

Getting Serious About Major Hazard Event (MHE) Management:

At a time when the offshore oil and gas competitive landscape is changing, it becomes essential that E&P companies be able to accurately and reliably predict their forward looking operating costs. As part of this, organizations must accelerate their efforts toward better major operational risk management, so that the next big safety event doesn't suddenly and unexpectedly turn up around the next corner.

"In preparation for take-off please bring your seats to the full and upright position, stow your tray tables and turn off all electronic devices – we'll be airborne shortly...."

"Good day Ladies and Gentlemen". "On behalf of the captain, I want to welcome you aboard our flight today"

"And if there's any first time fliers traveling with us today, then rest assured, I want to let you know that there is no need to fear as this plane is perfectly safe and we'll quickly get you to your destination without any incident or concern".

"And the reason I know this, is because not one of the baggage handlers have been seriously injured over the past six months!!"

Given its now 6 years since the Macondo - Deepwater Horizon disaster in the Gulf of Mexico (GoM) and the largest environmental spill in US history, you might well be forgiven for thinking that the underlying causes, omissions and errors that led to this catastrophic event have, for the most part, been largely addressed. Yet in talking to many offshore industry leaders, it seems that companies are still struggling to come to terms with the fundamental shift in management practices that still needs to take root to not only build a more complete and accurate picture of performance, but in doing so, provide the necessary assurance that major operational risks are being well managed.

And while the above example may serve to overly simplify or even exaggerate the point, the harsh reality is that for many offshore companies, effectively differentiating between reducing injuries to people and running an operation to a risk level of ALARP (as low as reasonably practicable) is something that still requires significant work.

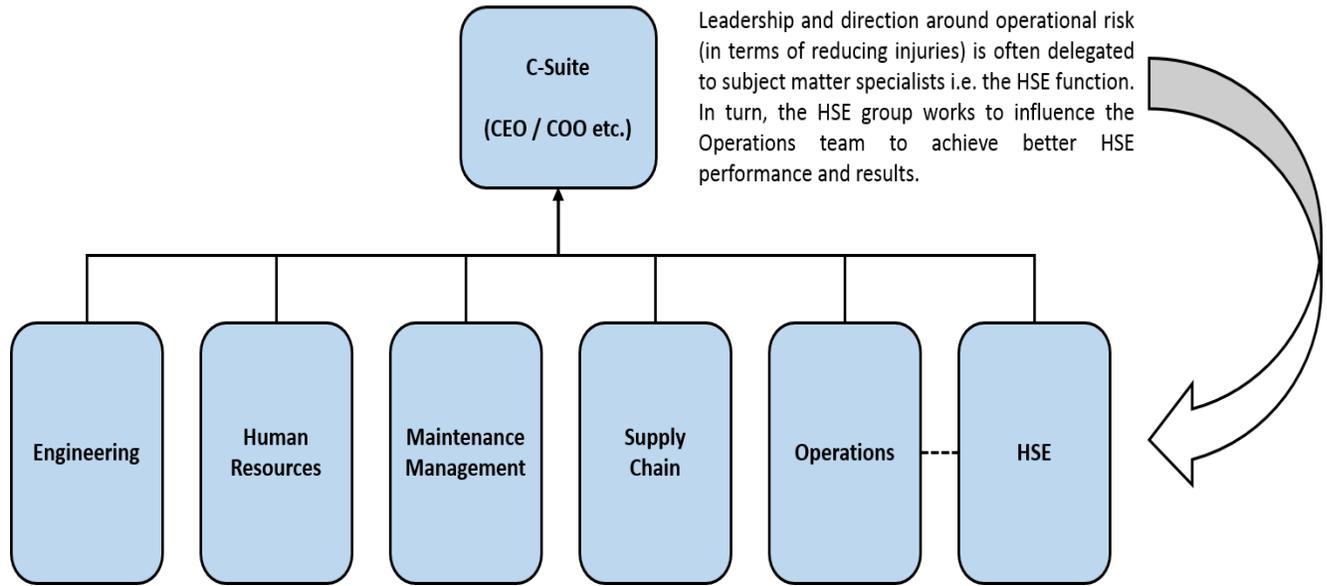
1) Organizations have been structured on managing personal safety vs. major operational risk:

Health, Safety and Environmental (HSE) Management Systems exhort that to achieve world class HSE performance, the organization first needs to be designed and structured in such a way to effectively manage it. But look at a typical organization chart for a company within the offshore oil and gas industry.... Reporting to the C-suite are the usual functional silos e.g. Engineering, Human Resources, Operations, Procurement, Maintenance Management, Operations, Marketing, Finance and so on.

