

Sustaining effective corporate governance in process safety across global manufacturing sites

Dr Julian Hought and Dr Andrew Fowler, HFL Risk Services, Freeman House, Denton Manchester, UK

Investigations into recent incidents such as those at BP Texas City (U.S. Chemical Safety and Hazard Investigation Board, 2007) and Buncefield (HSE, 2008) have resulted in calls for much greater emphasis on process safety management when managing risks at hazardous installations. All too often it has been found that major accidents have been attributed to poor management systems that have evolved in the presence of weak process safety leadership and an inadequate process safety culture.

Achieving good corporate governance in process safety in the current climate can be difficult, where de-layering and downsizing of departments, company reorganisations, acquisitions and divestitures are commonplace, and where a common understanding of the critical systems necessary for maintaining safe and reliable operation are often lacking.

Board members and senior management are ultimately responsible for plant safety and it is their opinions and collective behaviours that will determine the culture and set the course for success or failure. Process safety culture is the combination of group values, attitudes, behaviours and competences that determine the manner in which process safety is managed.

At the detailed level, there are multiple reasons why major accidents occur, relating to plant, process, procedures and the failures of people at all levels of the organisation. Whilst the immediate causes might lie in equipment malfunctions or errors made by frontline staff, the underlying causes are usually rooted in poor policy, lack of direction and gaps in the deployment of essential underpinning safety procedures.

Since the process safety culture of an organisation directly affects how risk control issues are approached and hence the outcomes, it is important for organisations to foster a positive culture throughout, by leading from the top, setting standards and engaging everyone. The challenge is greater for global companies operating across different geographical regions, where legislation and attitudes to risk may vary.

Using examples, this paper discusses how a sustainable and effective process safety management strategy can be cascaded down to individual sites across different regions using policy deployment to meet both the requirements of local legislation and the needs of the business overall. It considers issues around regional directives and local regulations, the need for compliant yet sustainable solutions, and the demands of the business in an environment where manufacturers are continually under pressure to reduce costs, and society as a whole has an ever decreasing appetite for risk.

Keywords: corporate governance; process safety, directors' responsibilities; culture; management; continuous improvement;

Corporate Governance

Before looking at corporate governance in process safety we must first understand what corporate governance is and more importantly what it is that drives company directors to take the decisions they do on a day-to-day basis. Primarily, the board of any company will be focussed on setting and delivering to the strategic aims and objectives of the business, responding to changing market conditions, to continually strengthen performance and profitability, and to maximise the return for shareholders. In the financial world, however, profits are to some extent the return for successful risk-taking and so the challenge for the board is to make valued judgements, based on all of the risks, for the long-term success of the business.

The Financial Reporting Council (FRC) is the independent regulator responsible for setting and raising standards in corporate governance in the UK. It does this, in part, through the UK Corporate Governance Code (FRC, 2012). The current version of the Code provides best practice guidance to company directors on the control and reporting functions of company boards and on the role of auditors in looking after the interests of shareholders. The Code is not prescriptive, more a set of guiding principles and provisions setting out best practice, based on a stated need for accountability, transparency and probity. Publicly listed companies in the UK are required to comply with the Code or explain why they have not under the 'comply or explain' principle, a principle which is widely respected internationally, but non-listed companies can equally benefit from its application.

Like much of the guidance on process safety, the Corporate Governance Code has evolved over time, largely in response to a series of disasters and high profile investigations. The first version of the Code was published in the report from the Corporate Governance Committee in 1992 (The Cadbury Committee, 1992), in response to concerns over financial reporting and accountability following the BCCI and Maxwell scandals. Further guidance on review of, and reporting on, internal controls came into being with the publication of the Turnbull Report (Turnbull Committee, 1999) and the principles-based approach first adopted by the Code was further endorsed by the Turnbull Review Group in 2005 through publication of The Revised Guidance for Directors on the Combined Code (FRC, 2005).

The current Code still advocates the definition of corporate governance first published in its original incarnation in 1992:

“Corporate Governance is the system by which companies are directed and controlled. Boards of directors are responsible for the governance of their companies. The shareholders' role in governance is to appoint the directors and the auditors and to satisfy themselves that an appropriate governance structure is in place. The responsibilities of the board include setting the company's strategic aims, providing the leadership to put them into effect, supervising the management of the business and reporting to shareholders on their stewardship.....”

