MOSH LEARNING HUB

MOSH

1 2 3 4 5 6 7 8 9

1. Mpumi Mthethwa
2. Kagisho Motseme
3. Tabby Resane
4. Ntsiky Phokwana
5. Sibusiso Talane
6. Kobus Blomerus
7. Tshidi Moabelo
8. Shane Durapraj
9. Mpho Mudau

The Mining Industry Occupational Safety and Health (MOSH) Learning Hub continued to collaborate in people-centric industry initiatives, including but not limited to leading practice adoption, modernisation, leadership's Vision 2030, health and safety training, adoption progress reporting, sharing lessons learned and successes, and monitoring and evaluation.

LEADING PRACTICE ADOPTION

The MOSH Learning Hub facilitated investigation, adoption and promotion of leading practices in health and safety in pursuit of zero harm, focusing specifically on noise, dust, falls of ground, transport and machinery.

NOISE

The MOSH Noise Team continued to facilitate the Industry-wide Buy and Maintain Quiet Initiative (IBMQI) under the auspices of the IBMQI Steering Committee. This noise source elimination initiative encourages management of the noise hazard at equipment design stage. It uses the industry's collective demand to motivate original equipment manufacturers (OEMs) and suppliers to focus on noise reduction in product development. The initiative acknowledges that individual mining companies have established Buy Quiet policies albeit with limited success. Some of the key achievements of the IBMQI in 2017 include:

- Development, evaluation and popularisation of the Critical Noise Equipment Screening Tool under the guidance of the IBMQI Procurement Working Group
- Development and publication of the Equipment Noise Reporting Guidance Note under the leadership of the Measurement and Standards Sub-Working Group – aimed at facilitating alignment of the equipment population and reporting process within the South African mining industry
- Engagements with OEMs on the introduction of IBMQI processes
- Critical noise equipment screening
- Equipment noise reporting guidance note
- Engagements with OEMs
- Identification of new leading practices
- Noise research

Critical noise equipment screening

Following the development of the Critical Noise Equipment Screening Tool, the Noise team initiated an industry evaluation and popularisation programme for the screening tool through regional tripartite forums and other platforms.

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10 11 12 13 14 15 16 17 18

10. Katlego Letsoalo
11. Stanford Malatji
12. Christopher Legodi
13. Israel Sibisi
14. Phelisa Yoyo
15. Willie Deysel
16. Dr Vukosi Banyini
17. Leigh McMaster
18. Sietse Van Der Woude

The main objective of the screening tool is to assist mining operations in prioritising management of noisy equipment, using a risk-based approach with a risk ranking output rather than a blanket-type approach.

The screening tool also complements the existing noise repositories of mines, assisting in choosing appropriate equipment. In ranking risk, the screening tool considers the number of people exposed, number of machines, duration of exposure, confined space, machine vibration, wear parameters, improvement ideas, effective hearing protection and frequency of noise.

The top 10 critical factors identified for each commodity inform engagement with OEMs, and ultimately the design and manufacture of quiet mining equipment.

Equipment Noise Reporting Guidance Note

Following the development of the Guidance Note for Noise Measurement of Equipment, to ensure compliance with Mine Health and Safety Council (MHSC) milestones, the IBMQI Committee identified variances in methodologies applied by various mining operations when reporting equipment noise. This highlighted the need for equipment noise reporting guidelines, which would facilitate a uniform approach for the South African mining industry so that results could be compared among mining operations.

The Measurement and Standards Sub-Working Group subsequently published the Equipment Noise Reporting Guide to assist mining companies in grouping equipment populations for noise measurement, and for recording and reporting the noise levels of individual pieces of equipment. It is envisaged that this step-by-step equipment noise reporting guide will be used by mining operations as an appropriate equipment noise reporting methodology:

1. Group equipment, according to type/model into populations, based on the South African Mines Occupational Hygiene Programme (SAMOHP) activity area.
2. Measure noise in equipment populations (minimum of five samples or 5% of equipment) per activity area.
3. Calculate the logarithmic average noise level for the equipment population, using the noise measurement results obtained in Step 2.
4. Report the logarithmic average noise result from Step 3 for the equipment population in order to track noise milestones and not in terms of individual measurement results.
5. Investigate any individual noise measurement, which was equal to or above the milestone sound pressure limit of 107dB(A), recorded for the sampled equipment population.

