scale due to factors such as:

- Developing chemistry
- Use of glassware
- Changing equipment configuration
- Inadequate appreciation of the hazards at this scale
- Less rigorous standards often applied as for the production plant e.g. Management of Change
- Inappropriate siting of operations and less developed emergency procedures

Learning Outcomes

- Pilot plants vs. production scale – what are the unique hazards and what can go wrong
- Hazardous area classification applied to pilot plant operations – when to apply and when alternative control measures can be used
- Fire and explosion hazards with common pilot scale operations and basis of safety options for changing plant
- Ignition source controls in pilot plant operations including electrostatic ignition sources
- How to manage reactive chemical hazards in pilot plant operations
- What safety data should be available at this stage and how it is used

Practical HAZOP Incorporating IEC61511

This training course covers HAZOP study in full with IEC61511 (and the master standard IEC61508) incorporated. Anyone wishing to use the HAZOP study in the lifecycle of safety instrumented systems (as they should) then this course shows how to incorporate the standard seamlessly and easily and how the leader can quietly ensure that everything necessary is covered.

HAZOP study is an established method for examining a process plant in detail. The standard for the central HAZOP study is IEC61882 which is a European Norm and published as EN 61882 throughout the EU. It gives guidance on application of the technique and on the HAZOP study procedure, including definition, preparation, examination sessions and resulting documentation and follow-up.

HAZOP study is included in the lifecycle in IEC61511 Part 1. If a safety instrumented system is to be, and claim to be, compliant with IEC61511 then this course has a full module describing what should be covered in the HAZOP study for SIL rated trips as safeguards.

Learning Outcomes

- Understand what data needs to be collected from the HAZOP study team who know the process often better than the SIL experts.
- Understand how to use a HAZOP to eliminate all cases that do not further review under IEC61511 or IEC61508
- Understand how to design and calibrate a HAZOP risk matrix that complies with IEC61511/ IEC61508

Lifecycle Process Safety & Regulatory Data

In all aspects of industrial safety it is necessary to have an understanding of the properties of the materials being stored, handled, produced or transported. In recent years this understanding of material properties has become more profound with the introduction of European standards and guidelines such as the ATEX Directives, REACH, CLP and UN Transportation of Dangerous Goods. How can a risk assessment be performed unless there is an understanding of a materials hazardous properties. This course will enable people working in process industries and involved in regulatory compliance or health and safety to have a better understanding on the type of physico / chemical data required for legal compliance and to make a formal judgment on the risks of handling hazardous materials. It will also enable people to have a better understanding on how this data is obtained and how it can be used.

Learning Outcomes

- Why hazardous material data is required
- Which data is required for Process Safety (DSEAR/ATEX)
- Which data is required for equipment selection (ATEX)
- Background information on test methods for physico/ chemical data
- Data requirements for REACH*
- Data requirements for CLP*
- Data requirements for UN Transportation*

Note * – In these areas there will also be mention on toxicological and ecotoxicological data requirements.

Practical HAZOP Leadership in Action

Complex processing with inherent hazards requires systematic methods for hazard identification and assessment. Hazard and Operability Study (HAZOP) is a recognised industry-wide method for achieving this.

HAZOP is a rigorous, structured approach to identifying process hazards and operational problems, which can be adapted to a variety of processes and technologies: however the effectiveness and efficiency of a HAZOP depends on the competence of the leader as well as the competence and engagement of the HAZOP Team. This course will help participants to understand the purpose of HAZOPs and how they can make an effective contribution to them.

Learning Outcomes

- When and how HAZOP should be employed, including how it relates to other techniques.
- What is needed to carry out a HAZOP
- How HAZOPs should be conducted
- How to use risk assessment with HAZOPs.
- There will also be an opportunity to participate in a HAZOP.

