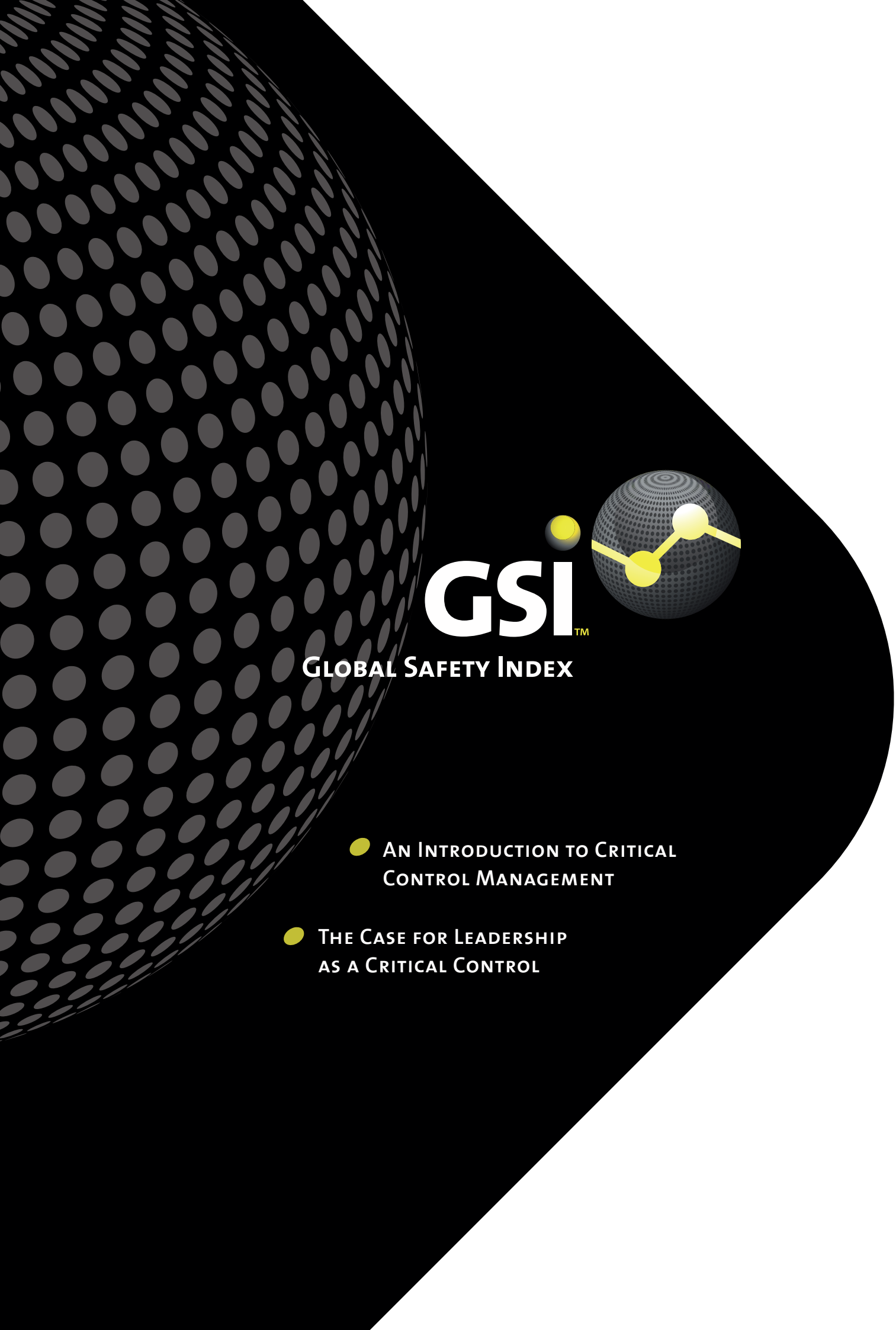

GSI™

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An Introduction to Critical Control Management

INTRODUCTION:

Critical control management is an integral part of risk management that focuses on identifying and managing the controls that are critical to preventing catastrophic or fatal events. Critical controls can either prevent a serious incident from happening in the first place or minimise the consequences if a serious accident was to occur.

