

A review of the safety successes at Wessels Mine

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1. SYNOPSIS

Wessels Mine experienced 2 fatalities in a short space of time one in November 2010 and another in February 2011, this following from what was thought to be a relatively stable safety performance. Wessels embarked on a comprehensive culture change initiative, using BHP Billiton values as the platform.

Wessels mine achieved 299 white flag days (without any injuries) on the 30th July 2013 and has achieved a record of 445 recordable injury free days on the 31st July 2013.

Post the fatalities, Leadership undertook a critical review of the leadership culture and organisational failures which led to the events. Specific issues identified included:

- Organisational structure and span of control – Wessels and Mamatwan Mines were managed as one Operating unit, with significant complexity and span of control challenges identified.
- Organisational culture – Although Safety was always a priority in the mining industry in general and at Wessels in particular, this focus was not aligned to a values approach, and was more compliance based.
- Safety systems – Key safety systems implemented at Wessels at the time was cumbersome and complex and did not create an enabling environment to reduce risk or drive compliance

To enable an immediate culture change and improve their safety performance, the Wessels Leadership implemented a number of specific and targeted changes in the organisation. The program did not entail the implementation of a new safety program, but rather focussed on:

- Structuring for improvement – The two mines were split into separate operating units and the implementation of BHP Billiton Operating Model was expedited
- Leadership behaviour and culture– modelling low tolerance for risk taking behaviour
- Leadership response to incidents – Driving a reporting culture and immediate response to addressing hazards
- Simplifying and entrenching existing safety systems

The Wessels approach aligned well with Casey's model (2012) which proposes 8 behavioural dimensions which would provide employees with safety performance expectations and will increase motivation to engage in safety beyond compliance.

The review of Wessels' successes confirmed that the 5yr key focus areas for MnSA¹ are aligned and will deliver improved safety performance, but specifically the following permanent culture changes need to be effected:

- Embrace the Operating Model and extracting value from functional excellence
- Consistently model the desired behaviour in line with values.
- Maintain the focus on the value of reporting to address gaps as opposed to it being seen as a tool to penalise employees.
- Simplify and embed key safety systems and extract value from the loop of verification, and gap closure.

The MnSA 5year focus areas are clearly aligned, but in order to achieve sustained improvement Leadership levels at all levels should be aligned, therefore the Leadership development initiative becomes key for MnSA success

¹ Manganese South Africa, BHP Billiton

2. INTRODUCTION

2.1. Purpose

The purpose of this document is to evaluate and understand the elements contributing to the exceptional safety performance at Wessels which lead to the Operation achieving a total of 299 days without any injuries recorded. Understanding these contributing factors is critical; if MnSA is to apply the learning's to its other Operations and replicate the performance across the BHP Billiton.

2.2. Background

Wessels Mine experienced 2 fatalities in a short space of time one in November 2010 and another in February 2011, this following from what was thought to be a relatively stable safety performance. These events necessitated a critical review of the leadership culture and organisational failures which led to the events.

Wessels embarked on a comprehensive culture change initiative, using BHP Billiton values as the platform. The program did not entail the implementation of a new safety program, but rather focussed on:

- Leadership behaviour – modelling low tolerance for risk taking behaviour
- Leadership response to incidents
- Simplifying and entrenching existing safety systems

This report will reference the state at Wessels Mine at the time of the fatalities and the changes and results thereafter, as these events were seen as pivotal in the changes achieved at Wessels Mine.

2.3. Current Performance

Wessels mine achieved 299 white flag days (without any injuries) on the 30th July 2013, is still maintaining a classified injury free (restricted work or lost time cases) trend and has achieved a record of 445 recordable injury free days on the 31st July 2013. The full year Total Recordable Injury Frequency rate (TRIF) at the end of FY13 was 1.4, which is the lowest in the BHP Billiton Group and is considered as benchmark in the mining industry in general. For this achievement Wessels was awarded a number of accolades by the Department of Minerals and Resources (DMR) including "Best performance in an underground mine division" and "Best improved mine in the Northern Cape"

The changes seen at Wessels are well entrenched and Wessels continues to perform consistently across all key leading indicators, maintaining on average 60% of all Significant incidents reported at Supervisory and Employee level and a 70% hazard (zero energy exchange) reporting as indicated by the graphs below. Significant incident reporting is maintained at >7.0 SIs reported per 100 FTE, and the ratio between PL4 (potential fatality) injuries and PL2/3 (maximum potential recordable) injuries, have decreased from 50% in FY12 to 0% in FY13.

