ARGON™ | World leaders in CBRN/ HazMat training systems

INDUSTRIAL ACCIDENTS

The importance of managing risk, training and training exercises

Major industrial or technological accidents, where the failure of a process, procedure or operating system leads to injury, loss of life, damage to property, economic disruption and environmental degradation, are thankfully comparatively rare. Indeed, in Europe, the number of major reported incidents has decreased steadily from 48 in 2010 to just 3 in 2015[1].

However, when an incident does occur it can have major consequences. For example, among those that took place in 2015, one included the release of gas and vapour from an ethylene distillation system, while another involved an explosion at a pyrotechnics manufacturing plant, which resulted in six fatalities and significant destruction of property over a large blast area.

Perhaps the most notorious case in recent years was the widely publicised explosion at the Buncefield Oil Storage Terminal in the UK in 2005. This injured 43 people, registered 2.4 on the Richter Scale, and caused a cloud of soot and other contaminants covering an area in excess of 200,000 m^2, which quickly reached a height of 2,700m and within 24 hours had extended across France and Spain. The financial costs of this accident have since been estimated at 1.13 billion Euros, including emergency response measures, remedial action and compensation claims, plus a further 11.8 million Euros in fines for the various operating companies involved.

Managing risk

The ownership and operation of hazardous industrial and process facilities, particularly those that fall under COMAH (Control of Major Accident Hazards) regulations and the Sevesco III directive, requires carefully managed processes and procedures to ensure full compliance and to reduce

risk to the absolute minimum. Additionally, if processes involve flammable or explosive materials, then compliance with the Dangerous Substances and Explosive Atmosphere Regulations (DSEAR) also has to form a key part of the overall risk management and safety strategy.

Under DSEAR, an explosive atmosphere is defined as, 'dangerous substances mixed with air, under atmospheric conditions, in the form of gases, vapours, mist or dust in which, after ignition has occurred, combustion spreads to the entire unburned mixture'[2] (the term 'atmospheric' is taken to mean ambient temperatures and pressures, -20°C to +40°C at pressures of 0.8 to 1.1 bar).

[1]European Commission Joint Research Centre Major Accident Reporting System

[2]http://www.hse.gov.uk/fireandexplosion/atex.htm

Further regulations include the European ATEX Directives 99/92/EC and 94/9/EC. These effectively control both the working environment and the protective equipment and systems required to maintain the safety of employees and the workplace as a whole. Individual sectors of industry are then subjected to specific regulations. For example, in the UK, the nuclear sector falls under the auspices of the Office for Nuclear Regulation, with safety and risk management being based around a legal framework constructed from the Health and Safety at Work Act, the Energy Act and the Nuclear Installations Act, as well as specific process and site security protocols.

Across industry, these regulations and directives create structures within which organisations can assess, define, control and manage risk with standardised, repeatable and documented processes.

However, despite these rigorous controls, the hazardous nature of the processes involved, combined with the ever-present potential for human error, means that there is always the possibility – however small – for an incident to occur.

This prompts the question: how best to prepare for a possible industrial accident?

Training and simulation

There are many different organisations providing a wealth of guidance and training courses to help managers assess and manage risk – the primary objective being to establish and document procedures, and then to embed these into working practices, so that unsafe systems and unwanted behaviours are identified and eliminated.

Although this approach is essential it is also important to ensure that staff are trained to deal with an incident if it should occur; in particular, equipping with skills and knowledge required to understand and handle the outcome from either an accidental or deliberate release of gas, vapour or radioactive material, which may be carried a considerable distance from the industrial or process facility and potentially affect both on-site staff and the general public in the surrounding area.

The challenge is creating training scenarios that replicate real-world situations, without actually releasing hazardous agents into the environment. Traditionally, this has been achieved either using classroom or field-based exercises – often with small quantities of live materials or check sources, which trainees locate using conventional detection instruments, or the use of signs and hand held notes around the training area or classroom that show the expected level of contamination readings at different locations.