Added to this list and rolled into the mix is the HSE function. And while this arrangement might easily and conveniently fit the typical organizational structure, it does very little to mobilize companies so that they can effectively perform the job of managing major operational risk.

How so?

Well the initial problem is that for far too long, improving operational risk has often been tied to good worksite safety practices which has been defined in terms reducing injuries to people, damage to equipment etc. In turn, this particular remit has traditionally been assigned to the HSE function. And although senior management are often supportive, subject matter leadership and direction is a clear expectation from within this function. Convenient in the sense that companies can feel confident that this aspect of the business gets delegated to the right people and where expectations are largely met.



Leadership and direction around operational risk (in terms of reducing injuries) is often delegated to subject matter specialists i.e. the HSE function. In turn, the HSE group works to influence the Operations team to achieve better HSE performance and results.

Figure 1: Typical organizations are structured to manage worksite injuries (personal safety) rather than major operational risk

Today however, very few organizations realistically expect that achieving world class safety performance is something that can be directly managed by the HSE function. More often, it is recognized that the HSE group will act as influencers to line managers / supervisors to attain the requisite performance by directing their focus and attention toward different metrics and behaviors. Ultimately of course, the HSE function simply doesn't have the requisite authority or empowerment to make the Operations function (or any other function) "do" anything different. And this is very much in keeping with the notion that safety / operational risk is a line management accountability - something that organizations have long subscribed. But while this arrangement may work reasonably well to reduce the number of worksite injuries (i.e. personal safety), it is wholly inadequate to effectively manage major operational risks.

Why? Well to understand this, we need (as always) to better understand how we arrived at this point.

2) An acknowledged common reference point for managing major operational risks:

Following the public enquiry into the causes of Piper Alpha in the North Sea in 1988 that resulted in the loss of 167 offshore workers, Lord Cullen advocated that a Safety Case regime should be established by the oil and gas industry. The objective being to demonstrate that Major Hazards Events (read major operational risk) were both identified and assessed and that controls and recovery preparedness

measures (i.e. barriers) were suitable and sufficient to reduce the likelihood of something similar from happening in the future.

Now scroll forward over 25 years....

By 2016, many oil and gas companies and geographic jurisdictions have made varying degrees of progress toward adopting the Safety Case regime (it's still not a regulatory requirement in the GoM). And throughout the international oil and gas industry it is now widely accepted that Bow-Ties (good or bad) and the Safety Case (good or bad) is the principal mechanism by which Major Hazard Event (MHE) management is conducted. And yet for many major operational risk related events, such as the PTT / Seadrill Montara fire and spill off the coast of Australia in 2009, or the bp / Transocean Macondo - Deepwater Horizon fire and spill in the US GoM in 2010, how many Safety Cases have been developed, written and deployed, only to find that the very things referenced in their pages continue to happen. How can this be possible?

Well all too often the reality is that where regulatory frameworks do not provide the necessary oversight, companies have often struggled to integrate the requirements of the Safety Case into day to day work activities - at least as a top priority. Consequently, senior managers have not consistently been held to account for maintaining their overall effective implementation. Though this may sound a little harsh, what is true is that different organizations and different regulatory regimes have established widely differing requirements for managing major operational risk. For example, the Written Scheme of Verification (WSV) adopted in the North Sea (and its similar variants applied elsewhere) has gone a long way to make Safety Case implementation a key operating requirement by flagging "safety critical" activities and expecting organizations to demonstrate that such tasks are well managed. But on a global basis, there's still an awful lot of work to do.