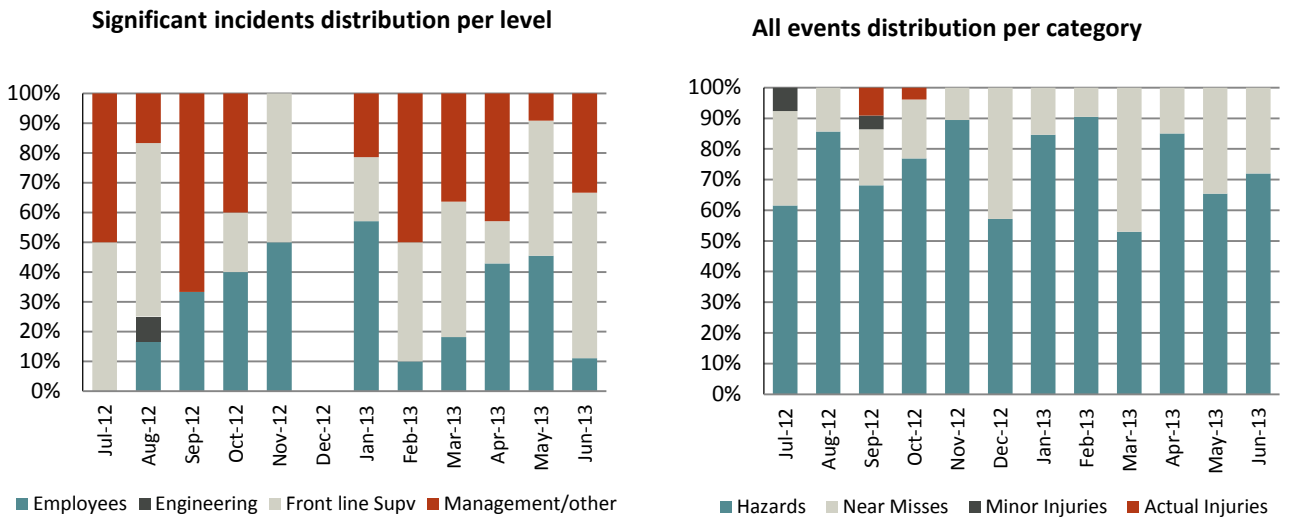


Figure 1: Distribution of SI’s reporting across levels

Figure 2: Hazard reporting

3. WESSELS MINE REALITY POST FATALITIES

3.1. Organisational Structure

Wessels and Mamatwan Mines were managed as one Operating Unit at the time of occurrence of the fatal events, under the Operational Leadership of a single General Manager. In addition, although Hotazel Manganese Mines were in the process of implementing the BHP Billiton Operating model, the General Manager was not only responsible for day to day running of the mines, but also for all functional activities (HR, HSEC, Finance etc.) as well as the management of Hotazel Town.

This, coupled to the fact that the mines are logistically removed more than 60km apart, and that 2 different mining techniques are applied (open cut and underground), added significantly to the complexity of General Manager’s role and substantial span of control issues were identified during the subsequent investigations.

3.2. Organisational Culture

An investigation (ICAM) into the organisational failures leading to the fatalities revealed significant organisational challenges contributing to the prevailing culture in the organisation at the time. Both Wessels and Mamatwan Mine, at the time had a relatively young leadership team with the Manager having the most experience on the BHP Billiton mine having three years of service. The leadership team were recruited from a variety of mines within SA and it was clear that each wanted to make significant changes to the processes and systems implemented at the Operations (by pulling from their previous workplace experience) but there was little success in aligning the team and the workforce on a common culture.

