

MINE SAFE

MINE HEALTH AND SAFETY CONFERENCE 2024

HYBRID CONFERENCE

ELIMINATING HARM THROUGH
CRITICAL CONTROL COMPLIANCE



MINERALS COUNCIL
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Abstract Book



6-7 NOVEMBER 2024 – CONFERENCE
EMPERORS PALACE CONVENTION CENTRE

**THE SOUTHERN AFRICAN INSTITUTE OF MINING AND
METALLURGY JOHANNESBURG 2024**



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FOREWORD

The South African mining industry has recorded 34 fatalities in the year to date compared to 39 this time last year. The number of occupational reportable injuries is 13% lower, with 1545 of our colleagues hurt while at work so far this year. The industry has however realised significant reductions in mining incidents and particularly fatalities over the last three decades through initiatives such as the Khumbul'ekhaya CEO-led strategy which has had a significant impact over the last five years. Through the industry's Fall of Ground Action Plan (FOGAP), there was a record low of six fatalities in 2022, a 97% reduction from the 239 FOG-related deaths reported in 1994. Transport and machinery-related fatalities have similarly decreased, falling by 91% to eight from 87 three decades ago. This is another example that through our unwavering focus on these historical agencies that led to fatalities, we are making a positive difference in creating a safer working environment.

This year the conference is once again focused on improving safety, health and environmental practices within the mining and metallurgical industry. It is an ideal platform for knowledge-sharing and idea exchange among various stakeholders, including mining companies, the Department of Mineral and Petroleum Resources, the Minerals Council South Africa, labour unions, and health and safety practitioners at all levels within the industry.

The main objectives of the conference are as follows:

Promoting Learning: The conference aims to facilitate a space where attendees can learn from each other's experiences and best practices. This will help enhance overall safety and environmental standards in the mining and metallurgical sector.

Addressing Safety, Health, and Environment: The conference will focus on discussions related to safety and health issues within the industry, including the well-being of employees, contractors, and local communities. Presentations on health and safety culture improvement, risk and control management and human factors will provide major insights into improving safety and health in companies. The conference will also emphasise the importance of reducing the environmental impact of mining and metallurgical processes.

Zero Harm and the elimination of fatalities: The conference will highlight the importance of adopting a 'zero harm' approach to health and safety in the mining and metallurgical sector. This means striving for an injury-free and accident-free workplace through tangible actions and leadership commitment at all levels.

Addressing Key Challenges: The conference will tackle major challenges in the mining industry, such as logistics, energy usage, and safety concerns related to employees, contractors, and communities.

By bringing together diverse stakeholders and sharing their expertise and experiences, this conference hopes to foster a safer and more sustainable mining and metallurgical industry. It emphasises the importance of collaboration and collective efforts to address the complex challenges faced by the sector.

L. McMaster

Chairperson of the Organising Committee

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Conference Chairperson



Leigh McMaster

Principal Specialist: Safety and Behaviour
Minerals Council South Africa

Leigh has been working as a Safety, Health and Sustainable Development professional for the last 16 years. Leigh has previous work experience in the trade union environment and in employer organisations and is currently employed as the Principal specialist: Safety and Behaviour at the Minerals Council South Africa where he is able to continue his passionate work around Human Factors, Risk Management, leadership and stakeholder engagement in the mining industry. He is also a registered Chartered HR professional in HSE with the SABPP as well as a registered Change Management Practitioner with the Institute for Change Management. Leigh is currently serving as the Vice President for ISSA (International Social Security Association) Mining: Africa Region for the period 2017-2024.

Keynote Presenters



Casper (Cas) Johannes Badenhorst

Associate Professor
Occupational Hygiene and Research Initiative (OHRRI), North West University

Cas holds multiple advanced degrees in physiology, occupational health and hygiene, mine environmental engineering, and Health and Safety Management. He has 28 years of experience in the field of occupational health and hygiene, including 15 years in leadership roles at both operational and corporate levels, mostly in mining and metals. Cas is a registered Occupational Hygienist and a Fellow of the Southern African

Institute of Occupational Hygiene (SAIOH).

As a leading expert and technical authority in Occupational Health and Hygiene, he is responsible for overseeing and managing Health and Wellbeing programmes within a global organisation. His duties include formulating and articulating the strategic direction of these programs, aligning their objectives with the broader goals of the organisation, and spearheading initiatives aimed at continuous improvement and excellence.

