

Process Safety Management - Creating a Sustainable Global Approach

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Woodside's Process Safety Management (PSM) Initiative introduced a framework for a holistic, effective and sustainable PSM system. We adapted an international industry standard based on the U.K. Energy Institute model to develop our own company specific Process Safety Management Procedure. Embedding PSM requirements into the existing Woodside Management System and workforce behaviours enables the business to execute consistent, proactive PSM throughout the exploration and production lifecycle - across assets and countries.

To enable us to achieve fundamental change, we chose to start by looking at the way we think, rather than focussing on technical processes. Change was facilitated through creating a shared vision for process safety, "We all own, understand and act to control process safety risks". We set clear expectations for ourselves and those we work with (our contractors) through defined roles and responsibilities. Fundamentally we moved our mindset to being 'Line-Led, Risk-Based' placing high value on visible leadership and operational discipline. Behavioural change was supported with a comprehensive training curriculum aligned to competencies and a coaching program. To make the changes sustainable, process safety responsibilities and competencies have been embedded in role profiles with existing personnel management tools being used to manage ongoing competency.

To facilitate consistent application of PSM across our global operations, we implemented a system using a whole of company approach. This included using a common language, tools and systems from service groups such as People & Global Capability through to operational groups such as Drilling & Completions, Engineering and Production. A key focus was applying a deep understanding of the hazards and risks in the business to establish a framework for quality multidiscipline risk assessments and risk-based decision making.

After addressing the cultural element, implementation included a suite of supporting technical, and management systems, including:

- Process Safety Risk Assessment and Operational Risk Assessment Procedures to support consistent risk evaluation and robust decision making
- Embedding a focus on current risk to ensure decision making is based on the risk today
- Standardised excursion monitoring and reporting tools to support effective risk management
- Connecting operators to facility integrity information
- Integrated safety critical element (SCE) performance management system, including an update of SCE rule sets
- Clear metrics to give an overall picture of process safety system health

Global requirements for process safety performance were established, based on the corporate risk appetite applicable wherever we operate, and the requirements embedded in a standardised way of working.

Our project empowers sustainable process safety performance through a risk aware workforce where everyone knows their top process safety risks and is required to take action to manage those risks.

Keywords: Process Safety; safe operating envelope; excursion monitoring; process safety risk assessment; operational risk assessment; safety critical elements; process safety metrics; process safety governance

Introduction

Process safety management (PSM) is critical to the oil and gas industry and has been subject to stronger stakeholder scrutiny since the Deepwater Horizon incident occurred in 2010 in the Gulf of Mexico. Delivering excellence in our process safety practices is essential for our business.

Woodside's Process Safety Management Initiative introduced a holistic, effective and sustainable PSM system based on an international industry standard, the U.K. Energy Institute High Level Framework for PSM. Embedding PSM requirements into the existing Woodside Management System (WMS) and workforce behaviour expectations enables the business to execute consistent, proactive PSM throughout the exploration and production lifecycle - across assets and countries.

Implementation included a suite of supporting organisational, behavioural and technical changes to ensure a high performing process safety culture – where employees actively seek out and address challenging issues and improvement opportunities. Part of this implementation included specialist PSM work streams within the project to address critical areas. Key delivery elements included:

- Process Safety Management (PSM) process with clear requirements specified.
- Defined PSM competencies for process safety critical roles and a learning and development environment to build capability.
- Improved risk assessment processes.
- Strengthened Safe Operating Envelope (SOE) controls - operation within technical integrity limits and alarm effectiveness.

- Redefined Safety Critical Element (SCE) management process and supporting tools to enable a step change in SCE management.
- Governance structure to enable sustainable PSM.

The changes needed to align with our existing company values which are well understood. We engaged and communicated what process safety means to each person in the business within the value framework they already understand and follow. We also piloted changes and promoted the benefits at each organisational level to grow the desire to change organically.

The PSM Initiative has enabled a step-change in PSM and is a key step on the journey for Woodside to achieve sustainable top quartile process safety performance.