Although Safety was always a priority in the mining industry in general and at Wessels in particular, this focus was not aligned to a values approach, and was more compliance based.

3.3. Safety Systems

The safety systems implemented at Wessels at the time was cumbersome and complex and did not create an enabling environment to reduce risk or drive compliance. Two systems in particular, added to the complexity and when leaders were interviewed on the design of these systems it was clear that these systems' contribution to a safer work environment was not well understood, nor effectively achieved:

Risk Management system:

The risk management system implemented at Wessels was designed to identify and rate baseline risks, conduct Job Hazard Analysis (JHA) and pre-emptive risk assessment (Take 5). The process was not well defined and documented and not embedded, to the extent that the HSEC Function owned the risk management process and Operational Leadership had very little understanding and knowledge of the processes. The use of the risk management process as an effective tool for risk identification and mitigation was not supported by the design and the main failures included:

- A service provider was contracted to review the baseline risk register. The process and tools used were not aligned to BHP Billiton Risk management process and defined the risk to a level of granularity that did not allow for management of the risks. The methodology lead to literally thousands of risk events identified ranging from multiple fatalities to slips and trips, and no clearly defined methodology and tools to manage these based on the materiality thereof.
- Utilising the services of an external party did not drive Line ownership of risks identified
- Line personnel were not clear on the use and application of the JHA i.e. when it should be completed, how it should be completed, what the process is when unmitigated risk is identified
- Line personnel were not clear in use and application of pre-emptive risk assessment (Take 5).

This led to a situation where these tools were used in general by the workforce to ensure compliance, however the lack of understanding of the purpose was lacking, leading to these tools being ineffective in actually managing the risks.

Isolation and permit to work system:

Due to the shortcomings in the Isolation and Permit to work system at Wessels Mine, as identified through audits and incident investigation findings, Wessels team conducted extensive benchmarking of best in class systems to replicate these learning's at the mine. Yet the team failed to sustainably implement these learning's as they had to overcome huge resistance to change stemming from a belief that the Wessels environment is unique and therefore similar systems elsewhere cannot be applied to the Wessels environment. Typical failures in the design included:

- Accountabilities and responsibilities for isolation and issuing of permits not clearly defined, an training and competency requirements to adequately addressed
- No clear defined process for managing multiple isolations and simultaneous work
- The system did not provide the assurance that all energy sources are identified and controlled when work is performed

4. ENABLING CULTURE CHANGE

4.1. Organisational Structure

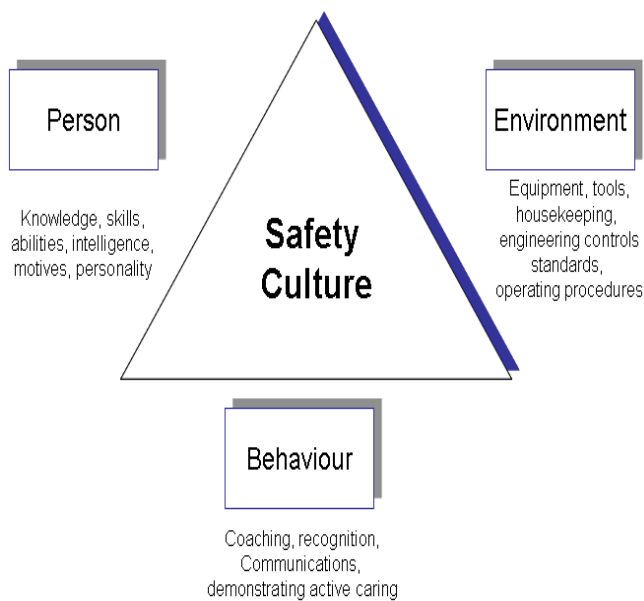
Following the investigation into organisational failures, the implementation of the BHP Billiton Operating Model was expedited, starting with the split of the 2 mines into separate Operations, each with a General Manager charged with the accountability for Safety, Cost and Production. The accountability for functional support services i.e. Finance, HR, HSEC, Non-process Infrastructure (including Hotazel Town), were removed from the General Manager's portfolio and as per the Operating Model assigned to Functional Heads, reporting directly to the Asset President.

