nebosh

TRAINING AND EVENTS FROM HSE

Process Safety Management

A course book for the NEBOSH HSE Certificate in Process Safety Management

Certificate

Contents

Foreword

The NEBOSH HSE Certificate in Process Safety Management is a qualification designed for those who need to understand the principles of process safety management as part of their job. Learners studying for this qualification will be able to contribute to the effective management of process safety and be able to profile the major risks present in a typical process installation.

The qualification is particularly relevant to the following people working within a process environment:

- Team leaders, supervisors and managers
- Process operators
- Newly qualified health and safety advisors

The qualification is not designed for chemical and process safety engineers experienced in the specification, design and maintenance of the integrity of process plant.

The NEBOSH HSE Certificate in Process Safety Management is intended to be suitable for learners working anywhere in the world. The content is based on recognised international best practice. Knowledge of specific legislation, either in the UK or in any other country, is not a requirement of the qualification.

This course book has been structured to match the NEBOSH syllabus and has been written by process safety experts. The information is divided into distinct sections, each of which starts by listing the learning outcomes for that particular section. Terms are explained clearly and written in plain English, and it offers useful examples, mock exam questions and helpful tips throughout to aid your learning.

This book is a useful resource for course preparation, study and revision for the qualification assessment. It is also a useful source of reference for the workplace.

Further information, including the syllabus guides for the qualification can be found on the NEBOSH website at www.nebosh.org.uk.

The NEBOSH HSE Certificate in Process Safety Management also complements other NEBOSH qualifications such as the NEBOSH National or International General Certificate in Occupational Health and Safety.

A guide to the symbols used in this course book

Activity

Carry out an activity to reinforce what you have just learned.

Example

Real or imagined scenarios that give context to points made in the text.

Key Terms

Definitions of key terminology.

Element 1
Process safety leadership

This element will explore what process safety is and will look at the importance of leadership in the process industries. It will also introduce organisational learning, management of change, and how worker engagement can be managed, and the importance of competence.

Learning outcomes

- Advise on the difference between process safety and personal safety
- Advise on the importance of leadership in assigning roles, responsibilities and resources to improve safety standards and positively influence organisational culture.
- Advise on the importance of organisational learning from lessons learned; accident and incident investigations; benchmarking standards; and sources of process safety information.
- Understand how 'change' should be managed to effectively reduce risks to people and plant
- Help your organisation to understand the importance of worker and contractor consultation
- Advise on the importance of competence and training.

1.1 Process safety management meaning

The distinction between process safety vs personal safety

When we think about safety, we naturally think about the personal safety of individuals who could be affected, and the various, often more traditional actions that can be taken to reduce the risk of injury and ill health. Many types of personal accidents are common, and are therefore reasonably foreseeable. Their control measures are often well established and straightforward to implement, such as machine guarding, fire precautions, equipment checks, managing slips and trips and the use of personal protective equipment (PPE). Low personal accident rates or number of days without an accident are often considered to be a measure of success.

St. Fergus gas terminal, Scotland.

By comparison, process safety (safety in high-hazard process industries) is rather more complicated. High-hazard process industries include chemical and oil and gas sectors. While they obviously suffer personal accidents like all other workplaces, there is also the potential for a major incident. This is because they deal with dangerous chemicals in large amounts and operate processes that, if not well monitored and controlled, can easily go catastrophically wrong, resulting in major fires and toxic releases. Major incidents like these are very infrequent events and can be difficult to predict (before they happen) because of the multiple causes and complexity of what leads to them. Neglecting seemingly small things (such as an intermittently faulty alarm or general maintenance) can end up causing a major accident.

In process safety, the emphasis is on the prevention of major disasters that have been historically an issue for the industry. Process safety needs both complex technical controls (on the plant itself) as well as a robust safety management system. It requires a great amount of specialist technical engineering and management skill to get right. Leadership is also important to give suitable high priority to process safety even though the standards and controls mean that incidents should be rare and may be outside the experience of operators.

Personal safety and process safety do link together (clearly, there is a risk of slips, trips and falls occurring in any workplace); however, in process safety, the emphasis is on the prevention of the high-risk, large scale catastrophic events that, though thankfully rare, could have devastating consequences.

There are various definitions of process safety management but the Institution of Chemical Engineers (IChemE) is particularly helpful for this course. They describe it as:

Key Term

Process Safety Management

A blend of engineering and management skills focused on preventing catastrophic accidents and near misses, particularly structural collapse, explosions, fires and toxic releases associated with loss of containment of energy or dangerous substances such as chemicals and petroleum products[1].

IChemE's definition is in turn adapted from the Center for Chemical Process Safety (CCPS) publication, *Guidelines for Process Safety Metrics* definition[2].

