High reliability organisations and mindful leadership

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Leadership is recognised as an essential part of the control of major hazards and is highlighted as such within the HSE Hazardous Installations Division regulatory model, onshore and offshore. The recent offshore HSE key programme (KP4 inspection programme) on ageing installations also emphasises the importance of leadership, and the need to adequately manage 'creeping change' within an ageing installation.

The aim of this paper is to illustrate how high reliability organisations (HROs) and mindful leadership can optimise process safety management and accident prevention. Organisations operating in critical environments such as chemical industries have to be proactively vigilant to emerging threats and to contain errors or incidents to prevent them from escalating into major incidents. These reflect the high reliability principles of anticipation and containment. The assumption is that by adopting these principles, HROs are creating a collective state of mindfulness to enable them to manage the unexpected. Focusing on both collective mindfulness and mindful leadership might bring greater benefits for employees, leaders and organisations.

The paper includes the following themes:

An introduction to mindfulness and HROs highlighting principles of anticipation and containment which include: preoccupation with failure; resistance to simplification; sensitivity to operations; commitment to resilience; and deference to expertise.

The need for mindful leadership in the context of HROs and process safety.

Insights from HSL's analysis of the offshore KP4 programme on ageing installations, including mindful leadership as a potential organisational antidote to 'creeping change' in both process equipment and safety culture.

Examination of the work carried out by the Health and Safety Laboratory (HSL) with a global manufacturer of oleochemical products to examine how the HRO principles were operated in practice.

HRO, mindfulness, leadership, process safety, culture, resilience

Introduction

Leadership is recognised as an essential part of the control of major hazards and is highlighted as such within the HSE Hazardous Installations Division regulatory model, onshore and offshore. The recent HSE offshore Key Programme 4 (KP4), an inspection programme on ageing installations outlined the need for those in leadership role to adequately manage 'creeping change' within an ageing installation. Organisations operating in critical environments have to be proactively vigilant to emerging threats (e.g. and to contain errors or incidents to prevent them from escalating into major incidents. Scholars (e.g. Weick and Sutcliffe, 2007; Hopkins, 2009, 2011) have suggested that high reliability principles of anticipation and containment can optimise accident prevention. These principles carry the assumption that by creating a collective state of mindfulness, organisations will be better able to anticipate and manage the unexpected.

We explored how the HRO principles that enable collective mindfulness were applied in practice to process safety through two case studies. One case study relates to the offshore KP4 programme on ageing installations, showing how HRO principles and mindful leadership can act as a potential organisational antidote to 'creeping change' in both process equipment and safety culture. The second case study highlights how the HRO principles are understood by managers and perceived to be applied within a global manufacturer of oleochemical products present in more than 30 countries. Suggestions for improving current health and safety related work practices are discussed.

Theoretical background

Mindfulness and High Reliability Organisations

Mindfulness can be understood as the quality individuals bring to attention and awareness of themselves, their actions, and their environment. There is more vulnerability to errors when individual attention is scattered, distracted, short lived, and dominated by abstractions (Sutcliffe, 2012). This vulnerability predisposed individuals to misestimate, misunderstand and misspecify what they think they face (Weick and Sutcliffe, 2007). Distractions come from associative thinking ("That reminds me of the time when…") which draws attention away from the present moment, away from making a necessary change, and substitute abstract ideas (or assumptions based on past experiences) for noticing concrete details of the present situation (Weick and Sutcliffe, 2007). Mindfulness in the context of safety requires a continual refinement and update of individual expectations, assumptions and beliefs (Sutcliffe, 2012) to assure each situation is viewed as objectively as possible. This is what people and processes within HROs attempt to continually cultivate.

HROs are organisations dealing with high hazards environments and complex technologies. They have operated nearly error-free for very long periods of time, are not disabled by errors, have capacity to maintain or regain a stable state. They cultivate an informed culture which includes a reporting, just, flexible culture (Reason, 1997). Lekka (2011) and Saw (2010)

also highlighted HRO continuous improvement through a proactive culture of learning and sharing. Organisations which have on-going reliable and safe performance such as HROs spend more time on these characteristics than other organisations to get a clear comprehension of emerging threats (Weick and Sutcliffe, 2007).