Quantified Risk Assessment (QRA)

To successfully manage major process hazards, assessment of the risks arising from the hazards is required. In some cases it is sufficient to carry out qualitative risk assessments using simple techniques such as risk matrices. However, when the risk is judged to be high, the consequences are severe, the system is complex or there is a regulatory requirement, it may be necessary to evaluate the risk numerically using Quantified Risk Assessment (QRA). The uses for QRA are as follows:

- To evaluate whether or not the risk is acceptable and then identify measures for cost-effective risk reduction if required
- To compare the relative risks of different options e.g. the transport of materials by pipeline vs. road transport
- To allow companies to meet their regulatory obligations for risk assessment, such as those required by the Seveso II Directive (COMAH Regulations 2015 in the UK).

The aim of the course is to give people who may need to carry out QRA a practical understanding of techniques that can be used.

Learning Outcomes

- Techniques for identifying major process hazards
- Techniques for modelling the consequences of major process hazards: fire, explosion, toxic and environmental
- release
- How to estimate the effects on people and the environment from major hazard events
- How to assess the likelihood of a major accident
- Criteria for judging risk acceptability
- Risk reduction measures and cost-benefit analysis.

Major Fire Risk Assessment in Manufacturing Environments

Each year a number of fires occur within process industries and these fires can result in serious injury, major asset loss and business interruption. For facilities that are classified as COMAH / Seveso II sites it is necessary to undertake specific studies such as predictive modelling of the impact of major process fires both on and offsite and consideration of the potential for domino effects e.g. a fire triggering a runaway reaction or explosion. Other studies such as Occupied Building Risk Assessment (OBRA) require the effects of major process fires on people in buildings to be fully evaluated. Undertaking an adequate fire hazard and risk assessment and implementing measures to prevent and mitigate against the effects of a fire can significantly reduce the potential for injury and business loss.

Learning Outcomes

- About different types of fire and the potential harmful effects
- Identification of scenarios that can lead to major fires e.g. loss of containment
- Identification of sources of ignition and prevention measures
- An overview of assessment and computational techniques for evaluating the impact of fires
- Estimating thermal flux from fires such as pool fire, jet fires and BLEVE
- Flame engulfment of tanks / vessels including reactive systems and impact on emergency venting requirements
- Gas generation in powder systems due to flame engulfment
- Methods to assess the impact of fires on people – thermal dose, probits etc.
- How to evaluate the risk from fires and determine reasonably practical mitigation measures

Equipment in Hazardous Areas

In June 2003, the ATEX Directives became a legal requirement for EU member states. Rarely in the past has compliance with new legislation caused so much confusion and misinterpretation. The legislation is now relatively mature and despite availability of many supporting 'harmonised' standards and guidance documents, we still find industry being interested in comprehensive training which can help with implementing compliance programmes. This applies to both end users and manufacturers of equipment.

Learning Outcomes

- Hazardous area classification & controls
- Control of ignition sources in hazardous areas including static and equipment selection
- Use of new / existing equipment in hazardous areas – how to select and comply with special requirements, risk assessments, inspection and maintenance
- Explosion protection systems
- Documentation requirements – demonstrating a basis of safety
- Dispelling common misconceptions
- Certification of new equipment, assemblies, components, safety devices and protective systems
- ATEX non-electrical equipment – how much detail is needed in risk assessments and how to document
- Self-certification
- Quality systems – what is needed for ATEX equipment manufacture
- Ex marking & standards available in support of ATEX 114
- Keeping your certification up to date

SIL Requirements (SIL Determination)

To have a SIL rated trip is not a success but a failure. What it means is that the one SIL rated trip is essential for covering the gap between the actual risk achieved and the corporate safety target. The ideal is therefore to show that there are sufficient other layers of protection to achieve the corporate target without any gap

The need for a SIL rated trip and the requirements for that trip is a team decision and so this training course is for process engineers and others who can identify and evaluate the other layers of protection of whatever kind and identify any remaining gap. Therefore this training course is for process engineers, mechanical engineers and others at the forefront of that assessment and not just for the instrument engineers.

The course includes exams on the content. This course explores the legal framework as well as methods of evaluation used for safety instrumented systems. The course also includes how to design and calibrate a risk graph for your company that meets the requirements of latest edition of IEC61511:3 and is presented by the author of the I.Chem.E book on the subject.