Beyond his organizational commitments, Cas plays an active role in the industry, serving on various national and international advisory and technical committees. He has co-authored numerous articles and publications and contributed to key ICMM publications focused on Safety and Health Management. Additionally, Cas is recognized as an academic leader, holding the position of Associate Professor at North West University in South Africa.



Tefo Molosiwa

Group Head of Policy and Planning Safety
Sustainability Development and Risk
De Beers

Tefo joined Debswana in 20023 as Environmental Officer at Jwaneng Mine, before becoming Safety Co-ordinator at Orapa, Letlhakane and Damtshaa Mines (OLDM). He then joined the De Beers Group Services department on secondment for a technical and assurance role in 2007. He returned to Debswana Corporate Centre in 2009, taking on Environment Strategy, Assurance and Sustainability role, prior to joining Jwaneng

Mine as Senior Manager Safety and Sustainable Development (S&SD). He moved to his most recent role as Head of S&SD for Debswana in 2015.

His key achievements include leading the development of the De Beers Principles Programme. This work formed the basis of the Debswana Sustainability programme. He also led the Debswana, De Beers and DTCB partnership in assisting the Government of Botswana procure 500, 000 doses of COVID-19 Moderna vaccines. Additionally, in terms of Debswana's Energy and Climate Change Strategy, Tefo has been instrumental in leading the development of Debswana's key focus areas and roadmap towards achieving the company's vision of being carbon neutral by 2030. He has also managed the company's Diamonds in the Wild programme by defining a vision to repopulate the Black Rhino's and the White Rhino's in Botswana, Southern African and Beyond. This vision is being set in place through the focus on Rhino security, knowledge economy, tourism, and marketing.

Tefo has more than 18 years' worth of experience in safety, sustainability, and environmental management. He will work closely with the De Beers Group Exco and colleagues across the business to embed a 'beyond zero' safety culture and deliver on the exciting and ambitious Building Forever 2030 goals

Preventing another health tragedy: A framework to manage DPM in underground mines

C.J. Badenhorst^{1,2}, J.D. Swanepoel³, and S. Horn¹

¹North-West University, South Africa

²University of Wollongong, Australia

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Silicosis litigation in South Africa has been a significant legal battle involving thousands of miners who contracted the disease while working in the mines. In 2011, the South African Constitutional Court ruled that affected mineworkers could claim damages from mining companies under the Occupational Diseases in Mines and Works Act, leading to the certification of class-action lawsuits. In 2023 a motion was filed in the High Court of South Africa requesting class certification for thousands of prospective class members. The litigation alleges the responding coal mining companies knew of the dangers posed to coal miners by coal dust but failed to protect its workers from high levels of exposure. Whilst over the last number of years the South African Mining Industry (SAMI) made good progress in reducing exposures in the workplace and achieved a year on year reduction in the number of reported cases of occupational disease, the SAMI is still some distance away from achieving 'Zero Harm' in occupational health. In 2012 the International Agency for Research on Cancer, declared diesel engine exhaust as a human carcinogen, with diesel particulate matter (DPM) being identified as a key contributor to its harmful effects. Twelve years later, the South African Mining Industry still has no occupational exposure limit set for DPM and whilst we've seen some isolated pockets of events to manage harmful exposure to DPM, we've not seen a consolidated response to this significant threat to the health of underground miners in SAMI. Could DPM become the next class-action or can we as stakeholders prevent another health tragedy in our industry? How can we, as opposed to getting ourselves stuck in endless clinical debates over diagnosis criteria, occupational hygiene measurement methodologies and feasible OELs, and ongoing research projects move to action? Effective management of DPM is crucial for ensuring the health and safety of everyone working in underground mining operations. Following an understanding of the unique challenges posed by confined spaces in these environments, it is essential to establish a robust framework for assessing and controlling DPM exposure. This paper outlines a framework of the critical steps required for effectively managing DPM, and diesel exhaust emissions overall in the workplace within SAMI. Underground mining is particularly complicated as mines can be kilometres deep, with high temperatures, confined spaces and ventilation challenges. Operating traditional mining vehicles underground creates even further challenges – the creation of airborne particulates which, when breathed in, can impact the health of people working in these mines for many years.