Developing an Integrated PSM Framework

In delivering the project, we wanted to understand the ‘full picture’ relating to process safety practices, not just Woodside’s perspective. To achieve this, we assessed available global PSM frameworks, engaged with specialist advisors and industry regulators to seek out lessons learned and best practices and considered internal and external audit findings to enable identification of critical areas for improvement.

The strategy was to adopt an international industry standard and make it our own, thereby ensuring the final product worked for Woodside and could be applied globally. After a review of the options, the U.K. Energy Institute High Level Framework for PSM was selected as it aligned most closely with our objectives and enabled us to develop a company specific PSM procedure with synergies to existing systems and processes. The PSM Procedure has 20 detailed requirements covering the breadth and depth of process safety. The Process Safety requirements from the procedure are embedded in Woodside’s Management System to facilitate integrated delivery as part of business activities. For example, PSM-related management of change (MOC) requirements are built in to the relevant MOC procedures and are identified as being PSM-related in Woodside’s management system assurance processes.

The adopted PSM Framework consists of four focus areas which are mirrored in the Woodside PSM Procedure:

1. Process Safety Leadership
2. Risk Identification and Assessment
3. Risk Management
4. Review and Improve

The project team worked across critical components of each of the four focus areas. In addition to the PSM Improvement project, other parts of the organisation were also working on aligned process improvements which provide tangible process safety performance improvements.



PROCESS SAFETY MANAGEMENT

We all own, understand & act to control process safety risks.

Process Safety Leadership

This focus area contains five requirements, of which the PSM Improvement Project focussed on three, being leadership, employee competency and workforce involvement.

Line-Led PSM Culture

Fundamental changes were achieved through creating a shared vision for process safety, “We all own, understand and act to control process safety risks”. Clear expectations were set for ourselves and those we work with (our contractors) through defined roles and responsibilities. A critical success factor was the mind-set of ‘Line-Led, Risk-Based’ that places high value on visible leadership and operational discipline. Behavioural change was supported through a comprehensive training and coaching program.

To facilitate consistent application of PSM across our global operations, we implemented a system using a whole of company approach. We established process safety requirements based on the corporate risk appetite applicable to wherever we operate and embedded the requirements in a standardised way of working.

The key success factor for the project was the work undertaken to simultaneously guide the whole organisation through the cultural shift that the change demanded. We chose to start by looking at the way we think, rather than focussing on technical processes. Process safety had to be integrated into our culture to be sustainable, to be the way we do business. To achieve this we:

- Aligned process safety with our existing values;
- Championed decision making that is line-led, risk-based; and
- Drove the change through leadership by letting the understanding of value push a commitment to change.

To support the cultural change required, we made and communicated a clear case for change:

“The project is about ensuring integrity across technical, design and operations so that we can operate in a way that keeps our people, business, partners and communities safe.”

To support leaders and individuals to champion a Line-Led, Risk-Based approach a coaching program was implemented as part of the PSM competency program.

PSM Competency Development

For Woodside to deliver outstanding performance in PSM, a competent workforce at all levels across the organisation is essential. Three key objectives were developed to underpin the design and delivery of the PSM competency and capability program:

1. Enable the building of PSM mindsets and behaviours that lead to personal ownership of outcomes and a clear commitment to do what is required to achieve PSM outcomes.
2. Provide the required PSM knowledge that will deliver an understanding of the PSM requirements and enable Woodside employees in a Process Safety Critical Role to confidently perform their role.
3. Motivate individuals to build an understanding of their PSM role and accountabilities and own their competency development.

To deliver and embed these outcomes, in particular, a ‘Line-Led, Risk-Based’ approach to PSM, a competency and capability program was developed comprising four key elements as depicted in the following graphic:



To ensure sustainable processes, a Process Safety Critical Roles Competency Procedure has been developed in alignment with existing competency and capability business processes. This procedure clearly defines the competency requirements for Process Safety Critical Roles and articulates how these competencies must be managed, including when incumbents or roles change.