Learning Outcomes

- Understand where IEC61511 and IEC61508 sit within the legal framework
- Understand how to document and evaluate all the existing layers of protection in order to identify if a SIL-rated safety instrumented system might be necessary.
- Understand that it is a team decision and who should be on the team and what they need to know.
- Understand how to design and calibrate a risk graph for the HAZOP team that provides all the information needed from those who know the process to the SIL expert who will do the LOPA confirmation calculation.

SIL System Maintenance

This course is for maintenance engineers who are required to maintain a SIL-rated safety instrumented system (“SIF”) and can be asked to be involved in installation and commissioning.

It covers the legal requirements for commissioning and maintenance of SIL-rated systems protecting any dangerous substance. Thus the maintenance engineer discovers what needs to be included and covered at installation, commissioning and during maintenance of the SIF. During the life of the SIF the course looks at replacement and repair activities that occur.

The course also covers the relevant aspects of the management of changes as well as full and partial proof testing. The result is that anyone involved in maintenance of a SILrated safety instrument understands what they need, what they can find, and what is required of them.

Learning Outcomes

- Understand what full and partial proof tests mean and their importance.
- Understand what demand rate means and what the impact is of MTTR on maintaining the loop.
- Understand what information must be obtained from the SIL-rated safety instrumented loop designer.
- Understand the legal requirements for maintaining a SIL-rated safety instrumented system.
- Understand what information must be collected during commissioning of a SIL-rated safety instrumented system.

Functional Safety Management & SIL Assessment

An introduction to IEC 61508/11 Safety Integrity Level (SIL) principles for establishing the performance, specification and reliability of Safety Instrumented System.

This course is suitable for anyone who would benefit from a broad understanding of this important safety related area and will cover the background of IEC61508/11 SIL development and its management requirements. The presentation will go on to explain SIL determination techniques such as Risk Graph & Layers of Protection Analysis (LOPA), which are common methods within the process industries. Workshops will reinforce the learning of these techniques.

Objectives

Following completion of the course, delegates should be able to participate in, and contribute towards, future SIL assessments within their own workplace, appreciate the elements of safety system design and the importance of operations and maintenance management to overall safety. Extensive opportunities to discuss the various issues raised with the lecturers will be provided.

Process Safety Management (PSM)

Major process accidents (Flixborough, Bhopal, Longford, Texas City, Buncefield, Deepwater Horizon) were all caused by inadequate management of process risks, often because process safety was given insufficient attention by line managers. As a result, effective PSM is now recognised as vital to the control of major process hazards, and this is reflected in legislation; for ex ample, the Seveso I I Directive in the EU and the OSHA 1910.119 standard in the USA. This course aims to give delegates an understanding of Process Safety Management, so that they can develop, improve and implement systems within their own organisation.

Learning Outcomes

- How PSM failures cause process accidents
- How PSM relates to and differs from other safety management systems
- The importance of leadership and culture to process safety performance.
- About key aspects of PSM; e.g. procedures, training and competence, process hazard analysis, process safety
- information, change management, plant integrity etc.
- Techniques for monitoring process safety performance and auditing PSM systems

Lessons from Process Incidents

Major incidents in the chemical and process industries such as fires, explosions and toxic releases continue to happen and often have disastrous consequences. These include loss of life and assets but ultimately could lead to shut down of the site with associated socio-economic issues. In the majority of cases, a similar type of incident has occurred before (either in the same organisation or elsewhere) and had lessons been adopted, it would most likely have been prevented. In addition, an understanding of the root causes and sequences of events in past incidents is extremely beneficial for predicting what might happen on new processes. Studying past incidents addressing relevant lessons should therefore be an essential part of any robust Process Safety Management (PSM) system.

Learning Outcomes

- The consequences of incidents and how they shape legislation
- The benefits of sharing and studying past incidents and near misses
- How complex scenarios can be better predicted through studying the past
- Common root causes of incidents
- Lessons from recent major industrial accidents
- Recurrent bad practices – are we really learning?