This paper will be published in the SAIMM Journal

Algorithms and data: A strategy for the successful implementation of machine learning in rock engineering to enhance safety

R.T. Masethe¹ and A.C. Adoko²

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²Nazarbayev University, Kazakhstan

Despite many advances in rock engineering designs where safety has been improved in recent years through the adoption of leading practices, accidents and fatalities still occur. Striving to improve designs and behaviour to achieve the objective of every mine worker returning daily from work unharmed is still a vision that needs to become reality. Machine learning (ML) has become increasingly important in rock engineering, offering new ways to enhance safety in the design and operation of rock structures (e.g., tunnels, mining stopes, slopes, etc.). ML enables rock engineering practitioners to increase the efficiency and usage of massive data sets during the design process as rock engineering moves into the next era and becomes more data-driven. Despite being a potent tool, ML algorithms' success is inextricably linked to the calibre and volume of available data.

Keywords: machine learning, predictions, data driven, risk, algorithms, deep learning, numerical modelling.



Richard Masethe

University of KwaZulu Natal, South Africa

Richard is actively involved in Rock Engineering, Geophysics, and Seismology. He holds a BSc Hons (Geophysics), a GDE (Rock Engineering), an MSc (Rock Engineering), and a PhD (Geophysics and Rock Engineering) from the University of the Witwatersrand. He started his career in 2007 as a graduate rock engineering trainee in Goldfields, and was involved in rock engineering projects and seismology in Sibanye-Stillwater. He is currently a lecturer at the University of KwaZulu Natal, College of Agriculture, Engineering and Science, specialising in research that includes rockburst phenomena, machine learning, artificial intelligence, geophysics, hazards and risks in mining seismology, probabilities, and risks in rock engineering designs.

IMS Hub: Mining houses working together to reduce fatalities with simplified and visualised safety standards

J.C.S. Chipps

Jincom, South Africa

Every year an unacceptable number of miners are injured and killed, largely because they do not have access to clear and simple critical controls to be able to do their jobs safely. This challenge is not unique to the mining industry; research has indicated that 66% of migrant workers make mistakes at work because they simply don't understand safety instructions.

Traditionally, safety standards are developed by engineers and subject matter experts who are highly proficient in their respective technical fields, but lack the skills to make content easily understandable and digestible by large and diverse workforces at their operations (people with different levels of experience, literacy levels, languages, etc.)

Other high-risk industries across the globe, facing similar health, safety and environment (HSE) communication challenges, have provided their frontline workers access to simplified and visualised standards and critical controls. They adopt this solution for the following reasons:

1. Our brains are wired to process visuals better than reading through heavy technical text documents. Most information input comes through our eyes with more than 70% of the human body's sensory receptors being in our eyes. So it makes sense then, when critical content needs to be quickly and effectively understood, communicated and implemented that it should be in a visual format.
2. We process visuals fast. The human brain can process entire images in as little as 13 milliseconds (three times faster than blinking). It follows that in high-risk situations and environments where critical safety information needs to be communicated quickly and effectively, visual content is king.
3. Visuals are more memorable. Our brains remember in pictures. If we hear a piece of information, it's likely that after three days we'll struggle to recall it and may only retain 10% of that content. But if an image is added to the information, we will recall up to 65% of it. Using visuals to convey critical safety material boosts memory retention so it makes sense then to adopt a visual safety management strategy.
4. Visual content reduces literacy and language barriers. Regardless of the language you speak, you can understand visual representations.
5. Visuals aid the actual understanding of the content. (Imagine having to assemble a Lego set or Ikea furniture without the clear visual guides!).

Developing quality, simplified and visual HSE content requires considerable time and effort from an HSE team as well as a budget investment. Some mining companies are following the approach of using simplified and visualised content, however they all started independently making investments into simplified and visualised content, essentially 'recreating the wheel', and therefore infinitely duplicating the mining industry's efforts to tackle the same issues.

This is where the International Mining Safety (IMS) Hub filled a massive need in the industry. IMS Hub founding partners, which include African Rainbow Minerals, Anglo American, AngloGold Ashanti, Eramet, Gold Fields, Harmony, Impala, Ma'aden, Sibanye-Stillwater, Teck Resources, Vale and the Minerals Council South Africa, all came together to address this challenge and achieve the common goal of reducing fatalities and serious incidents in mining. Together, these partners developed a 'by-industry for-industry' library of 300+ global best-practice and industry-endorsed, simplified and visualised health and safety standards, critical control checklists, toolbox talks, key message posters and incident learnings, covering over 70 fatal hazards.