In fact a recent conclusion from the US Chemical Safety Board (CSB) from its investigation into the Macondo - Deepwater Horizon, stated that many of the risk management policies bp and Transocean had in place before the disaster, would have actually satisfied the new post-Macondo federal requirements. And a recent audit by the US offshore regulating body (Bureau for Safety and Environmental Enforcement - BSEE) found that many E&P companies are simply placing too much emphasis on documenting regulatory compliance rather than actually managing major operational risks.

So what's the real problem? Well let's take one simple example....

3) Gaining an accurate picture of how major operational risk is managed can still remain elusive:

Let's say an employee was performing a maintenance routine on a fire and gas detection system (i.e. barrier management) and during the course of the work they slipped, tripped, fell and twisted their ankle. Works out the sprain incurred was sufficient that the employee was unable to be fit for duty the following day. As a result, a Lost Time Incident (LTI) or a Days Away From Work Case (DAFWC) was incurred.

Such an event (needless to say) would undoubtedly find its way to the top of the organization right quick!

Senior management have become very well versed in recognizing that such things need their immediate attention. They hit company scorecards, negatively impact bonus allocations and incentive schemes, as well as seriously undermining overall peer-to-peer benchmarking performance. Senior management

rightly demand answers and go about instigating actions designed to prevent reoccurrence including launching into detailed incident investigations to identify the root causes of such unplanned events. But while that's all fine and good (see also "Fixing" Human Error 1&2), now let's look at the exact same work activity, but this time from a much different perspective.

In the second instance, the employee didn't get hurt at all, but for any given reason, let's say that the work itself didn't get completed to the correct standard. Perhaps this was because the configuration of the equipment was new to the employee, or perhaps it was the first time they had performed this particular job. Perhaps the job itself occurred during a shift change and there was a breakdown in communication, or perhaps the supervisor was called away at a critical moment and didn't adequately perform the necessary oversight. Whatever the reason, the result being that the integrity and availability of the barrier (i.e. the fire and gas detection system) has been degraded to the point where it may no longer perform as intended or designed.

But now comes the critical distinction....

It is unlikely that the status of this barrier would also find its way to the top of the organization in the same way as the LTI or DAFWC!

In fact you may be fortunate if QA/QC practices were sufficiently robust that they would automatically flag the fact that the work hadn't been completed to the correct standard, let alone expect a line manager to recognize it as something worthy of being elevated to the highest levels of the organization.

And yet, in the big scheme of things, in terms of managing major operational risks - which is more important? Is it the availability and integrity of a key barrier or is it the employee who tripped and fell?

Ultimately, while both are important, in terms of risk management, the degradation of a key barrier should have a much greater weight than the personal injury in this particular case. And yet, in far too many organizations, the focus is still often weighted the exact opposite way around and as a result, "safety critical" activities fail to get the priority and scrutiny they should command.

So what's going on here? Well unfortunately you are what you measure.....

In other words, all too often C-Suite executives continue to measure and manage major operational risk by utilizing a suite of metrics, that from a risk standpoint are either simply incomplete, insufficient or in many cases, wholly inadequate. While determining the nature and classification of injuries to people (and even potential injuries to people) is immediately recognizable and largely familiar, it unfortunately gives little to no indication regarding the actual status of barriers designed to manage major operational risk. For that, you need an entirely different suite of metrics. And as the US CSB put it *"Zero workplace incidents for a day, a month or even years does not preclude a company from facing a potentially catastrophic incident tomorrow"*

So in returning to our airline example for a moment. Needless to say that gaining assurance that the plane is perfectly airworthy has much less to do with the number of injuries to the baggage handlers and much more to do with scrutinizing the maintenance routines and the operating records of the engine (i.e. "safety critical" equipment), that may have had a reported history of performance concerns.

Such a suite of performance metrics needs to be comprehensively embedded into company scorecards and routinely monitored by C-suite executives, before they are able to ask the right (read tough) questions

about the effective management of major operational risks. And it's not until offshore companies finally arrive at this juncture that CEO's and their boards can confidently provide the necessary assurance to their stakeholders that the next big safety event isn't just around the corner. Until this time, clear answers may continue to prove illusive and organizations will probably believe they are much safer than they really are.