This allowed the General Manager the time and space to focus on their accountabilities, whilst ensuring that deep functional excellence is developed in each of the functional support areas. Truly embracing the new operating model provided the platform to change.

4.2. Organisational Culture

4.2.1. Remodelling Leadership Behaviours:

According to Hopkins (2002) safety culture is described as the “...assembly of characteristics and attitudes in the organisation...which establishes safety as an overriding priority...” Agnew and Daniels (2010) states that culture is “Patterns of behavior encouraged or discouraged, inadvertently or intentionally, by people or systems over time.” Geller (2001) confirms a three-tier approach to achieve a safety culture and demonstrates by using the following diagram.



According to this diagram, three elements require focus when establishing a safety culture including the environment, person factors and behaviour factors. Geller (2001) maintains that changes in one of these elements eventually impacts on the other and that paying attention to one factor more than another will not support the successful implementation of a comprehensive safety culture in all levels of the organisation.

Figure 3: Elements requiring focus to establish a safety culture (Source Geller, 2001)

Following the 2 fatalities, Wessels Leadership embarked on a deliberate process to change the culture at the Operation, starting with introspection as to the sort of culture the existing leadership behaviours were driving. The behaviours of Leadership were carefully scripted to send appropriate signals to the workforce, realising that the cues that the workforce attunes to often relate to “what leaders do” as opposed to “what leaders say”. These behaviours were intended to demonstrate that Safety is a key priority and will not be compromised in order to drive any other KPI. In addition the behaviours were intended to drive the message of consistency, clearly demonstrating to employees and contractors that leaderships’ behaviour is consistent on and off the job. It was made clear that in order to entrench the value of Safety, each individual needs to understand that safety becomes a way of living, on and off the jobs.

“We previously had an unwritten perception that safety is only applicable to the workplace”
Wally Claassen, Maintenance Manager Wessels Mine

“Production and safety goes hand in hand. There is no such thing as production first and safety after”
Bakang Kwetsi, Full Time Health and Safety

The approach was to clearly articulate the expected Leadership behaviour in line with BHP Billiton values,

to the Management team, where after coaching and modelling was used to deploy the expected leadership behaviours to all levels of leadership. Leadership were expected to demonstrate intolerance towards risk taking behaviours and at risk conditions. It was expected at all levels that Leaders should intervene, engage and correct at risk behaviours and conditions on the spot, even if this meant interruption to production.

4.2.2. *Enable engagement:*

In order to drive the engagement at all levels, a number of process changes were made to enable engagement on Safety. These include:

- Establishing a safety contact – A safety contact was included as a mandatory item at all meetings. The use of the safety contact was driven by the leadership team, with all meetings starting off with a safety share in which any person in the meeting can raise a safety issue whether it is work / non work related.
- Creating time for leaders to engage – A rule was instituted that no internal or external meetings were allowed to be scheduled in the morning. This was to enable the leaders to spend time in the field, interacting with and engaging their teams.
- Defining requirements for time in field – The MnSA leadership time in field procedure was developed to ensure structured time in the field. This guided leaders on how much time should be spent and how this time should be utilised. In addition the focus for time in field engagements were shaped and informed by the risk management framework, to allow leaders to verify and coach on the effective implementation of critical controls.

“Field verification is helpful because management is visible and is helping teams by doing on the job coaching, which promotes safe work and reporting” Hanzel Basson, Operational Supervisor

These changes enabled the leadership team to establish caring relationships with their teams by immediately responding to hazards, coaching supervisors on the importance of controls and verification to ensure that this remains in place, embedding the BHP Billiton values by exhibiting these values in action on a daily basis.