Figure 1. Example of pages from simplified and visualised standard for Confined Spaces on the IMS Hub.

Each founding partner contributed two or more suites of materials around key fatal or catastrophic risks at their operations. Once transformed into simplified visual tools, they then shared the content on the Hub for the use and adaptation by all other partners.

The IMS Hub is an example of leaders in mining coming together to share and learn from one another for the benefit of reducing fatalities and serious incidents in mining across the globe.



Jonathan Chipps

Managing Director
Jincom

Jonathan Chipps is a seasoned professional with 17 years of experience in the content and communications industry. As the Managing Director of Jincom, which specializes in frontline workforce engagement within high-risk sectors. Over the past five years, Jonathan has collaborated with some of the world's largest mining companies, focusing on enhancing safety performance. His passion lies in delivering practical solutions that empower diverse workforces to understand and execute their jobs safely through simplified, visualised, and digitised health, safety, and environment (HSE) content. Jonathan is dedicated to driving positive change in safety culture across industries.

Climate change and workplace health in South Africa: Emerging hazards and mitigation strategies

M. Janse van Rensburg

Mine Ventilation Society of South Africa

South African Institute of Occupational Hygiene, South Africa

Climate change poses significant global and workplace health risks, driven by rising temperatures, shifting weather patterns, and an increase in extreme events. These changes disrupt environmental, social, and economic systems, intensifying occupational health hazards. The World Health Organisation 1 warns that over 3.6 billion people are at heightened risk due to climate change, with an estimated 250,000 additional deaths annually from heat stress and other related complications over the next decade. These environmental shifts directly affect workplace conditions, particularly through extreme temperature fluctuations. One of the primary impacts of climate change in the workplace is exposure to temperature extremes, which can cause serious health issues such as heat stress, heat stroke, and fatigue. Prolonged exposure to excessive heat reduces productivity and increases the risk of heat-related complications like sunburn and sleeplessness. Additionally, climate change affects the ozone layer, which reduces protection from harmful UV radiation. Workers in areas with significant ozone depletion face a higher risk of developing skin cancers, eye damage, and weakened immunity. Climate change also increases the frequency and severity of natural disasters, such as floods, landslides, and wildfires, which pose direct physical and psychological health risks to workers. These disasters heighten the risk of injuries, mental health issues, and accidents in the workplace, particularly for outdoor workers. In South Africa, workplace health hazards from extreme heat, air pollution, and UV radiation remain high. This underscores the need for stronger Occupational Safety and Health policies, including better protective gear, and comprehensive risk assessment and mitigation strategies to address the growing impacts of climate change on workers.



Monique Janse van Rensburg

Occupational Hygiene Specialist

Affiliation of the Mine Ventilation Society of South Africa

Southern African Institute of Occupational Hygiene

As a dedicated and skilled Occupational Hygiene Professional and registered with MVSSA and SAIOH, and a proven track record in mine health and safety, I bring a wealth of experience and expertise to the table. My journey in the field of occupational hygiene has been marked by substantial contributions to the companies I've worked for, including Vortex Solutions cc, Glencore Tweefontein Colliery, and Siyanda Bakgatla Platinum Mine. Where I am experienced in both Platinum and Coal commodity. I am also the Chairperson for the 2024/2025 MVSSA Northern Branch Committee and previously MVSSA Colliery Branch Committee Newsletter Editor.

Eliminating harm through critical control compliance

O.S.A. McCree

The Compliance Group (Pty) Ltd, South Africa

While having made great strides in reducing the number of fatal incidents, the South African mining industry, a pivotal sector in the nation's economy, remains to face challenges related to safety management, incurring several fatal incidents. The implementation of Critical Control Compliance (CCC) offers a strategic approach to mitigating risks and eliminating harm in mining operations. In this paper we explore the principles and practices of CCC, emphasising its application within the South African mining context.

When considering CCC, we must understand that focus should always be on the potential of an incident as opposed to the actual severity/consequence. While certain hazards/energy will typically have several controls in place, these controls may be cumbersome or difficult to implement or understand by the crew. In these instances, it is key to identify which of the existing controls significantly reduce the potential as well as the severity of the consequence (both sides of the bowtie analysis). It is these controls that we need to focus on or develop if they do not exist, and make sure they are simple to understand at all levels, implement and also monitored via line management. These monitoring systems should focus on the continual momentum of these controls, as well as the efficacy in reaching the intended result.