The processes that HROs have in place may increase individual awareness and also create a state of 'collective' mindfulness. Collective mindfulness is seen through the capacity of HROs to anticipate and contain the unexpected. *Anticipation* focuses on prevention of disruptive unexpected events. Unexpected events can develop despite effort to spot weak signals, and monitor operations. Therefore attention shifts to *containment* based on resilient capability and appropriate expertise to limit unwanted outcomes when incidents occur.

Looking at more closely what anticipation and containment meant, Weick and Sutcliffe derived five key principles which include: i) preoccupation with failure; ii) resistance to simplification; iii) sensitivity to operations; iv) commitment to resilience; and v) deference to expertise.

*Preoccupation with failu*re has to do with tracking all failures especially in conditions of missed steps in a procedure, staff spread too thin, or changes in supervision. It is about seeking out weak signals, taking near miss as evidence of failure rather than success; making possible safe reporting of near miss and incident and rewarding reporting; promoting a just culture.

Reluctance to simplify or resisting simplification is about making people notice more their initial impression rather than labelling/categorising too quickly an event; questioning assumptions; listening to sceptics; using H&S reviews, non-typical experience in recruits, frequent job rotation, and retraining to challenge habits.

Sensitivity to operations has to do with attention to front line, workloads, deviations and routines. Management is visible on site. Having an integrated big picture of ongoing operations is key. To counter the threat of the 'objective' engineering culture, there is the need to have continuous conversation to counter risks that designs have not anticipated.

The next two principles related to containment whilst the previous ones related to anticipation.

Commitment to resilience is the ability to bounce back from errors and coping with surprises in the moment. System/people need to be well prepared to react swiftly; and absorb strain under adverse conditions. Training, competency, capability building, proactive management practice are key.

Deference to expertise suggests a preference for seeking expertise rather than the view from a higher rank. Organisational decision structures are fluid, and expertise is said to be relational as much as residing in one particular individual (the expert). Diverse views are sought to inform and update expertise.

HROs processes can optimise anticipation and containment as well as people working in HROs at all levels but especially at leadership level by cultivating attentional mindful qualities. This is particularly important in process safety.

Process Safety Leadership

The need for strong process safety leadership has been a theme following a number of major incidents, including the explosion at BP Texas City and at Buncefield UK. Hackitt (2013) stated that organisational culture is defined by the tone of the questions that are asked from the top. Process safety leadership differs from that which would be adequate in an organisation that could not give rise to major accident hazards. Understanding, ownership and responsibility for the prevention and control of potential major accident hazards are particularly important. OECD (2012) published guidance for senior leaders in high hazard industries that includes a list of self-check questions to be answered by Board members and senior managers:

- Do you know what the major accident risks are for your organisation?

- Do you know what your main vulnerabilities are?

- What are you doing about them?

- How concerned are you about the level of risk?

- How confident are you that all safety systems are operating as they should?

- Do you seek out bad news as well as good news?

- If there's an accident/incident who do you blame?

- Are you doing all that you can/should to prevent a major accident?

In the UK, HSE guidance was issued on process safety leadership for senior managers (HSE, 2011) and a competency framework was developed (Cogent, 2011). The Process Safety Leadership Group (PSLG), that was set up after the Buncefield incident, published and signed up to a set of principles of process safety leadership. These principles are:

- Clear and positive process safety leadership is at the core of managing a major hazard business and is vital to ensure that risks are effectively managed;

- Process safety leadership requires board level involvement and competence;

- Good process safety management does not happen by chance and requires constant active engagement;

- Board level visibility and promotion of process safety leadership is essential to set a positive safety culture throughout the organisation;

- Engagement of the workforce is needed in the promotion and achievement of good process safety management;

- Monitoring process safety performance based on both leading and lagging indicators is central to ensuring business risks are being effectively managed;

- Publication of process safety performance information provides important public assurance about the management of risks by an organisation; and

- Sharing best practice across industry sectors, and learning and implementing lessons from relevant incidents in other organisations, are important.

