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Increasing Board and Executive Commitment to and Understanding of Process Safety

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Events such as the Texas City and Buncefield explosions and fires as well as the more recent incidents in the Gulf of Mexico have indicated how important it is for the board of a company to have a sound understanding of Process Safety and of the risks faced by the company. The 'Baker Panel', which was established to review BP's refinery operations in the USA, made a number of recommendations relating to the board including one which stated that 'BP should develop and implement a system to ensure that its executive management … possess an appropriate level of process safety knowledge and expertise."
Clearly this requirement is not restricted to BP. More recently the OECD Working Party on Chemical Accidents has issued guidance aimed at increasing board understanding of process safety.
The paper will describe the application of a programme developed by the Institution of Chemical Engineers to:

- developing the board's understanding of the principles of process safety management, of human factors and how safety culture affects performance
- ensuring board awareness of the process safety hazards of the business and of the board's role in managing these hazards
- methods used to inform the board of the status of process safety across the company
- exploring how the board's commitment to process safety is understood throughout the company and by the contractors employed in its operations

The paper will draw on the authors' experience in applying the programme to a range of companies in the nuclear, energy and chemical sectors.

1. Introduction

To Incidents such as the explosion at the Texas City refinery in the US and the explosion at the Buncefield oil storage depot in the UK have increased media and public awareness of weaknesses in process safety and the potential for injuries, deaths, material damage and severe environmental impact. More recently, the business impact which can accompany major accidents with multiple fatalities and widespread environmental damage has been amply demonstrated by the blowout of the Macondo oil well in the Gulf of Mexico (11 fatalities and an estimated 5 million barrels of crude oil released). The financial cost of this accident has been estimated at over $20 billion to date. Moreover, the accompanying damage to the reputation of BP led to its market capitalisation falling by over 50% in the 3 months immediately following the incident, at one point bringing into question the long term survival of the company. There is no doubt that these events have increased the focus on process safety in boardrooms around the world.
Investigations into the causes of major accidents invariably reveal technical failings as well as failures of management systems. More recently, there has been an increased focus on the contribution which underlying failures at board level make to the cause of major accidents. If industry is to improve its performance in the future there is no doubt that attention will need to focus on this area.

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The board's responsibility for process safety is clearly identified in the UK's Corporate Manslaughter legislation as well as the report into Corporate Governance (Turnbull,2005) which sets standards to be followed by all companies listed on the London Stock Exchange. The report states;
"It is the role of management to implement board policies on risk and control. In fulfilling its responsibilities, management should identify and evaluate the risks faced by the company for consideration by the board and design, operate and monitor a suitable system of internal control which implements the policies adopted by the board."
This paper describes an initiative by the Institution of Chemical Engineers (IChemE) to increase executive and board understanding of process safety.

2. The Role of Senior Executives in Preventing Major Accidents

Over the past 20 or 30 years we have seen major developments in process safety. These include improvements in the methods used to identify hazards, to assess their impact, to develop and implement comprehensive management systems as well as improved regulations. Whilst these developments have been important in the delivery of sound performance there has been limited attention to the roles and responsibilities of the board and senior executives.
A review of the findings from a number of incidents serves to illustrate the importance of the role senior executives must play in preventing major accidents.

2.1 Esso Longford Gas Explosion (1998)

The official inquiry into the fires & explosions at Esso's Longford plant noted that the audits carried out by Esso prior to the incident failed to highlight many of the weaknesses. These included a failure to carry out a scheduled HAZOP on the facility, a study which, if properly conducted, would have identified the weaknesses leading to the incident. To quote the official report's finding on the Esso audit, 'it… can only be concluded that the methodology employed by the assessment team was flawed.'
In addition the Royal Commission was critical of Esso's safety management system (OIMS) '…there was a tendency for the administration of OIMS to take on a life of its own, divorced from operations in the field. Indeed it seemed that in some respects, concentrating upon the development and maintenance of the system diverted attention away from what was actually happening in the practical functioning of the plants'.
System failings of this type cannot be corrected without the engagement and involvement of the board and top management. Hopkins, 2000, highlights the over-riding importance of management culture as a contributor to this event: 'What is required is a management mindset that every major hazard will be identified and controlled and a management commitment to make available whatever resources are necessary to ensure that the workplace is safe'.