4.2.3. Drive reporting:

Wessels took the lead in driving and establishing a strong reporting culture, a strategy which was adopted by MnSA. A strong reporting culture drives safety performance in the following ways:

- Reveal areas of weakness or serious organisational factors in advance of serious events
- Is associated with proactive activities of identifying hazards and mitigating these
- Builds a culture of caring

The culture was gradually embedded, starting off by focussing on reporting of significant incidents by the leadership layers of the organisation. This was achieved by including reporting as a leading indicator in the monthly reward program which was rewarded even in the event that production targets were not met. This change in the monthly reward program had a major impact within the organisation as previously the lagging indicators of safety incidents were used to discount the production enabled reward. This supported the move toward reporting leading events as safety incidents no longer penalised employees, but rather reward and recognition was based on reporting of hazards. Over time the focus of reporting changed to reporting of zero energy exchange events (hazards) and driving reporting down to employee levels.

An analysis of significant incident reporting from December 2010 shows low levels of reporting, although most if not all of these were reported by employees and supervisors. This trend is an indication of the level of engagement and time in field from Managers and Superintendents at the time. From June 2011 an increase in reporting is evident and it is clear that reporting was supported by Managers and Superintendent Levels, whom spearheaded the reporting drive and coached quality reporting and action to lower levels.

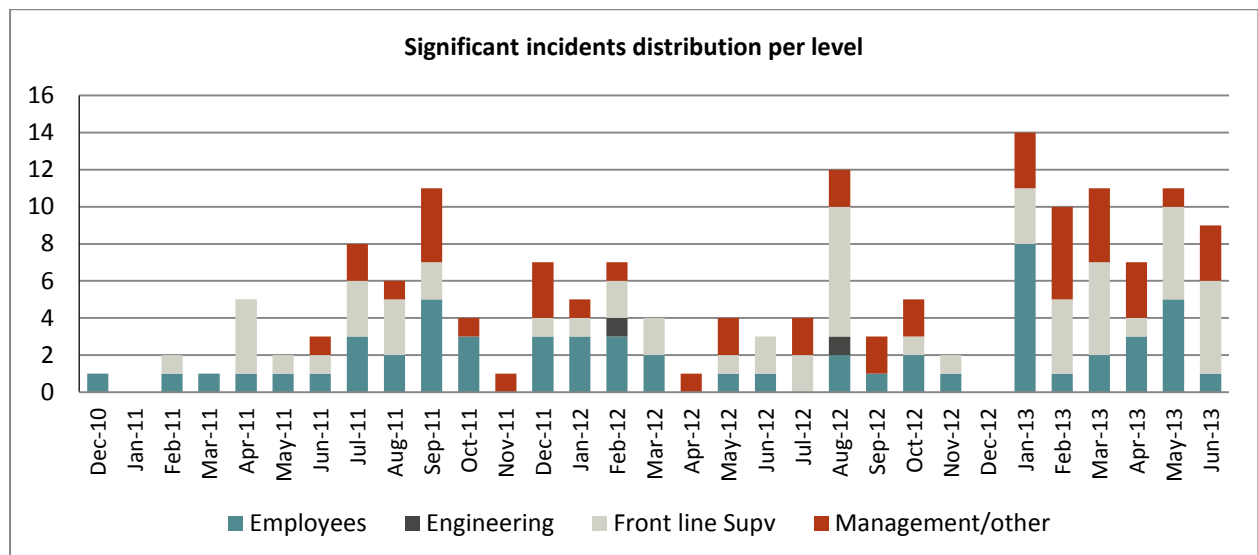


Figure 4: Significant incident reporting

Over the months that followed, Wessels maintained the level of reporting at high levels maintained a consistent distribution of SI reporting between Employees/Supervisor levels and Manager/Superintendent level of >60%.