Measuring Process Safety Performance

The concept of performance indicators such as KPIs (Key Performance Indicators) is widely used in all businesses and has been for many years. Recently this concept has been extended to process safety which can be a serious business risk. Major incidents such as the US Texas City Refinery explosion in March 2005 which resulted in 15 fatalities and 170 injuries, have given rise to the call for process safety KPIs. In this particular disaster, safety performance was assessed solely through measuring occupational safety i.e. number of slips, trips, sprains and strains. This gave a false impression on the overall safety performance of the organisation and was concluded to be a contributory factor to the disaster.

Learning Outcomes

- Understand why Process Safety Performance Indicators are required
- Look at the differences between Organisational and Process Safety KPI's
- What resources are available to aid identification and monitoring
- Look at the different approaches available and review their suitability for different situations

Trainers' Biographies

Simon Gakhar, B.Sc. (Hons) C.Eng. MIChemE Professional Process Safety Engineer

Simon is a Chartered Chemical Engineer and joined the organisation in 2004 as a Senior Process Safety Specialist working in both the industrial explosion hazards and chemical reaction hazards groups. Simon is currently the Technical Manager in the process safety consultancy group with over 25 years industry experience in a range of process safety and engineering roles across a broad range of industrial sectors and disciplines, including gas, dust and vapour explosions, electrostatic hazards, chemical reaction hazards and DIERS, occupied building risk assessments, pressure relief, discharge and disposal system design and process safety management. Simon is a very experienced trainer and presenter and has a particular interest in the use of practical demonstrations in training, many of which he has developed himself.

Keith Middle, BSc, CEng, FIChemE

Keith is a Chartered Engineer, a Fellow of the Institution of Chemical Engineers and a member of the IChemE Safety & Loss Prevention Subject Group and European DIERS User Group. With a BSc (Hons) in Chemical Engineering from the University of Birmingham, his specialties include runaway chemical reactions, thermal stability and decomposition, emergency relief vent sizing for uncontrolled reactions and 2-Phase Flow, hazard identification, risk assessment and worst case sce-nario studies, HAZOP team leadership and Safety Integrity Level and Safety Instrumentation (BS EN 61508/61511). Keith joined DEKRA Process Safety in 1994.

Nigel Allen, BSc, AMIChemE

Nigel has a BSc (Hons) in Chemical Process Engineering and Business Studies from Aston University and is an Associate Member of the Institution of Chemical Engineers (IChemE) and their Safety and Loss Prevention Group. His areas of expertise include explosion hazard and risk, HAZOP and Non-electrical equipment ignition risk, occupied buildings risk assessment (OBRAs), conse-quence modeling and Quantified Risk Assessments (QRA). In addition Nigel has experience in Seveso report writing, employee HSE competence profiling, process and occupational safety audits, process safety management (PSM) systems and culture reviews, accident and incident investigations and permit-to-work systems.

Wahid Azizi, M.Eng.(Hons.)

Wahid Azizi is a Process Safety Specialist consulting at DEKRA Process Safety. Previously, he was a Technical Safety Leader at Procter & Gamble. He worked in the London Plant; a Top Tier SEVESO site and one of P&G's largest plants globally. He has knowledge and experience in various areas of process safety; risk assessments techniques (HAZOP, LOPA), ATEX/DSEAR assessments, SEVESO/COMAH, Electrostatics, mechanical integrity programme and risk based inspection (RBI).

Ian Pavey MPhil, BSc (hons), MInstP, CPhys, AMIChemE

Ian graduated from Bath University with a BSc in Chemical Engineering. After acquiring practical experience of electrostatic hazards while working as a process development engineer, he gained an MPhil in Applied Electrostatics at the University of Southampton, thereafter specialising in electrostatic applications, problems and hazards. Ian is a Principal Electrostatics Specialist at Chilworth Technology and a member of the Institute of Physics' Electrostatics Group, the Institution of Chemical Engineers' Safety and Loss Prevention Group and the British Standards GEL 101 Committee among others. He has numerous articles published on subjects from new electrostatic applications to powder handling problems and fundamental research in understanding hazardous situations.