In chemical manufacture, storage and handling, potential loss of containment of hazardous materials or energy arguably poses the single largest business risk. The cost resulting from forced downtime, compensation claims, fines, clean-up costs and rebuilding can

be high but the impact on the business in the worst case scenarios where loss of life or widespread destruction of the environment occurs can be catastrophic. The likely impact of such events on employees and people in the neighbouring communities, and other supporting or reliant businesses can also be significant. The loss of hard gained local, national and international reputation of the company may be very difficult to regain. The potential follow-on costs associated with plant upgrades, improvements to management systems and standards, and organisational changes for companies in the wake of a major accident will also factor heavily. When viewed this way, making process safety a priority can be seen as safeguarding the business itself and not just protecting people and the environment. But company boards are required to strike a practical balance to ensure appropriate and proportionate allocation of resources to manage health and safety risks without over-burdening the business. Further, managing process safety risks can be particularly difficult because the focus is on prevention of major accidents that, although potentially catastrophic, are rare events that are seldom if ever experienced in a person's lifetime.

Fortunately, the process industry has been active in the development of guidance and sharing of knowledge. The UK Health & Safety Executive (HSE) publishes process safety guidance in abundance on its website and the UK trade associations have also been active in developing sector specific guidance for their own members.

More relevant to internal controls, perhaps, the US Centre for Chemical Process Safety (CCPS) has published its Guidelines for Risk Based Process Safety (CCPS, 2007). The 20 elements covered by the guidelines reflect on 15+ years of process safety management implementation experience, best practices from a variety of industries, and worldwide regulatory requirements. The Energy Institute has published a similar framework, albeit with less substantive guidance, in the form of its High Level Framework for Process Safety Management (EI, 2010). Broadly speaking, both frameworks cover compliance (i.e. with legislation, codes and standards), engagement of the workforce and stakeholders, the need for appropriate risk assessment and process safety documentation, the control systems necessary for managing risk, and the need to learn from experience. If properly applied, the guidance can be used to strengthen internal controls and minimise risks to business from process safety related events.

Aligning process safety management to Internal Controls

Whilst most board members will no doubt appreciate the need to effectively manage occupational health and safety, cost, quality and delivery of products and services, and therefore the need for efficient processes, reliable plant and equipment, and competent people, the measures necessary for managing process safety risks will often be less apparent. The difficulty that individual board members can sometimes have in fulfilling their duties, from a process safety perspective, is that it can be difficult for those from non-technical backgrounds to see the links between the internal controls advocated by the Corporate Governance Code and the detailed technical measures necessary for managing process safety risks. For example, it is only when one has knowledge of the safety critical assets and an appreciation of how they can degrade over time that the need for complex and often expensive intrusive inspection and testing becomes apparent and justifiable, or that extensive training and retraining is not only essential for those involved in operation of critical process systems but also for those involved in inspection and maintenance where failure to follow procedure could result in catastrophe.

In 2011, HFL Risk Services, together with the Chemical Industries Association (CIA) and the National Skills Academy for the Process Industries (NSAPI) embarked on what was the first ever process safety management benchmarking programme for UK sites regulated under the Control of Major Accident Hazards (COMAH) Regulations. The benchmarking exercise, which had the support of the HSE, compared approaches to asset integrity management at 12 COMAH sites against criteria based on the CCPS Guidelines for Risk Based Process Safety (CCPS, 2007) and the requirements of COMAH (HSE, 2006 and 2010), mapped against the model given in HSE's guidance document HSG65 (HSE, 1997). The results of the study were published in *A Benchmarking Study on Asset Integrity and the Issues of Ageing Plant in the UK Chemicals Industry* (Hought J. & Fowler A., 2012).

The study focussed on the systems, practices and procedures in place for preventing loss of containment and so was limited to consideration of: primary, secondary and tertiary containment systems; support structures; and protective devices (including Safety Instrumented Systems). The study did not consider reliability aspects, for example in relation to rotating equipment or electrical equipment generally.

The study revealed a clear need for businesses to set their own policies covering process safety management to allow them to set out their own programmes of work aligned to standards, risk and the business case, rather than allowing systems to develop through interventions by the regulator. As a result of the lack of policy, weaknesses were to be found in the organisational and planning and implementation arrangements in place, and therefore a lack of corresponding measurement metrics and monitoring systems to drive improvement towards meeting the needs of the business.