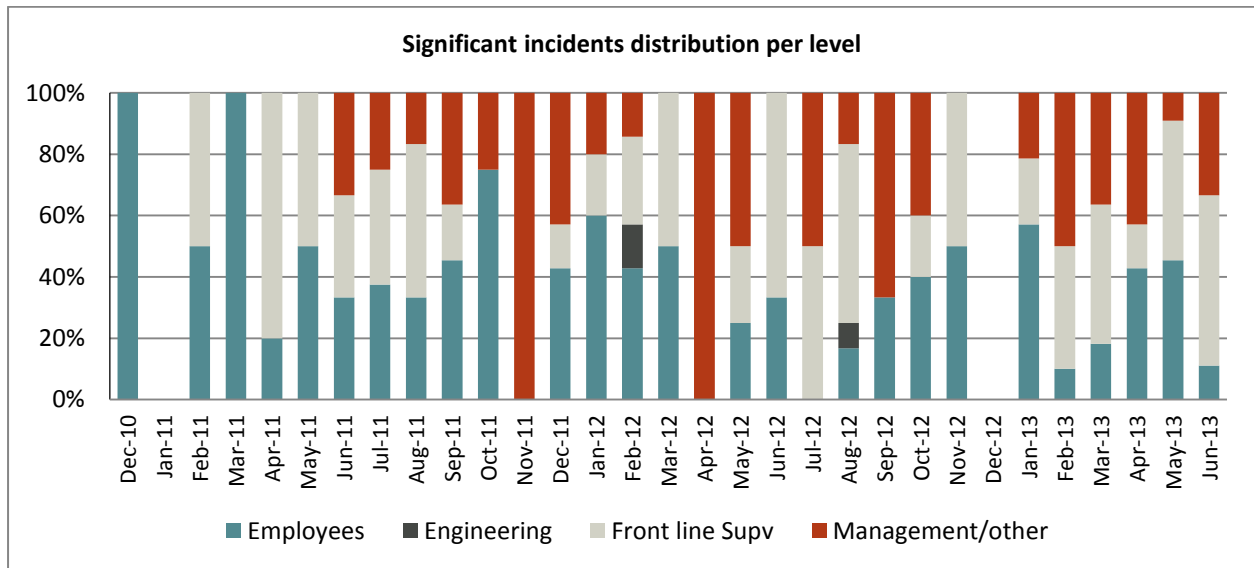


Figure 5: Distribution of SI's reporting across levels

The most significant impact from the change in reporting culture was not achieved through the numbers alone, but the fact that investigations were completed in a timeous manner and that the focus in these investigations shifted from blaming individuals to identification of the organisational failures which led to the event. This information was used to improve systems and processes to prevent similar and other incidents of the same nature. In addition, leaders used the time in field engagement and other communication forums to communicate and feedback to employees on the incidents and the actions taken, which further embedded the reporting culture, as it is clear to employees that their reports are taken seriously and addressed.

“Management played a big role to encourage employees to work safely. They have taken the responsibility to ensure that they investigate incidents in a timely manner to ensure that it does not happen again.” Patrick

An analysis of all events reported clearly shows the shift in focus from lagging (reporting of actual events and near misses) to leading (reporting of hazards). This in combination with timeous response to correct the related organisational failures effectively reduced the injury occurrence to zero.