A process safety curriculum and competency assessment process was developed to encompass all four competency levels: awareness; knowledge; skilled and mastery. In 2016, a significant PSM training program for the curriculum was delivered to build PSM awareness and knowledge throughout the organisation. At the end of 2016, the program had delivered 250 training courses to the business. Workforce feedback on the training program was positive and benefits are being seen through consistent use of process safety language and application of process safety requirements.

Competency is not achieved through training alone. Woodside uses the 70:20:10 model whereby 10% of competency is achieved through training, 20% through coaching and mentoring and 70% through practical experience. A coaching program, designed to support achievement of the required skilled and mastery level competencies in PSM, commenced in the middle of 2016 and is planned to continue in to the future.

Workforce Engagement

High levels of PSM performance require commitment from the whole workforce. To facilitate engagement, a number of different activities have been undertaken including roadshows and briefing sessions in conjunction with deployment communications for each deliverable.

To facilitate ongoing engagement and alignment, PSM working groups have been established throughout the business with these groups made up of members from different levels in the organisation, including front line representation. Initially these working groups were established at operating assets, and are now being expanded throughout the business into developments and functional groups. These groups undertake a level of governance over process safety performance, as well as sharing lessons learnt, and determining what engagement programs are needed to continue increasing awareness and

maintain the focus specific to their work groups. This is enabling the line-led approach as each group can tailor programs based on asset/functional needs.

Hazard Identification and Risk Assessment

A key aspect of this focus area was to ensure a deep understanding of the hazards and risks in the business and to establish a framework for quality multi-discipline risk assessments and risk-based decision making.

To achieve process safety performance expectations, risk assessment must be consistently applied, throughout the lifecycle, with robust, prioritised decision making as an output. Our risk assessments need to differentiate material risks to support detailed understanding of the risks, and quality and timely decision making, so we can make best use of our resources in managing risk. High quality risk assessment is essential for effective risk management - you must understand the risks to be able to manage them. Key success factors for risk assessment are the use of fit-for-purpose tools in combination with the right multi-discipline teams and accurate input information to deliver quality risk based decision making, particularly in operations where emergent risks need to be evaluated and treated efficiently and effectively.

The risk assessment work stream delivered procedures and processes that establish a clear framework for quality multi-discipline risk assessments to enable a deep understanding of the hazards and risks in the business, thereby facilitating effective risk-based decision making. This included:

- Process Safety Risk Assessment (PSRA) Procedure establishing consistent global requirements across the value chain and asset lifecycle.
- Operational Risk Assessment (ORA) Procedure and template to enable fit-for-purpose assessment of emergent operating risks.
- Layers of Protection Analysis Procedure to ensure equipment level cause-consequence scenarios are understood and appropriately managed.

The PSRA Procedure allows us to proactively use risk assessments in the design phase and facilitates generation and maintenance of accurate baseline risk assessment studies before, and throughout, the operate phase.

Review of existing internal practices identified evaluation of emergent risk for operating facilities as a key area for improvement. To close this gap, the ORA Procedure, together with a supporting template, was developed in collaboration with operations personnel to ensure the product facilitated the changes we needed – effective line-led risk-based decision making for emergent risks. Operations have embraced the process and it is recognised as a valuable addition to the business.

To support implementation of the PSRA and ORA Procedures, a HSE Risk Assessment Guideline was developed focused on aspects, such as consequence development and likelihood determination, which will support consistent and accurate risk assessments. This guideline is also designed to support competency development for risk assessment through use.

Deployment of the risk assessment requirements to the workforce was achieved via multiple avenues. The procedures have been supported through implementation by roll-out presentations and facilitation support for initial ORA execution. To support general competency development, a specific training package to address competency and consistency improvement opportunities related to risk assessment fundamentals and specific requirements under the PSRA and ORA Procedures was put in place. This package is delivered as the PSM Knowledge Level Risk Identification and Assessment Training administered through the wider PSM competency program. A tailored e-learning module has been created specifically for operations personnel who may participate in an ORA.