While the above focusses on leadership by senior managers and Board members, it also reflects the need for the key messages to cascade down to all levels of management and to the workforce. The safety management system (SMS) provides the nuts and bolts for this and for organising to achieve process safety. In addition a framework for the management of process safety/ major accident hazards is provided by the HSE HID regulatory model (HSE, 2013). This clearly shows leadership as the driver for ensuring that each major accident hazard has multiple layers of controls that are specific to the particular hazards of the site or installation.

Wilday (2009) discussed the relationship between process safety leadership and learning organisations (an attribute of HROs) and emphasised that leadership needs to achieve a combined top down-bottom up process for proactive implementation and improvement of process safety at all levels within the organisation (including worker involvement and empowerment).

Process safety leadership needs therefore to:

- Provide clear messages about the importance and priority of process safety

- Promote and maintain an appropriate organisational safety culture

- Engage the workforce and all levels of management to devise, provide and implement the risk controls that comprise the safety management systems.

Mindful leadership

Much has been written about *what* is needed to be a good leader. In terms of process safety leadership this includes acting consistently and congruently to demonstrate and insist on high standards of process safety (HSE, 2011). Less has been written about *how* to achieve it in this context, and it is not easy in a climate of conflicting priorities and time pressures. According to Weick and Sutcliffe (2007), some of the mindful leadership characteristics for the management of high hazards environments can be derived from the HRO principles. They are by no means exhaustive and can include:

- The need for the leader to clarify whether a near miss is a system's safeguard or sign of vulnerability; what constitutes 'good news', show tolerance for bad news, and create awareness of vulnerability. Encouraging reporting of near miss and incidents is key to learn from these events. This will contribute to developing preoccupation with failure in their teams.

- To resist oversimplification, the leader has to raise doubts to get information; know how to handle disagreement or look for conflicting views rather than avoiding or repressing them; treat all unexpected events as information.

- To increase sensitivity to operations, a mindful leader will encourage people to speak up even if sometimes work activities may be disrupted; to encourage sceptical views in workers, and give meaningful briefings.

- When committed to resilience, the mindful leader will treat past experience with ambivalence, i.e. avoid overestimating the value of past experience; combat habits; accelerate feedback and develop/refresh competencies.

- Deference to expertise will be cultivated by the leader making sure decisions are taken where it makes more sense. The leader will also try to boost people imagination for managing the unexpected (where problems are usually unlikely to arrive but can arise) and enhance workers/ experts' self-awareness with regard to safety matters.

- Mindful leaders foster a climate where safety is prioritized and more importantly where meaning and purpose for safety are constantly integrated in actions, decision processes and communications.

This theoretical framework underpins the case studies on creeping change and on implementing HRO principles.

Case study 1: Mindful leadership to address 'creeping change' and other major accident hazards within offshore installations

'Creeping change'

Creeping change relates to a build-up of small changes which can add up to a major change. These changes are gradual, unplanned and unseen in nature and therefore have gone largely unnoticed and have not been picked up by any hazard analysis or risk assessment (Goff, 2015). The need to address creeping changes in ageing offshore oil and gas installations was a finding of the KP4 programme (HSE, 2014).

While the effects of creeping changes are rare, the impact tends not to be inconsequential, and creeping changes have, in part, been evident in some major accidents (e.g. RAF Nimrod incident 2006 in which fuel leaks during air-to-air refuelling had become commonplace and accepted – a creeping change - until an explosion occurred with the loss of the crew). By its very nature it is difficult to monitor creeping change and take the necessary action to prevent a major incident. The first step is to identify the creeping changes, and this is where mindfulness can play its part as it increases the ability to notice and provides a heightened situational awareness. Noticing creeping changes is needed before these become embedded.

The need for mindful leadership in process safety

The possibility that mindful leadership may tackle the issue of creeping change was raised at recent HSL-led workshops for the offshore industry in Aberdeen, which followed up on the findings of HSE's ageing and life extension programme (KP4) initiative As described by Goff (2015), the participants identified a number of creeping changes that were within their experience of ageing offshore installations. The feedback received from participants during these workshops indicated that mindful leadership could effectively address creeping change.