The findings from the study support the assertion made earlier that it is difficult for board members, especially those from non-technical backgrounds, to see the links between the internal controls necessary for corporate governance and the technical measures necessary for managing process safety risks. It concluded that there was generally a lack of detail in high level policies covering asset integrity management and organisations were, in the main, allowing themselves to be regulated into rather than setting out their own programmes of testing and inspection. But self-regulation, led from the top, would give sites greater clarity on what needed to be done, where and when, in accordance with budgets to achieve business aims.

The UK benchmarking study was followed by assessments at other hazardous installations both in the UK and Europe for asset integrity management, culture, and organisational competence. The findings relating to setting and deployment of policy were consistent with those of the initial study, further supporting the need for alignment of process safety initiatives and corporate objectives (Grindrod S., Hought J. & Fowler A., 2013).

If this problem is to be resolved then the systems, procedures and practices in place for management of process safety risks must be treated as a subset and an integral part of the internal controls necessary for good corporate governance under the Corporate Governance Code.

In order to help illustrate the point, some of the main principles set out in the Code, which are particularly relevant to process safety management, are given in Table 1. Considering the main principles further, we can draw the following parallels on the responsibility of the board under the Code against those for process safety leadership and management.

Leadership

In order for the board to look after the long-term success of the company, it must set policy based on an understanding of the process hazards and risks posed by the company's operations and also the financial implications for a major accident resulting from harm to people, the environment, business interruption, loss of business due to damage to reputation and image, etc. The board must also be clear in communicating the aims and objectives of the policy, ensure that appropriate resources are deployed and have meaningful information on the effectiveness of systems in place for managing process safety.

Following publication of the findings of the Buncefield Major Incident Investigation Board (HSE, 2008), and recognising the critical role that industry leaders have to play in improving process safety, the Process Safety Leadership Group (PSLG) was quick to develop its own guiding principles for process safety leadership (HSE, 2009).

The National Skills Academy for the Process Industries (NSAPI) has also been instrumental in promoting awareness of process safety issues at board level. With the help of an Expert Panel comprising representatives from key stakeholders groups (including the authors of this paper), the Academy led the development of a new training standard for Process Safety Leadership (Cogent SSC Ltd, 2011), which was shortly followed by the launch of The UK Strategy for Skills in Process Safety Management (Cogent SSC Ltd, 2012). The leadership training course covers the nature of major accidents, the business case for effective process safety management and information to support the PSLG leadership principles. As a result of this programme it is estimated that over 500 executives and senior managers will have undertaken PSL training by the end of 2013.

Effectiveness

Management systems and procedures depend upon the actions of individuals and groups for their successful implementation. For example, a procedure may properly reflect the desired intent and be adequately detailed in its instructions but the successful execution of the procedure requires the actions of properly trained individuals who understand the importance of the underlying intent, who accept their responsibilities for the task, and who appreciate that taking a short cut would be inconsistent with the values within the organisation.

The effectiveness of the board will therefore not only depend on its ability to communicate the aims and objectives of policies but also on the abilities of its members to understand technical details relating to the measures in place for managing process safety risks. This must include an ability to understand the importance of the key Risk Control Systems in place for maintaining safe and reliable operation and an ability to interpret data relating to the ongoing effectiveness, or otherwise, of those systems. This means that the board must understand how to set and use key performance indicators to monitor performance and drive the behaviour of those operating the systems, in those areas where systems are weak, in a way that leads to continually improving performance.

The HSE has published guidance on the development of process safety performance indicators in its guidance document HSG 254 (HSE, 2006). The document explains how to monitor the performance of critical elements of key Risk Control Systems using a dual assurance approach based on leading and lagging indicators but development still requires technical insight.

Accountability

Board members are ultimately responsible for plant safety and so it is not only important for them to have a good understanding of how the Risk Control Systems in place operate, but also it is vital that they continue to demonstrate the value of such systems through their own individual attitudes and behaviours. For example, any positive steps to tackle ageing plant issues will soon be undermined if vital test equipment is not provided or inspection of critical plant and equipment is delayed in favour of production demand.

The board should also be capable of understanding the results of audits and assessments, looking at the general condition of plant and equipment, any significant gaps in process technologies with accepted good or best practice, and significant weaknesses in the ability of the organisation (both competence and resource based) to carry out safe operation and maintenance of the facilities under its control. This aspect is not only essential from a process safety perspective but essential in understanding the potential for escalating costs and the financial viability of hazardous processes going forward.