Part of the challenge was a need to reset the organisation in the merit and limitations of the different risk assessment techniques. Fully quantitative techniques and complex risk models can provide a false sense of security. These techniques can fall down during emergent risk scenarios and, for example, are not always able to deal with complex coincidental changes to operational baselines such as equipment degradation or failure impacts to risk during extreme weather events.

Risk assessments are an input into decision making, and not the decision itself. It is essential to become risk thinkers and understand the limitations and uncertainties in any analysis versus focussing on a number.

To help re-engage the organisation on the risk discussion, a Process Safety Risk Thinker Series was run to challenge our mind-sets around risk identification and assessment which included a risk thinker online quiz, an ORA competition and lunchtime drop-in sessions to explore four key themes of risk-based thinking: Materiality of risks; Multi-discipline teams; Making quality decisions; and Managing our risk effectively. The Risk Thinker conversation continues with proactive regular support provided to various functional and asset groups based on organisational pull – a sign that we are achieving the behavioural changes needed to achieve our risk assessment goals.

Risk Management

While all eleven requirements in the risk management focus area are essential for delivering PSM performance, the project identified two critical areas for which dedicated work streams were created: Process and operational status monitoring; and Safety Critical Element Management.

Safe Operating Envelope

The Safe Operating Envelope work stream had two key goals - to ensure operations stayed within technical integrity limits and to improve alarm barrier effectiveness.

Traditionally at Woodside, this monitoring of design limit excursions was done via a time-consuming process involving retrieving data from the historian and migrating into Excel for analysis. Being retrospective in nature, potentially up to a week delayed, this made timely decision making about exceedances difficult. There was also a lack of visibility for front-line operations personnel that did not enable the line-led, risk based process safety approach.

An Operations-owned Integrity Monitoring Tool, has been introduced to enable 24/7 monitoring of our design limits so that frontline operations and surveillance engineers have improved visibility of the integrity envelope enabling immediate response to excursion, and demands on safety systems. We have made our design limit exceedances aligned with risk to ensure prioritisation of work. The tool runs every 15 minutes, and if a design exceedance is detected within that time, the relevant people across operations and engineering are notified directly via email. Being an online environment the information can be readily accessed by all those who need it.

Alarms require an operator to intervene for them to be an effective control. This is where human factors come into play. The most effective way found to strengthen the alarm barrier was through the implementation of clear alarm responses. The work led to an update of the Alarm Management Philosophy to facilitate standardised rationalisation of alarm management across Woodside. As part of execution, all high priority alarms have been validated and operator actions defined.

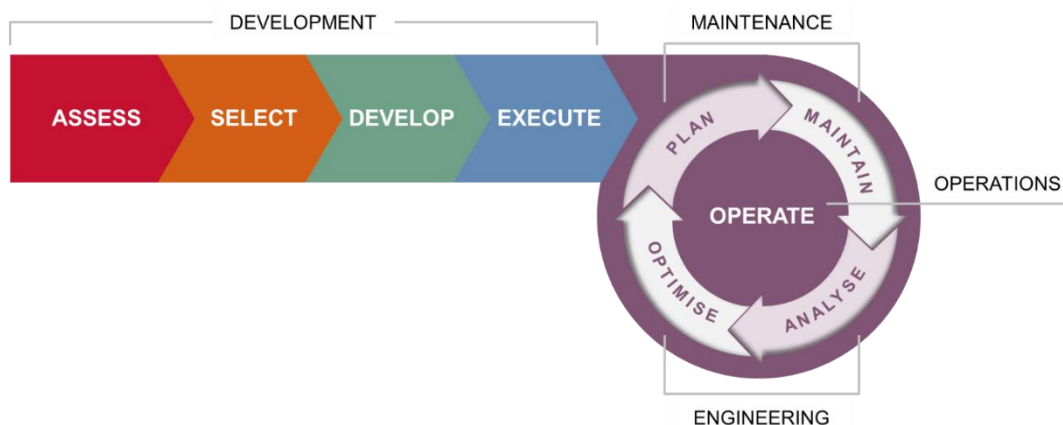
Safety Critical Element Management

Safety Critical Elements (SCE) are those items of equipment that are key to managing risk inherent in our business. SCEs are comprised of one or more items of safety critical equipment. For each SCE, a Performance Standard is required which defines the functionality requirements, performance acceptance criteria and the assurance tasks needed to demonstrate the fitness for service of the SCE and associated safety critical equipment.