4) Why functional silos do little to support a cohesive approach in managing major operational risk:

In addition to recognizing that the absence of the right performance metrics often results in organizations having a tough time differentiating between the safe execution of work (personal safety) and demonstrating that "safety critical" activities have been completed to the correct standard (i.e. barrier management), there are further challenges that also need to be addressed. For example, how are accountabilities for "safety critical" activities established when little to no guidance / direction / requirements are set by the overseeing regulatory regime? Before answering this question, let's stay with the example of the fire and gas detection system, and start by examining why it is even considered "safety critical" at all.

Clearly the objective of the fire and gas detection system is to provide a recovery preparedness measure (i.e. barrier) such that the early detection of a fire (or release of flammable gas) should initiate actions designed to mitigate the fire / potential fire from spreading and escalating. In effect, it helps to break the link between a fire at one location and the commencement of a new fire in an adjacent location. In effect, breaking the potential chain of events that would otherwise ultimately lead to catastrophic consequences. To meet this objective, the fire and gas detection system must typically meet the following criteria:

- Be designed to meet predefined operating envelopes and requirements;
- Be installed and strategically placed in such a location and in such a way that the equipment will always perform as intended;
- Ensure that any person performing work on the equipment are competent to do so;
- The equipment (including any replacement parts) must be sourced from approved vendors supplying genuine like for like parts;
- The equipment must be routinely inspected, tested and where necessary, calibrated to ensure the equipment will always perform as intended;
- QA/QC requirements established and implemented to demonstrate that any work performed on the equipment is completed to the correct standard;

In other words, gaining the necessary assurance that the ongoing integrity and availability for this single barrier (i.e. recovery preparedness measure) is suitable and sufficient, actually requires *multiple* functions within the organization to take some form of action. For example:

Barrier: Fire and Gas Detection System (Major Operational Risk Recovery Preparedness Measure)		
#	"Safety Critical" Activity	Typical Accountable Function
1	Designed to predefined operating requirements	Engineering
2	Be installed and strategically placed in such a way that the equipment will perform as intended;	Engineering / Operations

3	Ensure any person(s) performing work on the equipment are competent to do so;	Human Resources / Training
4	The equipment (including any additional and / or replacement parts) must be sourced from approved vendors supplying genuine like for like replacements parts;	Supply Chain
5	The equipment must be routinely inspected, tested and where necessary calibrated to ensure the equipment will perform as intended;	Maintenance Management
6	Establish and implement QA/QC requirements to demonstrate that any work performed on the equipment is always completed to the correct standard;	HSE / Operations

So in following such logic, managing “safety critical” activities becomes a *business process* in that it clearly cuts *across* multiple organizational functions - not up and down one or two single functional silos (e.g. Operations, HSE) as has traditionally been the practice when managing worksite injuries (personal safety).

What does this mean for the organization?

It means that only at a point where all the functions converge (i.e. the C-suite) can “safety critical” activities ever stand a realistic chance of being effectively and consistently measured and managed. So in other words, the implementation and overall coordination of “safety critical” activities can ultimately only occur from a level within the organization which holds the necessary authority, empowerment and accountability over all the other functions.