These methods, however, have a number of disadvantages. For example, using real detectors in training takes equipment out of service and can cause it to be damaged, while the use of live check sources, even on a limited scale, can present considerable risk to trainees and, as a minimum, require compliance with health and safety regulations and also limit the maximum reading that can be presented. At the other end of the scale, the use of printed signs around the training area may be inexpensive but in practice does little to help trainees understand the correct use of detection equipment or the best methods of interpreting readings under different operating conditions.

Creating real-world simulation

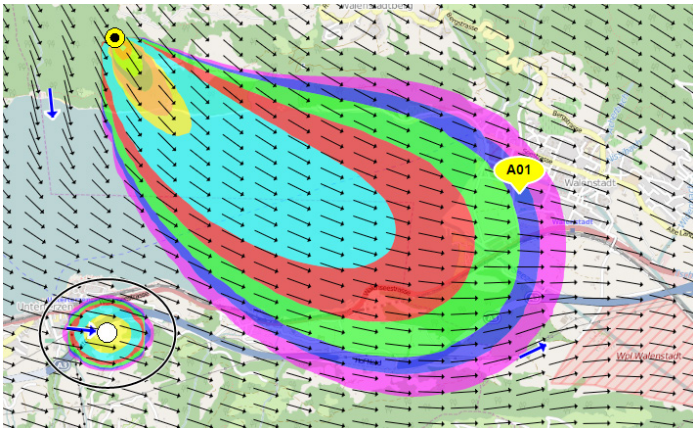
The alternative to these traditional methods of incident training is to use a new generation of intelligent computer based simulation tools, such as Argon Electronics' PlumeSIM-SMART system. The latest version of this powerful system has been designed for use in a wide range of industrial scenarios, including the release of radiological, chemical and petrochemical gasses, vapours or agents.

INDUSTRIAL ACCIDENTS

www.argonelectronics.com

PlumeSIM-SMART is a software based system, available on low cost annual user licences, which runs on a standard laptop connected wirelessly to one or more handheld smart devices or mobiles (SMART-SIM); these are used by students working in the designed training location, which can be up to 2,500km in area, and simulate real-life detection instruments. These are implemented as virtual devices within each SMART-SIM and include radiological dose and dose rate meters, multi-gas detection, air monitoring and in the future radiological spectrometry meters, as well as customer specific instruments.

The system allows an instructor to create, run and optimise each training exercise from a central point, with the ability to influence the readings that students should obtain across the training area at different times or phases of each exercise.



In the field, each student sees a customised display on their SMART-SIM. The readings are determined and automatically updated in real time to reflect the movement and location of the student and the impact that changing wind and weather conditions has on the dispersal rate of the plume of gas or radioactivity. Other features include the ability to simulate hot spots, such as static emissions or a localised radiological source, material fallout, deposition, persistency, evaporation and radioactive decay while the associated simulated instrument readings are automatically updated.
The route and actions taken by each student are automatically logged, allowing the instructor to review the choice of survey route, time taken, information collected and communicated, personal dose management and the decisions taken as a result of the readings and hazard predictions provided.

PlumeSIM-SMART can also be configured to provide an identical training regime in the classroom, with an integrated gamepad feature to allow trainees to manoeuvre through a virtual exercise space, thereby greatly enhancing Tabletop Exercises.

COMAH & Sevesco site simulation

This new technology is ideal for use in a wide range of training scenarios, and is especially valuable for industrial and process sites that are regulated under COMAH regulations and the Seveso III directive.

The system is simple to set up and use, yet delivers the ability to construct intricate training programmes, to reflect the challenges of dealing with complex dispersal patterns in different environmental conditions. Perhaps as importantly, it provides detailed audit trails and can be used for training and evaluating staff at all levels of seniority and skill, including for example in the UK Bronze, Silver and Gold commanders.

Tools such as PlumeSIM-SMART offer an extremely effective extension to existing safety management and training programmes, providing a new dimension that can play an important role in mitigating risk and, should an incident occur, dealing efficiently with the outcome.

To find out more about Argon Electronics, please visit our website - www.argonelectronics.com

Argon Electronics (UK) Ltd.,
16 Ribocon Way,
Progress Business Park,
Luton, Beds.
LU4 9UR

T: +44 (0)1582 491616
F: +44 (0)1582 492780
E: info@argonelectronics.com
www.argonelectronics.com