Hopkins (2011) describes a situation hours before the Deepwater Horizon blowout where four members of senior management (VIPs) with experience and knowledge of the offshore industry, through their previous roles as drilling engineers or rig managers, visited the rig in the time (hours) before the blowout. During this time there were several indications (warning signs) that the well was not under control. Unfortunately although the focus of the visit was primarily to emphasise the importance of safety, the visitors paid scant attention to major hazard safety indicators (e.g. the progress of safety critical activities that are characteristic of major hazards), while on the rig.

If the attention of the visitors was not focussed on major hazards and associated hazards, what was it focussed on? Examples include checking that the harness tests were up to date, that a certain slip hazard had been remedied and whether housekeeping was up to date. These are all conditions, which are relatively easy to audit because they tend to remain fairly static over time, compared to observable human behaviours, such as compliance with procedures - procedural drift being an example of creeping change (Goff, 2015).

A safety critical activity that was at the centre of the drilling operations when the VIPs visited the drilling shack (the hub of drilling operations) was the reduced pressure test, where the wrong conclusion was being drawn by those involved with this task (i.e. that the well was secure when in fact it was flowing), due to a misinterpretation of the testing results. This calls in to question the competence and training of personnel involved with this safety critical activity, as well as their compliance with procedures. Given their backgrounds (knowledge and experience of drilling and managing oil rigs) the VIPs might be expected to have created a complete and realistic picture of what was happening (i.e. the well was flowing); by asking the right questions and fully engaging with the workforce (mindful leadership/auditing). Regrettably the opportunity to undertake some robust and meaningful auditing; proactively checking the competence of those undertaking the testing and their compliance with procedures, was lost, and by ignoring the warning signs of impending disaster, the subsequent catastrophic major incident was not averted.

It is also worth noting that the VIPs safety audit focus was on personal safety as opposed to process safety. Conventional safety risks that result in personal injuries (e.g. slips and trips) are high frequency events when compared to major risk hazards (e.g. explosions). In addition when one of the VIPs asked the site rig manger, towards the end of the visit, how the reduced pressure test had gone, he got the thumbs up. Mindful leadership encourages the bottom up communication of news, good and bad. Mindful leaders tend to be suspicious of constant good news (e.g. thumbs up) as this can be a warning sign in itself.

Case study 2: HRO principles 'in practice' within a global chemical manufacturer

A workshop was held in September 2014 with over 40 health and safety or site managers working for a global chemical industry operating across several countries. The aim of the workshop was to make delegates understand how to create a *'collective state of mindfulness'* to enhance their ability to manage the unexpected using the HRO principles as a conceptual basis for actions. Prior to the workshop, delegates were invited to do some pre-reading on HRO principles and write a short summary on how they saw these principles applied in practice in their workplace. The reading was a way of getting them familiar with these principles and to recognise what these meant in practice. HRO principles provided a template against which the organisation could compare its current operations. This section highlights what worked and what was less effective in undertaking this reflective exercise.

What worked well:

The homework exercise revealed a good understanding of what each principle meant in practice. Many real examples derived from this organisation safety practices were given to illustrate each HRO principle.

There were similarities in perceptions across countries but also differences. For example, it was not unanimously thought that there was a no blame culture.

Some managers realised the importance of walkabouts and that they would need to change the way they pay attention to this in the future.

Much activity carried out appeared to be in line with HRO principles. However, delegates identified possible useful improvements. Examples included:

- More follow up after near miss reporting,

- Capturing and sharing best practice on weak signals

- The need to rethink spare capacity in order to increase commitment to resilience

- Sensitivity to operations could improve if receiving and responding to 'bad' news is done better at all managerial levels.

- A skill matrix formalising where the expertise resides within the organisation could help locate expertise and having it available quickly in critical times.

What was less effective:

The terminology used to describe the HRO principles can sometimes be difficult to grasp. It was also considered as having insufficient positive overtones.

Mindful leadership qualities need to be described in more practical terms for leaders/managers to understand how to develop them.

Participants spoke of the need to receive training on *the how* to demonstrate these HRO mindful leadership characteristics.