1.2 Process safety leadership

There have been a number of incidents in the process industry that have called into question the way that safety is managed; specifically, in relation to inadequate leadership and poor organisational culture.

Focus has historically been on the engineering solutions and design improvements that could be made; however, the hydrocarbon explosions at Texas City and Buncefield in 2005, and the Macondo blowout in 2010 (explosion of BP's Deepwater Horizon offshore drilling unit in 2010), highlighted the need to focus on not only the physical controls but also the leadership actions that will prevent such events.

After effects of the fire at Buncefield oil storage facility.
©Crown Copyright, Health and Safety Executive

Activity

Buncefield is discussed throughout this element so it would be useful for you to have an awareness of the incident. The report into the HSE's prosecution of companies involved in the Buncefield explosion, together with photographs and video evidence can be viewed on the HSE website (www.hse.gov.uk). Review some of the evidence and familiarise yourself with the case.

Hazard and risk awareness of leadership teams

Leaders need to be competent and actively engaged. At least one board member should have a good understanding of process safety management to help the board understand its organisational process safety risk, and the impact their decisions will make on this.

History has shown that if process industry leaders do not fundamentally understand the hazards and risks inherent in their business, unless they are extremely lucky, ignorance may ultimately lead to disaster. Lack of understanding may arise from things such as lack of technical knowledge or simply lack of data on which to base a decision (lack of reporting). Leadership teams are key decision-makers. If, through ignorance, they do not fully appreciate the consequences of their decisions (such as delaying plant maintenance on old equipment or cutting critical workers), they will make poor decisions that may make a major accident inevitable. To appreciate this, leaders need to be involved, competent and actively engaged - it does not happen by chance. They need to be fully aware of the hazard and risk potential of their processing activities and the potential consequences that decisions on whether or not to take action may lead to. Though a major incident may never have happened to the organisation in question, the major accident potential of its processes needs to be treated seriously alongside other business risks, since it is far more likely to have an impact on reputation and the survival of the business as a whole.

Clearly, leadership teams must therefore be aware of the hazards and potential impacts of their plant and sites (at every stage of their life cycle, from design to decommissioning). These impacts could not only result in life-threatening safety events but also reputational damage and business losses.

Example

In the 1988 Piper Alpha oil rig disaster, 167 lives were lost, insured losses reached £1.7 billion and impacted 10% of North Sea oil and gas production. Nearly 30 years on, the name "Piper Alpha" symbolises a monumental failure of process safety and the reputation of the Occidental organisation was tarnished forever.

Activity

Piper Alpha will be discussed several times in the course, so it would be useful to have an understanding of the disaster. Use the HSE website, search engines and public access video sites to understand (briefly) what happened and why the incident had such a profound impact on the industry and process safety as a whole.

Further, leadership teams need to understand the criticality of the layers of preventive and protective measures that prevent, detect and mitigate such undesirable events.

For those board members still unsure as to the importance of managing process safety, the publication *Corporate Governance for Process Safety - Guidance for Senior Leaders in High Hazard Industries*[1] contains the following statement:

"Safe operation and sustainable success in business cannot be separated. Failure to manage process safety can never deliver good performance in the long term, and the consequences of getting control of major hazards wrong are extremely costly... Major accidents may not just impact on your bottom line profitability - they could completely wipe it out. Major incidents in recent years have shown that the consequences for capital costs, income, insurance costs, investment confidence and shareholder value can all be drastically affected. So why take the risk? However, getting it right pays large dividends."

Activity

Consider the organisation or environment that you work in - how confident are you that leaders and managers are fully aware of the hazard potentials of the organisation's processes?

Board level visibility and promotion of process safety leadership

The Principles of Process Safety Leadership also place emphasis on board level visibility to promote process safety.

Directors and senior managers play a key role in promotion of process safety - they provide leadership, set direction and assign priorities, establish the health and safety tone of the organisation and ensure that the organisation's legal responsibilities are met.

As such, their actions are noted by workers and their visible leadership is essential in the development of the safety culture of the organisation. Leaders need to reinforce personal safety, such as wearing PPE, but also need to discuss and question the more complex issues such as resourcing and the process operations. The actions taken at leadership level establish the level of commitment to process safety that, in turn, helps to achieve the desired positive health and safety culture. Part of being visible is personally leading initiatives, challenging the organisation (asking difficult questions) and actually being physically present (visiting sites). In summary, they need to be role models and lead by example.

Process Safety Management follows the syllabus for the NEBOSH HSE Certificate in Process Safety Management (2023 specification). It provides the knowledge you need to help you gain the qualification.

The book also contains activities and case studies to illustrate the areas covered by the syllabus. It can be used as part of your studies during a taught course or as a study aid for e-learning, distance learning and revision sessions.

The information is also valuable as a reference source for those putting process safety principles into practice at work, for example when contributing towards identifying process related hazards and risks within the process environment.

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