The outcome of this paper suggests that a robust CCC framework, coupled with continuous monitoring and stakeholder engagement, can significantly advance harm reduction efforts in the industry.



Owen S.A. McCree

Managing Director

The Compliance Group (Pty) Ltd

Owen started his mining career in 1999 as a Learner Official at Anglo Platinum Rustenburg section. Working himself up through the ranks with various achievements, he progressed from production, through mineral resource management to the health and safety portfolio.

In this portfolio, he similarly worked his way up the ranks to Manager Group Safety at Lonmin before he started consulting in 2013. During his consulting career he has worked with large corporates in South Africa such as Anglo, Lonmin, Implats, South Deep, Harmony, Vedanta, Glencore Australia, Fluor SA, Sibanye, Multotec SA to name a few, as well as international clients such as African Chrome Fields and Adriatic Metals.

Owen has vast experience and has been widely commended in the safety management domain, in terms of system and resource architecture, culture programs, strategy facilitation, software mapping etc., coaching and development, and specialising in fatal and HPI investigations, having recently completed his 51st fatal investigation since 2013.

Owen is a Chartered Member and annual VIP speaker of the South African Institute for Occupational Safety and Health (SAIOSH) where he also serves as a member for the Legislative Review Committee, as well as the Past President of the Association for Mine Safety Professionals of South Africa (AMSPSA).

Post employment medical care framework

N. Moyo

Minerals Council, South Africa

On 20 April 2023 the CEO of Zero Harm Forum received a presentation from the Medical Bureau of Occupational Diseases on occupational lung diseases in the mining industry. The presentation highlighted that employees with occupational lung diseases were well cared for during employment but had poor access to services once they left employment. Arising from the presentation, the CEO requested the development of a Minerals Council-led post-employment programme. Following the CEO's request, the Minerals Council's Health Policy Committee (HPC) developed a Post-Employment Medical Care Framework that was approved by CEOs in August 2023, on how post-employment care would be improved.

The Framework has several implementers including the Minerals Council, external stakeholders and mining companies.

In November 2023 HPC approved the proposal that as companies they would do the following, among others:

- All companies should provide comprehensive referral notes to employees when they leave.
- Members provide inputs on how mining houses can track employees that were incapacitated and link them with the approved/available service providers.
- Ensure linkage to care for treatment of chronic diseases
- Companies to utilise TEBA or other means to ensure completion of TB treatment and the BME after one year of completion of treatment.
- In addition, the Framework requires that stakeholders, including mining companies, promote the utilisation of RMA for employees and contractors.

In July 2024 HPC approved that an evaluation of the implementation of the above decisions be conducted by mid-August as progress would have to be reported to CEOs in October.

The Health Department of the Minerals Council South Africa (Minerals Council) secured the services of a consultancy to assess how far its members had implemented the decisions of the Health Policy Committee regarding post-employment medical care. This report outlines the findings of the consultancy. The presentation will outline the implementation and evaluation of the Minerals Council's Post-Employment Medical Care Framework, focusing on the care of ex-employees with chronic and occupational diseases in the mining industry.

- o Framework Development and Implementation: The Post-Employment Medical Care Framework was developed by the Minerals Council's Health Policy Committee and approved by CEOs in August 2023, aiming to improve post-employment care for ex-employees with chronic diseases and occupational lung diseases.
- o Survey and Interview Approach: The evaluation included a structured survey and interviews with selected respondents, targeting 22 companies in the mining industry to assess the implementation of the Framework. For more information refer to Key Findings on Implementation: The research found inconsistent implementation of the Framework, with HPC members showing higher levels of agreement and implementation compared to non-members. Challenges included resource constraints, tracking ex-employees, and inconsistent use of referral systems.
- o Challenges in Tracking and Follow-Up: Tracking incapacitated ex-employees and ensuring follow-up care were significant challenges, particularly for those moving to remote areas or across borders. Maintaining contact and ensuring continuity of care were identified as major issues.
- o Resource and Communication Issues: Many organisations, especially non-members, faced resource constraints and communication barriers with public health systems, impacting the effective implementation of the Framework.