Relations with shareholders

Open and effective communications must take place between the board and principal shareholders. The board must be able to explain any significant process safety risks together with the financial implications for the business should a major accident occur. Any assessment of significant future financial implications for the business relating to compliance with current and/or emerging legislation or standards should also be communicated.

Table 1. Some of the Main Principles from the UK Corporate Governance Code relevant to Process Safety (*Financial Reporting Council Limited, 2012*)

SECTION	MAIN PRINCIPLE	REQUIREMENT
A: Leadership	A.1: The Role of the Board	Every company should be headed by an effective board which is collectively responsible for the long-term success of the company.
B: Effectiveness	B.1: The Composition of the Board B.4: Development B.5: Information and Support	The board and its committees should have the appropriate balance of skills, experience, independence and knowledge of the company to enable them to discharge their respective duties and responsibilities effectively. All directors should receive induction on joining the board and should regularly update and refresh their skills and knowledge. The board should be supplied in a timely manner with information in a form and of a quality appropriate to enable it to discharge its duties.
C: Accountability	C.1: Financial and Business Reporting C.2: Risk Management and Internal Control C.3: Audit Committee and Auditors	The board should present a fair, balanced and understandable assessment of the company's position and prospects. The board is responsible for determining the nature and extent of the significant risks it is willing to take in achieving its strategic objectives. The board should maintain sound risk management and internal control systems. The board should establish formal and transparent arrangements for considering how they should apply the corporate reporting and risk management and internal control principles and for maintaining an appropriate relationship with the company's auditors.
E: Relations with shareholders	E.1: Dialogue with Shareholders	There should be a dialogue with shareholders based on the mutual understanding of objectives. The board as a whole has responsibility for ensuring that a satisfactory dialogue with shareholders takes place.

Principles based Policy for Process Safety

A risk based approach to process safety should recognise that all hazards and risks are not equal; consequently it should serve to focus more resources on higher hazards and risks. The aim is to put just enough energy into each activity to meet the anticipated needs for that activity, based on agreed acceptance criteria. In this way, limited company resources can be optimally apportioned to improve both facility safety performance and overall business performance.

Efforts to improve safety must therefore be based on: an understanding of the hazards and risks of the facilities and their operations; an understanding of the demand for, and resources used in, process safety activities; and an understanding of how process safety activities are influenced by the process safety culture within the organisation.

Good process safety management requires an organisation to consistently perform when:

- defining acceptable operating envelopes for all critical components of the process;
- maintaining the process conditions within these envelopes;
- understanding the impact of excursions;
- maintaining and testing equipment and preventative and protective devices;
- maintaining operational discipline and compliance with procedures; and
- managing changes.

Process safety management can therefore be thought of as a high integrity management system focused on the critical plant, equipment and processes, however they may be defined. Whilst legislation and the approach to regulation of high hazard sites may vary around the world, the fundamental requirement to maintain containment remains the same.

Recognising the need for compliance at a local level and the need to maintain containment of hazardous substances and/or energy means that providing a principle based approach is used to set policies then they can still be set centrally and adhered to regardless of region. For example, in considering inspection, testing and preventive maintenance of assets, one could expect to see consistency in approach to:

- registration of assets and identification of those covered by specific local legislation and/or deemed important to maintaining safe operation and/or to the business;
- identification of safety critical assets using formal techniques;
- use of appropriate inspection, testing and maintenance plans and procedures for all relevant assets, based on known degradation mechanisms and anticipated failure modes;
- use of competent personnel for undertaking any inspection, testing and planned maintenance; and
- use of key performance indicators to show that the system is effective.

The purpose of the inspection, testing and maintenance programme (the Asset Integrity Management Programme) is for ensuring assets continue to perform their required function and to maintain the design intent. Such a system, however, should not only serve to protect the health and safety of employees, members of the public and the environment, it should also help to minimise production outages due to breakdowns. It achieves this by providing the means to ensure that the necessary people, systems, processes and resources are in place and directed appropriately as conditions change over time. The prioritisation process is used to determine where and how resources will be allocated and so it is essential that all those involved understand the basis on which priorities are to be set and the implications for the business.