John Butcher, Chemistry B.Sc.(Hons.)

John Butcher manages the UK DEKRA Process Safety (Chilworth Technology Ltd) Consulting team and is a primary peer reviewer. He has over 25 years' experience in managing successful tech-nical safety and operational teams in global chemical distribution and manufacturing businesses. He has chaired the SIA technical committee (UK's solvent sector) with contri-butions to the UK's Health and Safety Executive on the safe handling of flammable liquids. He joined Chilworth in 2013 as a Senior Process Safety Specialist and has worked on a variety of process safety projects in different countries.

Clive de Salis, B.Sc (Hons)

Clive is a Process Safety Specialist with DEKRA Process Safety, and has a B.Sc. (Hons) in Chemical Engineering. His background is as a process design consultant and expert in process design safety and critical instrumentation. Clive is an expert in process risk assessment, including HAZOP etc, with extensive experience in the design and installation of safety systems and determination of safety integrity levels. Started with LNG vaporisers and recent experience includes Expert witness selected by Barristers and Solicitors for dust explosions.

Chris Martin, B.Eng., MIChemE, CEng, GIFireE

Chris Martin is a Senior Process Safety Specialist at DEKRA Process Safety was formerly Group EHS Manager at Baxenden Chemicals, with EHS responsibility for three sites. He has fifteen years varied industrial experience, coupled with extensive Senior Specialist experience in safety engineering. He has successfully managed projects on ATEX, DSEAR, COMAH/Seveso, Process Safety Management Systems (PSM), Safety Audits, Fire and Explosion Risks Assessments and Consequence Modelling. He has carried out QRA, HAZOP, LOPA, HAZID studies for a wide range of clients across industrial sectors.

DEKRA Process Safety

The breadth and depth of expertise in process safety makes us globally recognised specialists and trusted advisors. We help our clients to understand and evaluate their risks, and work together to develop pragmatic solutions. Our value-adding and practical approach integrates specialist process safety management, engineering and testing. We seek to educate and grow client competence to provide sustainable performance improvement. Partnering with our clients we combine technical expertise with a passion for life preservation, harm reduction and asset protection. As a part of the world's leading expert organisation DEKRA, we are the global partner for a safe world.

Process Safety Management (PSM) Programmes

- Design and creation of relevant PSM Programmes
- Support the implementation, monitoring, and sustainability of PSM Programmes
- Audit existing PSM Programmes, comparing with best practices around the world
- Correct and improve deficient Programmes

Process Safety Information/Data (Laboratory Testing)

- Flammability/combustibility properties of dusts, gases, vapours, mists, and hybrid atmospheres
- Chemical reaction hazards and chemical process optimisation (reaction and adiabatic calorimetry RC1, ARC, VSP, Dewar)
- Thermal instability (DSC, DTA, and powder specific tests)
- Energetic materials, explosives, propellants, pyrotechnics to DOT, UN, etc. protocols
- Regulatory testing: REACH, UN, CLP, ADR, OSHA, DOT
- Electrostatic testing for powders, liquids, process equipment, liners, shoes, FIBCs

Specialist Consulting (Technical/Engineering)

- Dust, gas, and vapour flash fire and explosion hazards
- Electrostatic hazards, problems, and applications
- Reactive chemical, self-heating, and thermal instability hazards
- Hazardous area classification
- Mechanical equipment ignition risk assessment
- Transport & classification of dangerous goods

We have offices throughout North America, Europe, and Asia.

For more information, visit **www.dekra-process-safety.co.uk**

To contact us: **process-safety-uk@dekra.com**

Chilworth Technology Ltd
Phi House, Southampton Science Park
Southampton - Hampshire - SO16 7NS - UK.
Phone: +44 23 8076 0722
Fax: +44 23 8076 7866
process-safety-uk@dekra.com
www.dekra-process-safety.co.uk