SCE Management was identified as an improvement opportunity and this was determined as a key PSM Improvement Project work stream. To ensure we had a clear picture of what was needed, the following definition of success was developed:

- Minimum requirements are clear and achievable.
- We know and focus on what is important.
- We fix safety critical equipment that is compromised.

An output was a new SCE Management Procedure clearly articulating the requirements for effective asset lifecycle SCE management and an associated Guideline to facilitate implementation. A key deployment message – everyone’s involved - is reflected in the lifecycle graphic below. All the responsible parties need to be completing their parts in a timely and efficient manner to ensure ongoing effectiveness.



To enable the desired SCE management step change, all SCE generic performance standards have been revised to ensure functionality is clearly defined, performance criteria supports the demonstration of functionality and assurance tasks are achievable and meaningful. The generic performance standards were also benchmarked to ensure aspects, such as test frequency, are aligned with good practice. Following on from this, facility specific performance standards are being updated to align with the generic performance standards.

To support the process, a new Conformance Reporting Tool has been developed which provides improved governance of safety critical equipment and enables engineering review of equipment performance and reliability.

Governance and Assurance

We need everyone to understand, own and act on their role for PSM. To underpin this we needed a governance and assurance program that supports understanding of the health of the PSM system and process safety outcomes. The graphic below illustrates the governance and assurance delivery model.



To facilitate governance, an automated PSM metrics dashboard has been developed for key process safety metrics, and this has enabled improved visibility of process safety performance. The metrics represent quantifiable aspects of process safety, with other aspects being monitored through assurance assignments. Based on the line-led approach, governance starts at the work-site level and flows upward, with appropriately focussed activities, through asset level to operating unit level and then through to the sustainability committee at the board level. Functional group governance also takes place. This governance model leverages existing company governance structures and allows for effective integration of PSM into business activities. The purpose of the governance process is to use the metrics to provide an avenue to take action on process safety risks through informed decision making. A key decision was taken to launch the metrics without performance targets so that they could be used to inform risk and drive quality decisions rather than create artificial thresholds.

Assurance has also been facilitated through embedding the PSM requirements within the Woodside Management System and the use of ‘tagged’ requirements. The Woodside Management System captures key controls which support assurance tasks to assess performance. Those controls tagged as PSM-related allow for reporting on PSM performance as a subset of the overall Woodside Management System performance.

Incident Investigation

In parallel to the PSM Improvement Project, an Event Investigation Improvement Plan was put in place to facilitate Continuous Improvement in the areas of event notification; event investigation; investigation reporting and learning from incidents. A key requirement was a move to line-led investigations versus central or independently led investigation. This is fully aligned with the ‘line-led, risk-based’ PSM delivery approach. Through the establishment of a structured investigator competency development program; a roster to support line-led investigations; and a standardised suite of tools and methods to support investigations, a step change in event reporting quality has been realised. An improved event lessons bulletins process has also been put in place to support company-wide learning. The next stage will consider improved processes for capturing, sharing and embedding applicable external events.

Summary

The project has provided a PSM framework which is inherently aligned with our company values. The required changes were facilitated through creation of a shared vision - “We all own, understand and act to control process safety risks”. The project leveraged the existing positive behaviours and attitudes for HSE, extending the focus to process safety.

Delivery of the project work streams, relating to capability and competency, risk assessment; safe operating envelope; SCE management and governance, has established the basis for successfully delivering PSM. The PSM Procedure, supported by fit-for-purpose procedures, guidelines and tools, will facilitate long-term sustainable process safety performance. We will deliver process safety the same way everywhere we operate in the world – making us a quality, reliable and continuously improving partner of choice to industry.