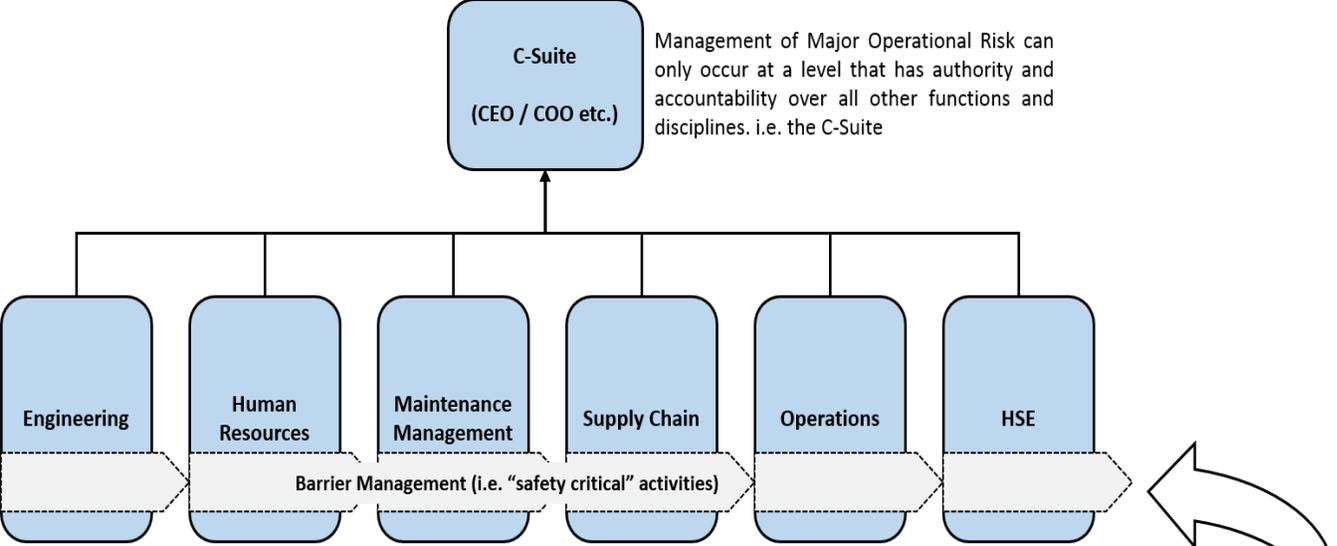


Figure 2: Barrier management cuts *across* multiple functions nullifying the typical organization structure for managing operational risk

Managing major operational risk is a *process* in that work flow cuts horizontally *across* the organization. i.e. effective barrier management requires actions and deliverables from many different functions and disciplines - not just one or two.

But how many CEO's or COO's routinely use the Safety Case to directly guide their decision making and actions in terms of managing major operational risk?

Yet what it does tell us is that a single function such as Operations or HSE can never be held accountable for the overall management of major operational risk (via the effective implementation of "safety critical" activities), given they have neither the necessary authority or empowerment. Therefore, to be successful, achieving effective barrier management must ultimately force organizations to rethink how they're structured to ensure that accountabilities for the implementation of actions designed to manage major operational risk is established at the right level.

5) Inconsistent definitions of "critical" activities:

Though "safety critical" activities are actually managed as part of a *business process* (which cuts *across* multiple different functions as opposed to a single functional silo such as Operations or HSE), there are still further challenges and considerations that conspire to make it difficult for the organization to effectively manage "safety critical" activities.

The next problem being that in many instances, companies (and even individual functions!) have inconsistent, or different interpretations of what exactly constitutes "critical". For example, ask a maintenance manager for a list of "critical" activities and they may point to a list that doesn't 100% align with the "safety critical" activity lists defined and established in the Safety Case. Ask an Engineering or Operations Manager the same question and you may get further interpretations and variants.

In other words, in addition to the Safety Case, there are often other important drivers for establishing "critical" activities - but these may or may not necessarily be linked to barrier management as part of major operational risk. More often they are designed to reduce operational inefficiencies that could lead to down time, non-productive time and generally slower production. That would explain why the Safety Case (though accepted as the common reference point for managing major operational risk), isn't necessarily seen by all functions within the organization as the single most important driver for defining and establishing "critical" activities.

While increasingly, "safety critical" activities referenced in the Safety Case do make up a key part of what constitutes "critical" (where the Safety Case exists), the downside is that sometimes a big difference between "critical" activities designed for maintaining the availability and integrity of a barrier (as part of major operational risk) and those designed to maximize operational efficiencies. Occasionally there may be a direct correlation, but in many instances, they can be diametrically opposed. Hence QA/QC metrics and practices, designed to determine the availability and integrity of all "critical" equipment, may ultimately need to be able to readily distinguish between those QA/QC aspects that are designed to support major operational risk management (i.e. "safety critical") from those that are "critical" for other reasons.

While this approach is not doubt a worthy effort, organizations may find themselves simply overwhelmed trying to separate and distinguish between all the various "critical" aspects of a vast inventory of equipment and its operational configurations. However, if they were at least able to establish consistent definitions for "safety critical" across all functions (since ultimately multiple functions contribute to the overall integrity and availability of key barriers), this might well be a good place to start. Once this aspect

is well understood and consistently applied, the definition of “critical” could then be broadened and expanded as the organization moves forward in a cohesive and ever more sophisticated manner.