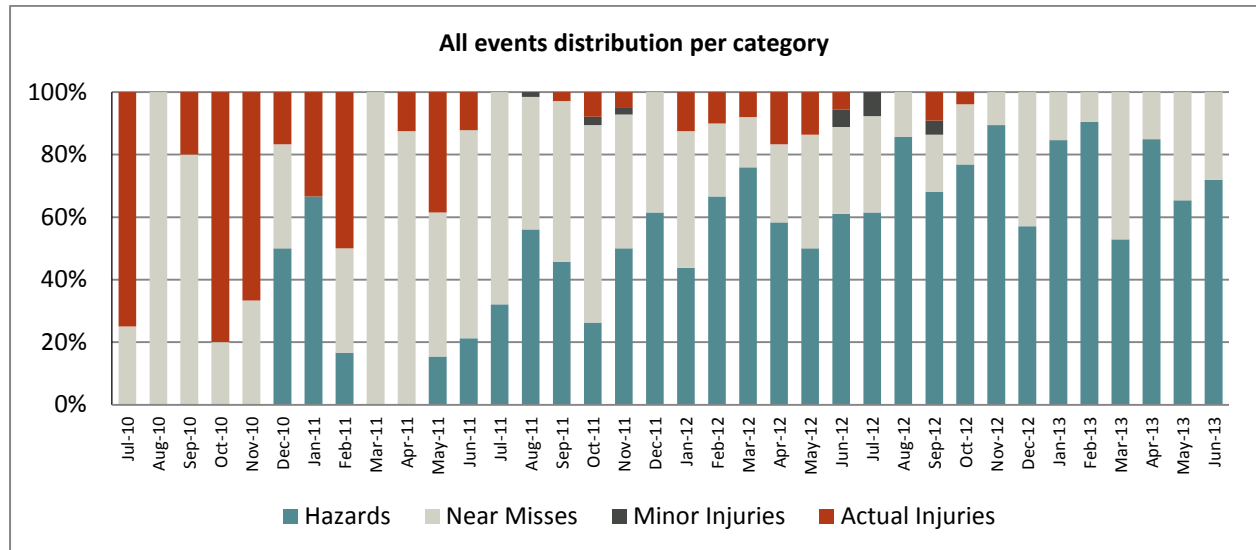


Figure 6: Reporting of zero energy exchange events

4.3. Simplification of systems

Several incident investigations findings pointed to failures related to risk management and Isolation and Permit to work system. Immediately following the fatalities, Wessels reviewed these systems and implemented changes to simplify the processes and tools and to ensure that the processes are understood and well embedded.

4.3.1. Risk Management Framework

Simplification of the risk management process entailed a revision of the Material risk management process, use of Job hazard analysis and revision of pre-emptive (personal) risk assessments. Wessels, as all operations in MnSA adopted and implemented the MnSA material risk management framework. There are a number of elements that contributed to this process change impacting on the safety performance:

- The Wessels Leadership team actively drove the ownership of risks and controls to line by identifying Managers as risk owners and holding these risk owners accountable to ensure that the risk is well controlled.
- The material risk framework was utilised to define the focus for leaders during their time in field engagements. At all levels of leadership is actively engaged in verification of effective control implementation.
- Establishing clear accountabilities for risk owners and control owners, with every employee understanding their accountability to ensure that controls are in place. Supervisors can clearly articulate the top 5 risks their areas of responsibility
- Active learning and feedback loop from significant incidents reported: Event reporting provides information as to the effectiveness of controls and lead to a revision of the controls and related performance standards.

In addition to the implementation of the Material risk framework, the JHA and Take 5 processes was also revised and simplified:

- Clearly framing the role and applicability of each process and how it fits into the overall process, and how it contributes to risk reduction
- Communicating when and how to apply these tools
- Revising the tools to simplify and remove ambiguity

Again, Leaders took the lead to ensure that these tools are embedded, engaging their teams on their application and actively using the tools during their time in field sessions.

4.3.2. *Isolation and permit to work*

Following the fatalities, Wessels worked towards adapting the lessons learned from benchmarking, to ensure an Isolation and permit to work system, which incorporates the best in class practices observed, but applying it to the Wessels underground environment. The Isolation and permit to work systems was significantly simplified, with most important improvements including:

- Zoning equipment and identifying all energy sources using detailed isolation maps. These enable clear and quick identification of all sources to be isolated.
- Appointment and training of permit issuers, and general workforce in isolation
- Revising the isolation process to ensure that all employees working on a piece of equipment locks out on the isolation board as opposed to just the isolation officer locking out.

The most important change to the process is the incorporation of isolation controls in the material risk management process; including regular verification against performance standards and the feedback loop from reported Significant incidents to ensure the controls are improved following identified failures.

4.4. Work Management and Planning

With the implementation of the BHP Billiton Operating model, Wessels aligned and improved the planning processes to support work management execution. At the time, work was completed in an uncoordinated manner, with planning not considering stakeholders across the planning, maintenance and production functions. With the establishment of discreet Planning and Maintenance functions within Mining Production, weekly and later 14 day planning was instituted to feed into the execution function with all stakeholders consulted and agreeing with work that needs to be completed in the planning timeframe.

Another important change is that any changes to the agreed plan is risk assessed before signed off and communicated for execution. Where previously the maintenance teams would be pressured to release isolated equipment on short notice, each change to planned work is thoroughly reviewed and risks understood before a decision is made to change the plan.