- o Recommendations for Improvement: Recommendations included standardising processes across the industry, enhancing communication and collaboration, allocating more resources, and expanding training programmes to ensure effective implementation of the Framework.
- o Support from the Minerals Council: The Minerals Council's role is crucial in providing leadership, resources, and advocacy to drive improvements, including establishing multi-stakeholder forums, standardising processes, and advocating for legislative changes



Dr Nothando Moyo

Deputy Head: Occupational Medicine
Minerals Council SA

Dr Nothando Moyo is an Occupational Health Medical Practitioner with 12yrs of experience in Occupational Health and Occupational Health Policy formulation. She is currently the Deputy Head of Occupational Medicine at the Minerals Council. Dr Nothando has been the Chairperson for the Northern Cape Mine Managers Association (NCMMA) Wellness Stream and is a past president of the Mine Medical Practitioners Association (MMPA). She has previously worked for Anglo-American as a Superintendent for Health and Wellness. She has a Master of Business Administration from Wits Business School, a Post-graduate Diploma in Occupational Medicine from the University of Pretoria, Medicine and Surgery (MBChB) degree from Medunsa. Dr Nothando is passionate about all things - health and wellness. She is an avid golfer and loves the great outdoors.

A closer look at reducing the environmental impacts, caused by mining and metallurgical processes, by employing circular economy principles and the challenges of implementation

H. Booysen¹ and H Grobler²

¹Samancor, South Africa

²University of Johannesburg, South Africa

The concept of a circular economy is not an entirely new to the mining and metallurgical industries. At site levels, the efforts to reduce the negative impacts of extraction and production have been the focus for years.

Mining and metallurgical processes are essential for resource extraction but often have significant environmental impacts, which includes: pollution, resource depletion and the degradation of ecosystems. In response to these environmental impacts, the mining and metallurgy industries have made focused its efforts to move towards a more sustainable way of working by implementing integrated circular economy principles, such as waste management, optimised resource use and improved product value.

These efforts are focused on developing innovative technologies to provide sustainable solutions, emphasising the sustainable use of materials through the entire lifecycle – from extraction through to production, and finally, disposal. All these efforts aim to work towards a net zero nature-positive world.

However, despite its potential, the implementation of these principles faces several challenges. These include technological limitations, high initial implementation costs, financing, regulatory barriers, and the need for industry-wide collaboration. Furthermore, the transition from traditional linear models to circular systems requires a shift in mindset, both within industries as well as among stakeholders, alongside the development of supportive policies and infrastructure.

This paper explores how circular economy strategies, such as: closed-loop production, sustainable material sourcing & replacements and innovative recycling technologies can be applied in mining and metallurgy to reduce waste, lower energy consumption, and mitigate environmental damage. Finally, the case study investigates slag generation, its commercial use and marketing initiatives, as well as the legislative steps to be taken to have slag approved as a beneficial waste.



Roux Meyer

SHEQ Superintendent - Environment
Samancor Chrome

Roux Meyer has 24 years of experience in environmental management related to mining, smelting and the refinery industry. Land, air, water and waste management are the foundations of his experience. Roux has worked for the following companies in an environmental related role:

- BHP Billiton - Ingwe Colliery Ltd - Mine Closure Operations (Duvha)
- BHP Billiton - Optimum Colliery (Hendrina)
- Xstrata - Mount Isa Mines (Qld - Mount Isa)
- Glencore - Oaky Creek Coal (Qld - Emerald)
- Korea Zinc - Zinc Refinery (Qld - Townsville)
- Glencore - Clermont Coal (Qld - Clermont)
- Samancor Chrome Corporate (Sandton)

Developing an automated system for analysing regulatory paperwork, permits, and compliance reports to ensure adherence to MHSA requirements in mining

K.B. Mwamba and N. Ndiweni

University of Johannesburg, South Africa

The mining industry is one of the essential pillars of the South African economy, contributing significantly to national income, employment, and exports. Rich in resources such as gold, platinum, diamonds, and coal. South Africa's mining sector has historically driven industrial development and sustained economic growth. However, the industry faces challenges in complying with health, safety, and environmental regulations set by the Department of Mineral Resources and Energy (DMRE). These challenges include delays in issuing permits, such as Sunday Labour permissions and Section 54 of the Mine Health and Safety Act (Act 29 of 1996) (MHSA) upliftment. Compliance with these regulations is necessary to ensure worker health and safety, environmental protection, and sustainable mining.