6) Acting Before the Last Line of Defense is Breached:

Clearly then, work is needed before organizations can gain the necessary assurance that the integrity and availability of key barriers (for managing major operational risk) is consistently being well executed. Establishing an appropriate suite of metrics to support this and maintaining them at the right level of the organization is key in this regard. That way, the frequency, scope and seriousness of any and all barrier degradation(s) can be immediately identified, assessed and acted on. Similarly, establishing consistent definitions for “safety critical” will help organizations move forward in a cohesive manner.

But unfortunately - and precisely at a time when the offshore E&P industry can least afford it - the ongoing status and routine monitoring of key barriers still doesn't get the necessary attention from the highest levels in the organization. In many cases it's only when the last barrier fails and the prospect of a serious consequence begins to loom, do organizations really force themselves to examine the size and number of holes that may exist within their barriers (preventative controls and recovery preparedness measures) for managing major operational risk.

The point being that the cumulative functionality of multiple key barriers is not always known at a sufficiently high level within the organization and when combined with the failure to rigorously monitor their ongoing availability and integrity, means that any early warnings signs that should otherwise flag elevated levels of risk, often simply come too late.

This all of course represents one big vicious circle. Gaining a detailed understanding of how barriers work interdependently (for any given Major Hazard Event scenario), combined with poor overall monitoring, are products of often insufficient and inadequate metrics generating enough key data points for C-suite executives to act on. The consequence of this being the potential for complacency and cultures of “casual compliance” begin to manifest. In other words, if no one is telling a middle manager or line supervisor to do anything different (i.e. because of the absence of relevant data), then why would they even think to change their current behaviors when they've served them so well in the past? And again as the US CSB put it *“One individual didn't cause the Macondo event. A multitude of decisions and actions up and down the organizational chains of both bp and Transocean led to this disaster”*

But should suitable and sufficient metrics become well established, such that each and every time a barrier didn't perform as expected it was flagged and communicated to the highest necessary level within the organization such that coordinated action would result, then a very different picture of performance could be established. From there, C-suite executives would once again be able to ask the right (read tough) questions, shrug off their complacency and finally begin to turn their organizations toward one that resembles high reliability in terms of managing major operational risk. Until that point, organizations can expect more Major Hazard Events (MHE) in the future, while at the same time continuing to exhort their ongoing exemplary safety performance.

7) Summary:

In summary, when it comes to managing major operational risk, organizations have to begin to depart from their traditional ways of doing things and recognize that fundamental changes in management practices are urgently needed before organizations can confidently assure their stakeholders that the next big safety event isn't just around the corner.

Organizations would do well to take on the following measures:

- Establish consistent definitions of “safety critical” across all functions / disciplines - anchored in barrier management and tied to the Safety Case;
- Establish a suite of metrics (KPI's) that enables routine monitoring of barriers designed to manage Major Hazard Events (MHE) - and at a minimum, held at the same level of importance as metrics for determining personal safety performance (LTI's, DAFWC etc.);
- Align the organization structure such that ultimate authority and accountability for barrier management (Safety Case implementation) is not delegated to any one particular function, but resides at a level that has ultimate authority and accountability over all functions;
- Establish practices at the worksite that enables “safety critical” activities to be clearly flagged and labelled such that all persons - not just those performing the work, but also those supervising / managing the work - recognize the importance of completing the job to the correct standard and in doing so, contribute to the overall management of major operational risk (as opposed to simply executing the job safely to avoid any LTI's, DAFWC etc.);
- Introduce effective QA/QC practices to ensure sufficient checks and balances exist to demonstrate the ongoing availability and integrity of any barriers remains (following any work performed on such equipment);
- Expand the unplanned event (incidents, Near Misses etc.) reporting process to include missteps or breakdowns related to the QA/QC assurance protocols for all “safety critical” activities. And if such a process is risk based, it should easily be able to distinguish between low risk personal injuries (including those carrying high consequence classifications such as LTI's) and high risk barrier failures that may or may not have resulted in any specific consequences. Such weightings should subsequently result in the correct level of scrutiny and at the right level of the organization;