The aim of this document is to provide a short overview for Global Safety Index Members who are considering implementation of a Critical Control Management (CCM) process. This document contains excerpts from the ICMM Critical Control Management Implementation Guide for your convenience. The full 60-page Implementation Guide can be downloaded at http://www.icmm.com/document/9722

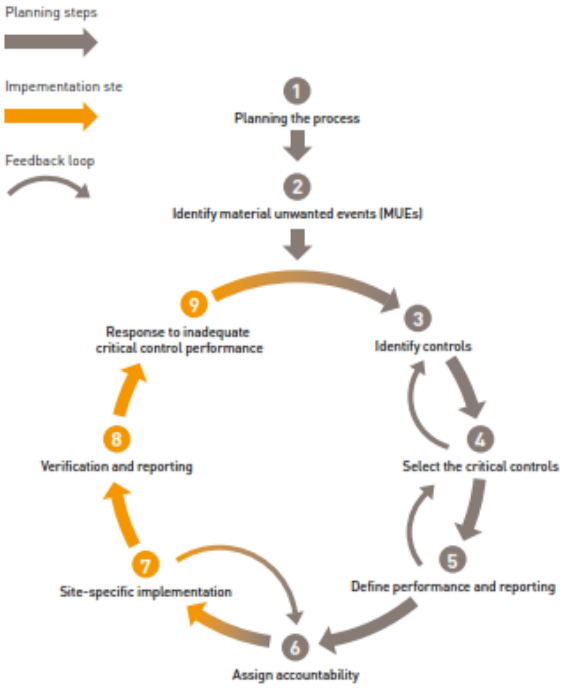
The excerpts cover the origins and history, a discussion of the benefits of implementing a CCM process as well as key challenges faced in implementation.

What is the CCM process?

The CCM process (see Figure 1) is a practical method of improving control over rare but potentially catastrophic events by focusing on the management of critical controls. These sorts of events are called material unwanted events (MUEs). Mining industry examples of MUEs include underground fires, coal dust explosions and overexposure to diesel particulate matter. Not all MUEs though involve sudden events.

For example, MUEs may also include the potential exposure of groups of workers to carcinogenic or other agent at harmful levels over a protracted period. These all have the potential to cause multiple casualties, but they can also affect the ongoing viability of a business. In other words, they represent a material risk to the business. Prevention of MUEs requires specific attention at the highest level of an organisation alongside other material business risks.

Figure 1: The critical control management process



The CCM approach is based on:

- having clarity on those controls that really matter: critical controls (Step 4)
- defining the performance required of the critical controls (Step 5)
- what the critical control has to do to prevent the event occurring
- deciding what needs to be checked or verified (Step 5) to ensure the critical control is working as intended
- assigning accountability for implementing the critical control – who has to make it work? (Step 6)
- reporting on the performance of the critical controls (Step 8).

History Of The Critical Control Management Approach

Managing health, safety and environment in high-hazard industries

There is a long history of programmes to improve l controls for major incidents in a variety of industries. Major improvement initiatives have typically followed major disasters and have involved building on pre-existing ideas and programmes that may not have received sufficient support prior to the incidents.

In Europe, the Seveso incident in 1976 led to European-wide regulatory change involving a type of safety case, which has influenced regulatory systems around the world. The Alexander Kielland and Piper Alpha disasters in the North Sea during the 1980s had a similar impact on upstream petroleum's emphasis on managing material events. More recently, the 2005 BP Texas City disaster and the UK Buncefield petroleum terminal explosion in the same year have stimulated greater focus on MUEs. These incidents have driven development of a wide range of guidance and standards. Examples include:

- Centre for Chemical Process Safety 20-element approach
- Energy Institute 20 elements (2010).

Typical approach to improving health, safety and environment in high-hazard industries

A traditional approach to implementing a control-focused initiative would typically involve selecting a reputable process safety management framework (such as the Energy Institute 20-element programme mentioned above) and conducting a "gap analysis". The result is an assessment of the company's current situation, identifying the areas in a company's management system where further work is needed to meet the requirements of the chosen framework. A prioritisation of gap analysis results would be undertaken before developing a plan to implement the requirements for adopting the framework.

This is usually regarded as the orthodox approach. However, while this approach is valid, it can result in relatively high-level actions with limited impact on the practices of the organisation. This includes a limited impact on managing critical controls. For example, if it is determined that management of operational interfaces requires more work to meet the Energy Institute guidance, then the improvement work in a company may focus on related systems. This is an important topic and no doubt will yield rewards in time. However, it is still difficult to see how this will affect adherence at the front line to critical controls, nor help to start and sustain a programme to improve critical controls.