2.2 Explosion at BP Texas City Refinery (2005)

The Chemical Safety Board's (CSB) investigation into the explosion at Texas City identified many generic factors which applied across the site including lax supervision and shift changeover as well as failures to implement improvements in process safety due to cost pressures on the site, including measures which would have prevented the incident. These were not consistent with the corporate safety policy which stated that 'Everybody who works for BP, anywhere is responsible for getting HSE right. Good HSE performance is critical to the success of our business'.
In addition to the CSB investigation into Texas City and the prosecutions by OSHA, BP established an independent panel under James A Baker to carry out a review of all its refinery operations in the USA. In its comments on 'Corporate Oversight' the report notes that:
'BP's executive management either did not receive….information that suggested process safety deficiencies…or did not respond to the information that it did receive', and that
'Although BP's executive and line management was responsible for ensuring the implementation of an integrated, comprehensive and effective process safety management system, BP's Board has not ensured, as a best practice, that management did so'.
The report of this panel identified the importance of an understanding of process safety throughout an organisation, recommendation 3 of the Report stating:
'BP should develop and implement a system to ensure that its executive management, its refining line management above refinery level and all US refining personnel possess an appropriate level of process safety knowledge and expertise'.

2.3 Nimrod aircraft crash (2006)

Whilst the failure of the Nimrod aircraft over Afghanistan was an aviation incident it can also be considered as a process safety incident within an aircraft. There was a failure to prepare an effective safety case, take action to control identified hazards and to look for the root causes behind an unacceptable number of on-

board fuel leaks as well as a lack of clear organisational accountability between the manufacturer (BAE Systems), the Ministry of Defence and the Royal Air Force. These led Haddon-Cave 2009, to recommend the implementation of a new set of principles covering,
'Leadership, Independence, People and Simplicity together with a new safety culture, a Reporting Culture, a Just Culture, a Flexible Culture, a Learning Culture, a Questioning Culture.'
The report named senior staff responsible for the failings and a court martial has been opened against the senior RAF officer responsible for aircraft maintenance.

2.4 Deepwater Horizon Rig Explosion (2010)
BP's internal inquiry into the losses in the Gulf of Mexico has highlighted a number of failings which contributed to the loss. To quote the report ' a complex and interlinked series of mechanical failures, human judgments, engineering design, operational implementation and team interfaces came together to allow the initiation and escalation of the accident. Multiple companies, work teams and circumstances were involved over time'.
Whilst the technical issues are outside the scope of this paper it is clear that there were serious failings in the relationship between BP and its contractors. This was confirmed by BP's CEO in his appearance at the UK's Parliamentary Energy & Climate Change Committee, Financial times 2010, where he admitted that
'What we have here is a lack of rigour and a lack of oversight of contractors'
Litigation on this accident is ongoing.

3. Institution of Chemical Engineers Initiative

In 2007, in response to the incidents at Texas City and Buncefield the IChemE established a working party which resulted in the development of the training programme, 'Fundamentals of Process Safety'. This one week course was aimed at providing engineers and managers working in the process industries with a broad understanding of process safety to help them to fulfil their roles as well as providing a basis for identifying the need for more specialised training in the future. The course has been very successful, being run on a regular basis in Europe, Asia, Australasia and South Africa, in both an 'open' and 'in-house' format. To date over 25 courses have been run with over 400 attendees. Versions of the course have been developed which are specifically targeted at the oil and gas and the nuclear sectors.
Whilst a sound understanding of Process Safety by managers and engineers is essential, as is evidenced from the incidents described above, an appreciation and understanding of Process Safety at board level is equally important. With this in mind, I Chem E decided to extend its training in process safety to encompass senior executives and members of the board. BP's internal inquiry into the losses in the Gulf of Mexico has highlighted a number of failings which contributed to the loss. To quote the report ' a complex and interlinked series of mechanical failures, human judgments, engineering design, operational implementation and team interfaces came together to allow the initiation and escalation of the accident. Multiple companies, work teams and circumstances were involved over time'.

4. Course Aims

Whilst it would be possible to develop an executive course which concentrated solely on improving the understanding of Process Safety, it was decided that it was also important to provide an opportunity for board members to build a shared understanding of the risks associated with the company's operations. This would help them identify actions which would improve process safety throughout the organization. Following discussion with lead companies the key objectives for the course were identified as:

- developing the board's understanding of the principles of process safety management, of human factors and how the safety culture affects performance
- ensuring board awareness of the process safety hazards of the business and of their role in managing these hazards
- identifying the methods used to inform the board of the status of process safety across the company
- exploring how the board's commitment to process safety is disseminated throughout the company and by the contractors employed in its operations

The structure provides the board & executives with an opportunity to share perceptions and discuss the potential impact of different courses of action, creating a better team understanding of the issues they face.

5. Course Structure & Content

It was decided that the course should provide a broad understanding of the basic principles of Process Safety management in order to raise overall competence. However there are many aspects of process safety and, in the limited time available, it is important to concentrate on the ways in which the work of the board can affect the company's standards, culture & performance. As was identified in the Baker Report, leadership and culture and monitoring and assurance are important topics on which the board should focus its attention.

It was recognized that in order to maximize value, there would be a need to provide plenty of opportunity to discuss the application of the principles to the company concerned.