5. KEY LESSONS FOR MnSA OPERATIONS

5.1. Key enablers for Wessels' success

Casey (2012) states that motivational approaches, which focusses on the behavior and attitudes of employees, are aimed at targeting employee compliance. However, while this will nurture a strong safety climate, the risk remains that employees will believe that shortcuts provide immediate pay-off, which will lead to the individual challenging the value of acting according to some externally imposed directive. Geller (2001) confirmed this phenomenon by observing that the natural relationships between behaviour and its motivating consequences result in "convenient" at-risk behaviours. Casey (2012) poses the challenge of moving towards genuine ownership of safety through "building safety citizenship". "Organisational citizenship is the term for behaviours outside the normal scope of employees' position descriptions. Such behaviours go above and beyond what is minimally expected from employees" Casey (2012). Neal et al (2000) suggests that there are 2 dimensions of performance: compliance and participation. Compliance involves adherence to procedures and generally conducting work in a safe manner, while participation rather speaks to behaviours outside the normal scope of what is expected of employees and involves helping co-workers, promoting the safety program and demonstrating initiative.

Casey (2012) indicates that leadership is a "powerful predictor of safety citizenship behaviours". Podaskoff et al (1990) found that transformational leadership behaviour influences citizenship behaviour. Leaders, through the way they interact, and by way of what they focus on effects the way in which employees behave. But is it possible to isolate the leadership behaviours which will promote safety citizenship? Lekka and Healy (2012) suggest that both transformational and transactional leadership styles promote perceptions of a positive safety climate, employee compliance. Specific behaviours associated with transformational leadership style includes conveying a safety vision, acting in a manner consistent with the values they embrace, while specific supporting transactional leadership behaviours include setting safety related goals and monitoring and rewarding positive safety behaviours.

Transformational leadership styles however has the biggest impact on safety citizenship behaviours while transactional leadership styles impacted on level of safe behaviours i.e. compliance. (Lekka and Healy, 2012)

Casey (2012) proposes a leadership behavioural framework based on existing transactional and transformational theories. The model proposes 8 behavioural dimensions which would provide employees with safety performance expectations and will increase motivation to engage in safety beyond compliance:



Figure 7: 8 Dimensions of safety leadership (Source: Casey 2012)

The Wessels approach impacted across all dimensions of the Safety leadership as suggested by Casey's model. Specifically, the elements of Actively caring, Vision, Inspiring and Role modelling and Recognising, are well entrenched and maintained in Wessels.

5.2. Extracting lessons for MnSA Operations

During the FY13-17 Planning cycle, MnSA identified key focus areas to improve the safety performance over the five year period:

- Planned, stable maintenance and operational environment
- Reduction in risk profile by Elimination of material risk and repeat low consequence impacts
- Engaged, empowered workforce (Leadership engagement, Trained competent workforce, Accountability)
- Effective management of incidents and injuries to prevent repeats
- Contractor Strategy (In-sourcing of core contractors, Reduction in number of non-core contractors by identifying preferred suppliers and close engagement to elevate standards)

All of the MnSA Operations therefore has a similar focus as the Wessels mine, however, reports various levels of success, none on the performance level as Wessels Mine. This is key to understand, if MnSA is to be successful and achieve sustained benchmark safety performance. Key lessons that can be extracted from the Wessels case study are:

- The Leadership team has *embraced the Operating Model*, extracting value from this by enforcing the principles and holding functions accountable to deliver in accordance.
- The Leadership has been able to *consistently model the desired behaviour* in line with the values and did not reduce their focus or change their approach to time in the field when other competing priorities emerged.
- The operation was able to *eradicate the fear of reporting* and managed instead to maintain the focus on the value of reporting to address gaps as opposed to it being seen as a tool to penalise employees.
- Successfully simplified and embedded key safety systems and extract value from the loop of verification, and gap closure.

The MnSA 5year focus areas are clearly aligned, but in order to achieve sustained improvement Leadership levels at all levels should be aligned, therefore the Leadership development initiative becomes key for MnSA success.

6. LIST OF REFERENCES

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