What is different about the critical control management approach?

CCM focuses on the specific, most important controls to prevent or minimise an MUE. This can establish a robust CCM system quicker and more efficiently than the systems gap analysis methods outlined above. Any managerial change programme needs "quick wins" to demonstrate that the change is working. The CCM approach is focused on achieving practical and visible actions that verify critical controls. This will increase the likelihood that the change in emphasis for an organisation can be sustained: maintaining gains on personal safety while enhancing managerial control over MUEs.

The CCM approach focuses on:

- identifying what controls are needed (many controls will already be in place), as well as considering their effectiveness
- identifying the critical controls
- ensuring supervisors and managers are verifying the critical controls to check they are providing in practice what they are assumed to provide by design.

WHY SHOULD AN ORGANISATION UNDERTAKE THE CRITICAL CONTROL MANAGEMENT APPROACH?

Why is a focus on material unwanted events needed?

Many companies have improved their safety performance as measured by lost time injury frequency rates and similar measures. However, MUEs such as fatal accidents, rarer catastrophic events and significant health exposures can still occur. Investigations of incidents that are material (MUEs) to companies, including fatal accidents and rarer catastrophic events, typically show that known controls for recognised risks were not effectively implemented in practice. This is the reason for the focus on critical controls that is championed by the CCM approach.

Many of the systems and plans in place to prevent MUEs are often set out in bulky and complex safety management systems, hazard management plans, risk registers and procedures. They can be difficult to implement, often becoming "shelf ware". Experience also suggests that these systems and plans lack clarity as to the overall control framework for the MUE, as well as performance requirements and verification strategy for the very important or critical controls. The key to the CCM approach is a focus on the critical controls, clearly described, carefully reviewed, verified and reported upon. Much of the pre-existing information in management plans and their risk assessments are still needed. This information provides background material to help the CCM approach be designed and implemented.

What are the benefits of implementing the critical control management approach?

By adopting the CCM approach we can reduce the risk of an MUE. This is because the CCM approach:

- focuses on a smaller and more manageable number of risk controls – the critical controls
- uses bowties, which provide a simple and readily understood picture of the links between the MUE, how it can be caused, and the critical controls to prevent the MUE and minimise the consequences should the MUE occur
- documents the critical controls in a simple format, making explicit the relevant performance requirements how they are to be verified and who is responsible for the verification, as well as responding to verification reports
- gives a clear understanding of the controls needed to manage MUEs across all levels of the organisation.
- provides a way of measuring the "health" or performance of critical controls – knowing the health of controls provides a mechanism to keep the business aware of the risk status due to changes in critical controls.
- allows for more effective governance over this category of material business risks

Companies have also reported other benefits. These include:

- *A better understanding of critical controls has led to more productive and insightful "visible leadership" interactions between managers and the workforce. This occurs because the documents produced as a result of implementing the CCM approach, for example bowties (Steps 3 and 4) and critical control information summaries (Step 5), make it easier to have meaningful discussions. Senior managers now have the detail to ask good-quality questions about critical controls even if the subject-matter is outside of their expertise.*
- *A focus on the controls has led to better maintenance and improved asset integrity. This has resulted in reduced downtime and lowered maintenance costs.*
- *Actively managing the risk of an MUE also manages the risk of reputation damage.*
- *A focus on controls and oversight of the MUEs allows better governance and decision-making.*

Workforce and culture

The CCM approach supports the development of an effective safety culture. CCM emphasises and drives the importance of effective implementation of critical controls. In other words, it focuses on important practices that prevent or minimise MUEs. A focus on practices or "how we do things around here" is an accepted way of developing and sustaining an effective safety culture. As Andrew Hopkins has pointed out, an effective safety culture is necessary to make safety systems work.

Learning from the experience of others

This guidance is based on practical experience from a number of organisations that have embarked on the process of improving their managerial focus on MUEs. The lessons learnt from this experience, and from other industries that have carried out similar work, is reflected in the following guidance on how to implement the CCM approach.