Policy Deployment

The process safety policy statement should set out the key principles governing the process safety management programme, stating clearly the organisation's regulatory and corporate requirements. In addition to meeting the requirements of specific regulations, the policy should cover, as a minimum, the organisation's approach to:

- hazard identification and risk assessment, setting clear tolerability criteria based on recognised guidance and company standards;
- compliance with legislation, codes, standards and generally accepted good practice principles;
- process safety information management;
- organisational competency management;
- appropriate use of systems and procedures for safe operation and maintenance of process plant and equipment, including management of change and emergency response; and
- training.

The policy should clearly set out the company's position on tolerability of risk and the use of risk assessment for identification of critical equipment to allow prioritisation and appropriate allocation of resources. This means that the risk assessment process should consider, in addition to risks to people and the environment, other types of loss that can be more difficult to quantify, for example, business interruption, loss of good will within the community and damage to reputation and image.

The policy should also assign specific responsibility for all activities associated with delivery of the defined programme, from boardroom to supervisory level. Only by doing this can the company achieve alignment against its corporate targets and objectives.

In accordance with both the UK Corporate Governance Code and the PSLG principles, the board must be provided with information in a form and of a quality appropriate to enable it to discharge its duties. The challenge for many companies is one of how to set an appropriate number of indicators to facilitate monitoring without creating cognitive overload for those involved. In truth, whilst performance indicators should be used to drive behaviour and improve standards at the detailed level, the board will have many different business issues to contend with on a daily basis and so it is desirable to allow it to manage by exception, triggering appropriate action at the right time but only when it is needed. Using asset integrity management as an example, one could expect to see:

Organisational level metrics set based on corporate goals to provide assurance that the programme is continuing to operate as intended, which might include the:

- ratio of overdue inspections on critical items of plant and equipment (may include process safety and business critical plant and equipment);
- backlog of required repairs to critical assets; and
- number of near miss reports raised for failure of assets in service, even where there has been no loss of containment.

Site level metrics specific to each installation to drive behaviour at a location towards achieving and/or maintaining the corporate aims and objectives (they will include corporate metrics but these may themselves incorporate data from a number of sources), which could include the:

- ratio of breakdown maintenance to planned preventative maintenance on critical plant;
- number of operations of critical trips, PSVs, bursting discs, etc.;
- trips/devices found on test/examination to be not functioning correctly (e.g. fouled PSV);
- number of tests/examinations done by due date;
- number of near miss reports raised for failure of assets in service;
- percentage of overdue planned preventative maintenance tasks;
- number of temporary repairs currently in service;
- number of deferred repairs;
- average time to address/correct deficiencies; and
- number of planned preventative maintenance tasks that uncover a failure.

Plant level metrics set to drive behaviour and monitor performance at a more local level. They may include those for the site or installation but should be designed to show whether or not specific management processes within the plant are operating as originally intended, e.g. progress against inspection plans, operation of critical trips, failure of protective devices in service, etc.

Equipment level metrics to provide very specific information focused on the performance of safety critical equipment, e.g. adherence to equipment specific procedures for examination and testing, etc.

Conclusions

Considering the requirements of the UK Corporate Governance Code (FRC, 2012) against the Principles of Process Safety Leadership set by the PSLG (HSE, 2009) and the guidance provided by key stakeholder groups, and especially the process safety management frameworks and guidance provided by the Center for Chemical Process Safety (CCPS, 2007) and the Energy Institute (EI, 2010), there is no good reason why organisations should have difficulty in creating management alignment, i.e. alignment of process safety targets with corporate aims and objectives. Only when this has been achieved can process safety management be regarded as an integral part of daily business management.

However, it is clear from the results of extensive benchmarking studies (Hought J. & Fowler A., 2012 and Grindrod S., Hought J. & Fowler A., 2013) that barriers exist, resulting in a general lack of detail in high level policies covering process safety management and by not having clear policies in place, companies are allowing themselves to be regulated into rather than setting out their own programmes of work.

One of the major responsibilities of a good and strong leadership is for it to recognise that people, at all levels in the company, are its most important asset. Their loss, due to poor leadership, could prove catastrophic. Safety Culture needs to be developed; it may be slow in developing, but has to be driven from the top. Responsibility for management should only be given to those who demonstrate effective leadership in their role or function.

Leadership and a commitment to process safety management, prioritised on the basis of risk to the business, with clear policy aims and objectives and a fundamental understanding of what success looks like, will result in sustainable, continuously improving business performance. This is simply the implementation of best accepted management practices, already undertaken by many companies with regard to other aspects of the business, in a process safety setting.

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