An important part of the training provided by IChemE is a structured pre-meeting with the company's senior manager responsible for process safety. This ensures an understanding of the company's activities and the hazards associated with these as well as any specific concerns which need to be covered during the course. In addition it provides an understanding of process safety initiatives already underway in the company. Experience has shown that a meeting of this type greatly increases the effectiveness of the course. It generally takes 4-6 hours and should take place at least four weeks before the course. Where travel costs are high a teleconference may be appropriate.

5.1 Day One - Introductory session

In order to allow enough time to consider company specific issues and to develop action plans the courses start with a late afternoon/ evening session of about four hours led by the course tutors. This session uses case studies to demonstrate the impact that a major incident can have on the company's reputation and finances as well as the ways in which process safety can be affected by the relationship between the company and its contractors. This session has served to bring the topic to life and to illustrate the wider implications of a major accident, promoting discussion between board members.

5.2 Second Day

The next day, the following topics are covered:

- Development of a shared understanding of the hazards associated with the business and of their potential consequences.
- The principles of Process Safety Management including hazard identification, the 'Barrier Model' and methods of risk assessment
- The mechanisms used by the board, including auditing and key performance indicators (KPI) etc., to ensure that the risks are being properly managed
- Safety culture, leadership and the ways in which the board ensures that a commitment to process safety is communicated throughout the company

Throughout the courses considerable time is made available for facilitated discussion and the development of action plans specific to the needs of the company. This is assisted by using a team of two tutors to deliver the courses, one with a sound knowledge of process safety and the other a 'facilitator' used to working with senior management groups.

The courses end with a session to identify actions and responsibilities, this ensuring that the material becomes grounded in pragmatic outcomes and builds a sense of commitment to make use of the insights gained throughout the course.

6. Experience to Date

At the time of writing the course has been delivered to five major companies:

- Energy Solutions, UK subsidiary of an American company responsible for the operation and decommissioning of the UK's Magnox nuclear power stations
- Rolls Royce Marine Power, responsible for the development of marine nuclear power plant.
- National Grid; responsible for LNG import into the UK as well as gas transmission and distribution across the whole of the UK.
- Synthomer (previously Yule Cato) a specialty chemical manufacturer with facilities in the UK, Germany and Asia.
- OMV, an international oil & gas production company based in Austria.

In all cases the course was attended by board members and other senior executives, including where possible non-technical functions such as company secretary, finance director & human resources.

The Institution also has experience of delivering courses restricted to one day and whilst these are able to cover the technical material the opportunity to explore company specific issues is greatly restricted and the one day plus evening format is much preferred.
The course addresses many common issues and reinforces best practice in process safety management. A common area of interest is the establishment of relationships between the company and its contractors which could form a basis for high standards in process safety performance. Many other issues are identified which are particular to the company concerned – for example, in one case the need for a clear understanding of the differences between managing process safety as distinct from product safety.
All companies have commented on the value of the course which resulted in the creation of a shared understanding of the issues likely to be encountered in meeting changing business direction and priorities and worldwide skills shortages.

7. Recent Developments & OECD Guidance

The course aims and content have been shared in the UK with the Environment Agency and with senior members of the HSE who have given strong support for its further development and application in other companies where the management of process safety is important. The experience gained above has given the Institution the confidence to promote the course more widely, initially with companies in the energy and chemical sectors.
More recently the OECD Working Party on Chemical Acidents has issued its document, 'Corporate Governance in Process Safety, Guidance for Senior Leaders in High Hazard Industries'. The structure of OECD enables it to draw together representatives from industry and regulators in both developed & developing countries. This is the first international guidance which concentrates on corporate responsibility and has received strong support since its publication. The document outlines requirements under the following headings:

- Risk Awareness
- Information
- Competence
- Action,

all of the above being driven and facilitated by Leadership & Culture.

The OECD guidance represents an important step in the improvement of corporate understanding of process safety, however IChemE experience has demonstrated that it is unlikely that change will occur unless board members and senior staff can be brought together to consider the implications for the company for which they are responsible. In order to do this changes have been made to the IChemE course to align it with the OECD guidance. The first courses with this new structure have been completed at the time of writing and results will be reported at the symposium.
Linking the latest version of the course to the OECD guidance on Corporate Governance will help to provide a more consistent international approach, whilst building on the experience gained from earlier courses run by the Institution.

8. Conclusions

Events over the last few years have demonstrated the need for greater understanding of Process Safety at board level. The course developed by the Institution of Chemical Engineers is a way of addressing this issue. It provides a basic level of understanding of modern process safety management and focuses in more detail on those topics which are of key importance to senior executives and the board. It also provides a forum for building a common understanding of the process safety issues faced by the company and what can be done in the future to maintain and improve performance. The course structure is completely compatible with the OECD guidance on 'Corporate Governance in Process Safety'.
It is planned to make the updated programme available to more companies in the energy, chemical and nuclear sectors.

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