The HRO principle that seems less clear was *reluctance to simplify* or (over) simplification/ quick interpretation. Much less comments were received on it. Given that part of managing operational units is about standardising processes, simplification of operations is necessary. However, avoiding simplification in HRO context is about avoiding to label or categorise very quickly inputs or clues as this can be misleading or erroneous.

Conclusions

High reliability organisation (HRO) principles and good process safety leadership are increasingly seen as means for increasing resilience to major accident hazards. HRO principles can also be relevant to other organisations wishing to understand what constitutes a HRO. Mindful leadership has the potential to enhance the ability of leaders to put these principles into practice, and indeed greater mindfulness could potentially enhance the ability of those at any level in an organisation to contribute to a healthy process safety management system. Mindfulness can be taught and experience already exists of mindfulness training to increase workplace efficiency and reduce stress (Mellor et al., 2013).

Case Study 1 illustrates that mindful leadership has the potential to help address 'creeping changes' and to enhance process safety in an offshore major hazards environment. It can optimise process safety leadership.

Case Study 2 illustrates that the HRO principles are meaningful and can be anchored in working practices within high hazard organisations. They need to be refined and examples of leadership practices provided for organisations to make the most of these concepts.

Acknowledgement

References

Cogent, (2011), Process Safety Leadership for Senior Executives - Training Standard & Endorsement Guidelines, Approved Version 2.0, November 2011, http://www.cogent-ssc.com/Publications/, accessed 6/1/15

Goff, R J, Wilday J, and Holroyd J, (2015), Creeping Changes, IChemE Hazards 25 Symposium, Edinburgh, May 2015

Hackitt, J, (2013), Process Safety – Focussing on what really matters – leadership!, Frank Lees Memorial Lecture, Mary Kay O'Connor Process Safety Center Symposium, Texas, USA, 22 October 2013, http://www.hse.gov.uk/aboutus/speeches/transcripts/hackitt221013.htm, accessed 6/1/15

Hopkins, A, (2009), Failure to Learn: The BP Texas City Refinery Disaster

Hopkins, A, (2011), Management Walk-Arounds: Lessons from the Gulf of Mexico Oil Well Blowout

HSE, (2011), Leadership for the major hazard industries: Effective health and safety management, INDG277, Rev 1, 09/11. http://www.hse.gov.uk/pubns/indg277.pdf, accessed 6/1/15

HSE, (2013), HID Regulatory Model: Safety Management in Major Hazard Industries, 02/13, www.hse.gov.uk/hid/hid-regulatory-model.pdf, accessed 6/1/15

HSE (2014), Key Programme 4 (KP4): Ageing and Life Extension Programme, http://www.hse.gov.uk/offshore/ageing/kp4-report.pdf, accessed 6/1/15

Lekka, C, (2011), High Reliability Organisations: A Review of the Literature, HSE RR899

Mellor,N, Van Huizen,M., Ingram, L., and Arnold, J. (2013). Implementing and evaluating mindfulness training: A workplace case study. Division of Occupational Psychology conference.

OECD, (2012), Corporate Governance for Process Safety: Guidance for senior leaders in high hazard industries, http://www.oecd.org/env/ehs/chemical-accidents/corporate%20governance%20for%20process%20safety-colour%20cover.pdf, accessed 6/1/15

PSLG Principles of Process Safety Leadership, Process Safety Leadership Group, http://www.hse.gov.uk/comah/buncefield/pslgprinciples.pdf, accessed 6/1/15

Reason, (1997) , Managing the risks of organizational accidents. Ashgate Publishing Ltd.

Saw JL, Wilday A, and Harte H, (2010), Learning organisations and the role of the regulator, Process Safety & Environmental Protection, 88, 236-242

Sutcliffe, K.M, (2012), Safety complex, manageable pathways to reliability. Michigan, Ross School of Business.

Weick, K.E, and Sutcliffe, K.M, (2007), Managing the Unexpected: Resilient Performance in an Age of Uncertainty, Second Edition, San Francisco: Jossey-Bass

Wilday J, Kumasaki M, Saw L and Sugden C (2009), Process safety leadership, worker involvement and learning organisations, IChemE Symposium Series No 155, 62-69