DUST

Continuous real-time monitoring

The community of practice for adoption (COPA) for continuous real-time monitoring (CRTM) continued to dedicate its programme to sharing the understanding and challenges of the adoption process and the on-mine pilot of the instruments prior to rolling out. At the end of the reporting period, there were 55 mines adopting the practice. An opencast coal mine, as well as a manganese mine, a gold surface plant and a gold operation were added. Of these mines, 20 are collieries, 31 gold mines while the rest are manganese, iron ore and a platinum converting plant. The overall adoption progress, based on the MOSH process, was 68.5% with 498 units scheduled to be rolled out in 2018.

CAPTION

Anglo American Coal – New Vaal*

** New Vaal has since been acquired by Seriti*

CASE STUDY

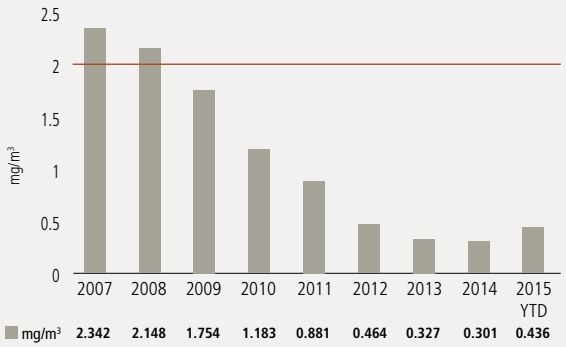
DUST MEASUREMENT AT ANGLO AMERICAN COAL'S NEW VAAL COLLIERY

The CRTM leading practice continued to show the sustainability of engineering control efficiencies through continuous real-time feedback and intervention, as illustrated by New Vaal Colliery. Since 2011, primary tip dust measurements have been below the milestone 1.5mg/m^3.

When dust challenges were identified at New Vaal's primary tip, the DMR focused continuously on this operation. Anglo American's zero tolerance approach required proactive monitoring of key dust controls. This led to continuous real-time monitoring of engineering controls, production stopped and engineering control failures were repaired. The outcomes included:

- Improvements in health (lower dust exposure)
- Safety (improved visibility)
- Production (better coal rock tipped)
- Community relations reduced environmental nuisance dust

Primary tip dust measurements



Source: *Department of Mineral Resources*

Underground Colliery Working Group

The Colliery Working group was formed on 30 March 2016 for airborne dust monitoring with a real-time dust (CRTM) monitor on-board a continuous miner (CM) to prevent explosions. The forum concurred that this initiative has unforeseen occupational health benefits in that it reduces dust exposure for same-zone workers. The MOSH Dust Team is therefore fully supportive of this coal sector initiative.

When mining groups (Sasol, Exxaro, Anglo Thermal Coal and South 32) were invited to a site meeting with all OEMs, the forum acknowledged the need for continuous real-time monitoring of airborne engineering controls with explosion proof certification (EXia). At the initial meeting, five OEMs were invited but three accepted and attended this first session. OEMs pointed out that the process of seeking EXia certification had begun. At the time, it was observed that the CRTM can theoretically work on explosion-proof continuous miners. The forum requested collaboration among OEMs as one supplier had experience with real-time dust monitors in a non-explosive environment and others with on-board continuous miner methane monitoring. It was concluded that the CRTM retrofits would be piloted simultaneously with improved real-time methane detection tests, and the additional continuous miner scrubber heads and additional nozzle sprays with engineering controls.

Despite the setbacks, there has been progress:

- EXia approved a CRTM continuous miner retrofit. The mining houses and OEMs developed a protocol submitted to EXia for approval, which proved that the CRTM was safe for use in a continuous miner.
- OEMs collaborated towards the success of continuous miner CRTM retrofit success. The briefing and terms of reference set by the MOSH Dust Team on 30 March 2016 ensured sincere collaboration between methane and dust CRTM. This has ensured that continuous miner OEMs include software communication.

TRANSPORT AND MACHINERY

The adoption team continued to focus on supporting the industry in improving transport and machinery safety performance.

Proximity detection system leading practice

It must be noted that the MOSH proximity detection system (PDS) leading practice for underground diesel trackless mobile machinery only required a warning functionality and the initiative should not be confused with Chapter 8 of the Mine Health Safety Act pertaining to trackless mobile machinery.

For electric machines used in underground coal mining, the Chapter 8 requirements are the same as those of leading practice. However, for diesel trackless mobile machinery, the Chapter 8 requirements are much more advanced. In 2017, there was movement from the underground gold sector to rail-bound beacon technology. The team believes this will make a further significant contribution towards tramming safety.