The main lessons from other companies in both mining and other industries are:

- Most companies reported that they already had the information necessary to implement a CCM- type approach in the form of hazard identification and risk assessments. However, they had not distilled or summarised this information into a readily usable form.
- Companies usually cannot get this right the first time – it requires experience. But this experience is useful as it builds understanding of the MUEs, the controls and the critical controls.
- There is no one right answer to the question, which controls are the critical controls? This depends on the particular circumstances of a company and mine site.
- Implementing the CCM approach requires a careful project management approach and dedicated human resources.
- Wherever possible the experience of internal company personnel should be used. In particular, the involvement of subject-matter experts on technical areas will be required. However, external resources may also be needed, particularly in the early stages of a CCM project.
- Create a realistic project plan that does not underestimate the time required to thoroughly review the MUEs and develop the CCM material.

The Case for Leadership as a Critical Control

THE CASE FOR LEADERSHIP AS A CRITICAL CONTROL

It is increasingly recognised that leadership is a key, if not primary, contributor to effective WHS risk management. Leadership is commonly seen as the 1st element in a WHS management system. Research has identified that leadership may be a greater contributor to reducing accidents than hazard management systems or safety consciousness.

Considerable effort in 'process safety' has taken place in the oil & gas, mining, aviation, shipping and other industries that are characterised by a potentially higher innate risk of a major incident. What may not be clearly evident is the success to date of these initiatives in reducing the incidence of catastrophic events.

Conclusions of investigations into recent catastrophic events indicates that there are multiple factors at play that in combination lead to the event, e.g. '…a whole sequence of events of poor decisions with unfortunate consequences when put together.' Don Boesch, Member of Presidential Commission, BP Deepwater Horizon Oil Spill and Offshore drilling. Overall, the conclusion of the Presidential Commission into the BP Deepwater disaster was that the blowout was avoidable. 'This disaster likely would not have happened had the companies involved been guided by an ***unrelenting commitment to safety first.***' (our italics), Bob Graham, Commission Co-Chairman.

A review of the conclusions from the enquiries that inevitably follow catastrophic events, from the Titanic, through to those in more recent memory such as Challenger, BP Texas City Oil Refinery, and Deepwater Horizon (Macondo Well) tell us there are a relatively small group of common indicators that are present as interdependent causal factors, including:

- High management turnover resulting in: the loss of institutional knowledge; changed expectations, agenda or focus areas; different management and leadership styles; trust levels needing time to develop.
- Recent significant organisational change, such as a re-structure or staffing cuts, resulting in: uncertainty over new roles and accountabilities; higher workloads; new work relationships and networks to develop.
- Significant / ongoing budget cuts, e.g. cut in maintenance schedules, resulting in: implied if not explicit understanding that safety is negotiable
- Reward systems dominated by (short-term) production-budget targets, resulting in: sub-conscious if not conscious decisions to promote production that enhances (significant) risk
- Level of risk oversight not at the highest level in the organisation, resulting in: less optimal risk data and understanding at the governance level where overall strategic direction and priorities are set
- Record of previous warnings not being heeded, resulting in: failure to learn and the implementation of required remedial action
- Previously agreed safety performance strategies not or only partially implemented, resulting in: risk level not reduced and therefore remains susceptible to the unwanted event occurring
- Recent incidents not reported and/or relevant learning shared, resulting in: institutional ignorance to risk and/or risk level
- Audits/inspections infrequently conducted and/or subsequent recommendations not implemented, resulting in: risk and/or risk level not known or existing controls verified as appropriate and/or effective

In Michael Quinlan's recently published book 'Ten Pathways to Death and Disaster: Learning from Fatal Incidents in Mines and Other High Hazard Workplaces' (2014), he lists 10 factors that most incidents had evidence of at least three and many exhibited five or more. Here are four of the ten pattern causes identified by Quinlan:

- Failure to heed warning signs
- Economic / reward pressures compromising safety
- Worker/supervisor concerns that were ignored
- Poor worker/management communication and trust

It is our view these four clearly suggest a 'failure of leadership' that we can see clearly in the recent Deepwater Horizon disaster:

"At the time of the Macondo blowout, BP's corporate culture remained one that was embedded in risk-taking and cost-cutting – it was like that in 2005 (Texas City), in 2006 (Alaska North Slope Spill), and in 2010 ("The Spill"). Perhaps there is no clear-cut "evidence" that someone in BP or in the other organizations in the Macondo well project made a conscious decision to put costs before safety; nevertheless, that misses the point. It is the underlying "unconscious mind" that governs the actions of an organization and its personnel. Cultural influences that permeate an organization and an industry and manifest in actions that can either promote and nurture a high reliability organization with high reliability systems, or actions reflective of complacency, excessive risk-taking, and a loss of situational awareness."