Adoption tracker for transport and machinery leading practices

Leading practices	Participating mines	Installations	Installation of proximity detection system
Electrical machines in coal mining	13 operations (4 mining houses)	113 sections	100% (2016: 89%)
Hard rock track-bound equipment	79 operations (8 mining houses)	582 levels 2 992 locomotives	54.5% (2016: 51.1%)
Hard rock trackless mobile machinery	35 operations (9 mining houses)	4 146 machines	94.4% (2016: 92.8%)

Traffic management leading practice

The applicability of opencast/pit traffic management leading practice stretches across the entire country with approximately 1,700 potential adopter mines, ranging from sand works to large-scale mines. Roll out of the practice will be lengthy, given the size of the team (three people).

The practice was successfully launched in the Northern Cape in May 2017 and in Mpumalanga in August 2017. The practice, over and above the 17 technical elements it comprises, also includes analysis of traffic flow and risk, which directly addresses the concerns expressed by the MHSC with regard to the quality of risk assessment in industry. This element could significantly improve the effectiveness of safety risk management in opencast/pit operations. Although it is early in the application stage of this practice, industry feedback is positive. The team believes that the approach could be developed as an example of 'Local solutions for international challenges' and demonstrates the team's solutions to industry challenges outside the narrow definition of leading practice rollout. The 17 technical elements will be confirmed in 2018 as the single most comprehensive collation of leading practices regarding safe movement of vehicles and pedestrians in opencast/pit mines around the world. The body of work has been acknowledged by an international organisation, Earth Moving Equipment Safety Round Table (EMESRT), which has decided to realign its strategic priorities for opencast/pit operations from level 8 and 9 (advanced technology) controls to level 1 to 6 controls due to the effectiveness of controls (leading practice elements) at these levels in comparison with reliance on last-second technology intervention to prevent collisions.

Other transport and machinery (T&M) initiatives

The year 2017 marked major contributions by the T&M team with a number of initiatives:

- **Behavioural communication**

  The team initiated the development of a behavioural communication mode as a play, which addresses some fundamental beliefs, at managerial level in the industry, hampering progress towards zero harm. The play was performed at the Northern Cape Zero Harm Conference in February 2018. It addresses generic and specific challenges, and not only issues related to transport and machinery.

- **Milestone management**

  While the team proactively began to challenge industry with the concept of milestone management (T&M only) as early as 2014, it made a breakthrough in 2017 when it was presented to the CEOs of local Anglo American companies, and received their support. The team started to show mines the value to be derived from the initiative over and above reporting of progress for industry at large. The team successfully proposed to the Chamber that an electronic system should be developed to facilitate effective milestone management and this has been incorporated into the Chamber's information management initiative.

- **Leveraging technology for behavioural change and behaviour management**

  The team presented a challenge to industry and PDS suppliers at an all technical PDS symposium early in 2017: to spend focus effort and cost on the development of technology functionality and reporting to facilitate behaviour change and management among operators. The presentation highlighted the importance of machine operators adhering to operational rules and the fact that automatic slow down and stopping of vehicles implies non-conformance to operating rules and thus poor operational management. Some suppliers have made progress in this regard. The concept of 'technology for people-centred behaviour support' could advance beyond equipment operators.

- **Stakeholder interaction**

  Encouraged by the head of the Learning Hub, the team interacted with machinery inspectors in Mpumalanga and the Northern Cape. The engagements concluded that some work was needed to build trust between the parties. The fact that the team took initiative did pay off in the sense that we were able to secure follow up sessions with the Inspectorate.

- **Modernisation for mining and job creation**

  The team participated in a hackathon in 2017 and also supported the Chamber at the International Council on Mining and Metals innovation summit (focusing on PDS) in presenting 'local solutions for international challenges'. Technology for machine operator behaviour has been highlighted as a differentiator by existing international providers and could be a quick win opportunity.

- **Support for Chapter 8 collision management system rollout**

  The team offered to develop a rollout guide for the collision management systems required to comply with Chapter 8 regulations. The MOSH Traffic Management Leading Practice has a direct bearing on the need for technology to avoid collisions in that it offers mines a number of superior controls.

- **Knowledge and skills sharing**

  In 2017, the team revived the development of a programme to share knowledge and build competence in addressing the challenges faced by industry in introducing new ways to work, particularly using technology. The programme has been accepted from industry attendants. The team has also developed training interventions for traffic flow and risk analysis.

- **Sponsor support**

  The team's sponsor, Themba Mkhwanazi, continued to provide exceptional leadership, direction and support to the team. In particular, his dedication to personally emphasizing the importance of beacon technology in rail-bound equipment has led to renewed focus on this subject by the industry.

FALLS OF GROUND

Through the community of practice for adoption (COPA), the falls of ground team continued to monitor the adoption rate of the existing leading practices, namely: Entry examination and

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making safe (100%), nets with bolts (100%), and trigger action response plan (85%). In addition, the ledging planning leading practice was launched in June 2017 during a workshop attended by approximately 160 industry representatives (organised labour, senior mine/general managers, rock engineering professionals, etc.). In parallel, a process to make further enhancements to the drilling and blasting leading practice was started. Collaboration with the MHSC saw the barring-down best practice research outcomes being launched in March 2017, and a process is underway to develop dissemination booklets and related materials. In response to the spate of seismic events that led to a number of fatalities, a Day of Learning workshop was convened in September 2017 attended by approximately 50 rock engineers, safety executives and mine/general managers which facilitated the unpacking of the underlying causes of rock burst accidents and incidents. This workshop resolved that research related to preconditioning and platinum pillar design needed to be reviewed. In addition, the work of the CEO Zero Harm Forum as well as the industry's falls of ground management systems also need to be reviewed.

MOSH Learning Hub secretariat

The Learning Hub secretariat continued to play a strategic facilitator role in leading the change to zero harm, including the provision of operational support to the adoption teams through monitoring and evaluation of behaviour change processes.

Monitoring and evaluation

Monitoring and evaluation interventions included the adoption rate of leading practices, identifying and sharing lessons learned and successes. A post-adoption assessment mechanism was also used to guide adoption so that mines could self-evaluate and thus assess the quality of adoption.

The tool aims to track and determine a balance between the adoption process (behaviour aspects) and technical aspects of the leading practice. A survey was conducted to gauge general perceptions of health and safety, including the MOSH initiative. MOSH website visitor measurement analytics show an average of 659 visitors per month locally and internationally. The Learning Hub continued to be actively involved in the broader information management initiative with a view to boosting data collection and reporting needs.

Behavioural change

The Chamber completed exploratory work in 2017 to assess areas in which additional development was required by the industry. Two of these areas include skills development in health and safety at graduate level and development of leadership capacity across the industry.

Chamber working groups, led by the MOSH Learning Hub, developed conceptual models for both of these areas, and significant progress was achieved in this regard towards the end of 2017. The Chamber, in collaboration with other stakeholders, has begun assessing modalities for the development of a Diploma in Occupational Health and Safety. A budget and programme has also been allocated for the development of a leadership assessment and development tool incorporating the latest methodologies and technology available in the market.

Behavioural interest group

The Human Factors Framework (HFF), developed in the second quarter of 2017, has been accepted as a guide by the Behavioural Interest Group (BIG) team, which believes that this tool would be useful for companies assessing human factor and behavioural interventions.

An industry organisational human factor comparative analysis was completed in the third quarter, providing a thematic overview of the behavioural and human factor programmes implemented in the mining industry. Further development is required in line with recommendations to extend the analysis and to continue updating the document so that more companies can be included.

The BIG team decided to focus on the following areas in 2018:

- Visible-felt leadership (specifically unlocking mechanisms for quality conversations in the mining industry)
- Systemic inclusion of the assessment and management action related to risk propensity
- Change management

ONGOING ASSESSMENT OF PREVAILING PERCEPTIONS IN THE MINING INDUSTRY

A comprehensive survey was conducted in the last quarter of 2017 to assess the industry's perception of safety, behaviour and the MOSH adoption system.

A total of 72 responses were received from three major stakeholder groupings namely: organised labour, employers, MHSC and government (including the DMR). Results show that more than 90% of respondents believe that compliance with rules and an unresponsive industry culture are the main reasons for poor safety performance. This is supported by the view that the 'main' root cause of incidents is people's behaviour and lack of discipline. Very few respondents recognised the deep systemic issues influencing behavioural aspects highlighted in leading literature and models. Significant work is needed to change perceptions and paradigms regarding risk.

GOVERNANCE STRUCTURES

Engagements with adoption team sponsors continued to provide strategic guidance. Reporting to the CEO Zero Harm Forum also continued to elevate leading practice adoption issues related to health and safety. Two interactive sessions were facilitated for the MOSH Task Force and chief operating officers (COOs), culminating in an annual action plan and the need for new leading practices to be vetted by the COOs before they are widely promoted.

RESOURCING AND CAPACITY

With staffing levels at 81%, a process to fill three vacant positions began in the second half of the year. In addition, collaboration with the Mining Qualifications Authority led to the recruitment of graduates for a 24-month internship programme, which started in February 2018.