Final Report on the Investigation of the Macondo Well Blowout - Deepwater Horizon Study Group, March 1, 2011, Center for Catastrophic Risk Management.

The fact that these events continue suggests that we may not understand and accept that these interdependent causal factors were repeated time after time. Therefore we may not have taken the necessary steps to ensure that it does not happen in our organisations.

Temptation may exist for executives and managers in less high risk industries to dismiss the lessons to be learned from these disasters as being at best only tangentially relevant to their industry, or at worst irrelevant and only applicable to those high risk industries. Ideally, reflection will lead to a more direct, high level connection, helping any organisation identify opportunities to improve their risk management process.

The Critical Control Management Process

Another inevitable learning from major losses involves the absence or failure of the controls that should have been in place to prevent or at least reduce the consequences of the event. Controls can be as complex as a technological system to monitor hydrocarbons or as simple as a seat belt.

In addition to effective leadership, the management of critical controls is increasingly seen as the way forward. Though not developed in the mining industry, the global industry body, International Council of Mining and Metals (ICMM) distributed a brief process guideline[2] in mid-2015 that has been adopted by the vast majority of industry companies as the target for the future.

Called Critical Control Management (CCM), it focuses on the specific, most important controls to prevent or minimise an event that would have a very high consequence to the specific company. These priority events are called Material Unwanted Events or MUEs. The CCM approach defines and establishes practical actions that verify the status of critical controls.

Please refer to 'An Introduction to Critical Control Management' for more detail.

Recent advances in WHS risk management suggest that moving to a critical control-focussed operation will result in better performance. However, CCM is

not an overnight adjustment to the business. Companies have developed multi-year plans to move toward the goal of effective CCM. CCM involves major changes in mindsets, as well as activities.[2] As a result, the move to CCM requires effective leadership for CCM planning and successful embedding Without committed and involved leadership the opportunity of focussing the business on the critical few to avoid disaster will fail.

However, the Leadership critical acts for an effective change are not well defined. There is a need to look at Leadership itself as a critical control and understand the specific leadership acts that contribute to a successful change to a critical control focused WHS management system.

Leadership as a Critical Control Research Project

GSI, as a global leader in helping develop effective Leadership, is sponsoring a research project designed to gather and analyse data about the quality of Leadership Acts related to critical control-focused WHS management in order to identify their effectiveness and the relationship to successful change. Also, this study would demonstrate the value of measuring critical control acts and sharing related learnings.

CCM defines ownership for events and controls at several levels in the organization. An example of fully implemented CCM Leadership is suggested below. These levels of leadership provide a reporting conduit that captures the real status of critical controls, providing an opportunity to act or investigate should a critical control be failing.

- The overall leadership of the CCM initiative
- The leadership of the assigned MUE owner,
- The leadership of the assigned Critical Control owner for the MUE, and possibly
- The leadership of the assigned verification information gathering for each Critical Control

The proposed research project will examine the respective, critical-few Leadership Acts required at each level, establish and test a process for the capturing and recording these acts to gain insight into any required corrective actions at the achieve the most effective Leadership approach.

Initial workshop outputs involving organisations currently implementing CCM suggest that there are six critical acts of CCM Leaders.

- Engage with Leaders about the their CCM roles
- Set clear expectations for the CCM Leaders
- Ensure the CCM Leaders have required CCM knowledge & skills for their roles
- Provide feedback on data or observations about the Leaders role execution
- Encourage all CCM initiative issues to be reported
- Act decisively when a CCM initiative concern is raised

This approach to considering selected critical Leadership Acts to be the focus of developing and measuring Leadership is not only relevant to CCM but any major change in an organisation. Good understanding of this approach should be a priority for reducing risks to the business. Therefore, GSI is establishing a multi-company approach to investigate Critical Leadership Acts and invites your participation in this seminal research.

Please refer to the 'Leadership as a Critical Control' Research Program 2016-2017 for more details.

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[1] R.B.M. de Koster, D. Stam and B.M. Balk, *Accidents happen: The influence of safety-specific transformational leadership, safety consciousness, and hazard reducing systems on warehouse accidents*, Journal of Operations Management, Nov 2011

[2] International Council on Mining and Metals (ICMM), *Health and safety critical control management good practice guide*. London, UK:2015

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