Traditional oversight methods by the mining industry regulator, such as frequent inspections, manual data collection, and post-accident reporting, have been adequate to some extent. However, they also have significant limitations. These include errors in routine compliance reports such as legal appointments, incidents/accident reports, and manually completed quarterly, annual reports, and labour statistical returns, which can lead to severe problems, including legal penalties, regulatory restrictions, adverse health and safety, and environmental impacts. These limitations underscore the need for a more efficient and real-time monitoring system.

Recent technological advancements have revolutionised the approach to compliance in this high-risk sector. Imagine a system consolidating legal documents, permits, and compliance reports into a unified digital platform, enabling real-time monitoring and swift response to potential issues of omission. These innovations promise a paradigm shift in how health and safety standards are upheld in the mining industry.

The advantages of real-time monitoring systems are substantial. These systems enhance law enforcement by furnishing accurate and current information that underpins decisions and ensures compliance with legal standards. They boost operational efficiency by detecting potential issues early, reducing downtime, and optimising resource allocation. Furthermore, real-time monitoring systems contribute significantly to the broader safety and environmental protection objectives by ensuring continuous compliance with health, safety and environmental standards.

Adherence to these standards is a regulatory obligation and a critical factor in mining operations' overall success and sustainability. Non-compliance can lead to severe consequences, including increased accidents, health and safety hazards, environmental damage, legal penalties, financial losses, and reputational harm. Therefore, implementing a real-time permit and compliance system is a significant step in ensuring continuous monitoring and immediate response to any issues, safeguarding all stakeholders' interests.

Benjamin Kamala Mwamba

University of Johannesburg

Benjamin is a student at the University of Johannesburg, currently completing undergraduate degree in Mining Engineering. He holds multiple leadership roles, including Class Representative for the 2023 and 2024 Mining and Survey classes, Academic Officer for the 2024 Mining Forum, Mining Engineering Tutor, and Head Residence Academic Advisor. He also represented his university as a delegate for the winning UJ team at the YPC Student Debate. Focused on continuous growth, Benjamin aims to combine his technical expertise with leadership skills to contribute to the future of the mining industry

Striving towards zero harm and fatalities from occupational health conditions

T. Balfour

Minerals Council, South Africa

The mining industry is committed to zero harm and zero fatalities. The Minerals Council's Khumbul'ekhaya strategy is centred on these principles. The full effects of harm due to health exposures are not immediately apparent, unlike safety fatalities. This paper is on ill-health and death due to occupational diseases. Data from the Department of Mineral and Petroleum Resources as well as the National Institute for Occupational Diseases was utilised to show the extent and causes of morbidity and mortality among current and ex-mineworkers. Interventions by the Minerals Council to reduce this mortality and morbidity are explored.

Keywords: Khumbulekhaya, Masoyise, MOSH Learning Hub, respirable crystalline silica, TB



Thuthula Balfour

Head Health

Minerals Council South Africa

Dr Balfour is a qualified medical doctor and public health medicine specialist with an MBA and Diploma in Occupational Health. She has a wealth of management experience that spans 36 years, 23 of which have been at a strategic level and 16 in the mining industry.

In the mining industry she has led several initiatives in the industry with massive improvements in monitoring performance and outcomes in occupational health.

Dr Balfour currently serve on the board of Department of Labour's Compensation Board and Department of Mineral Resource's Mine Health and Safety Council and also serves on the BUSA Task Team on the National Health Insurance. She served on the South African Health Ministerial Advisory Committee on COVID-19 from 2020 till 2023.

In 2018 she was named as one of the Top 100 Global Inspirational Women in Mining.

Eco-friendly mining: Challenges for the mining supply industry?

O. Drusche

Technische Hochschule Georg Agricola, Germany

Companies in the supply sector of the mining industry can positively impact environmental, social, and governance factors. These factors significantly affect corporate performance, investment returns, and risk reduction. However, it is predicted that the demand for mineral resources will increase in the coming years, leading to higher energy consumption, emissions, and waste production in mining and processing. The mining industry accounts for up to 10% of global energy consumption, with the process of crushing rocks alone responsible for approximately 3% of this usage. To achieve the goal of net zero emissions, mining companies must commit to credible, science-based plans that include targets for reducing greenhouse gas emissions. Suppliers are taking measures by adapting their product portfolios to reduce emissions in the mining industry. The objective is to expedite progress in tailings and waste management, water stewardship, and most importantly, achieve net-zero emissions through the implementation of new technologies. This paper explores options beyond conventional product development and efficiency improvements, presenting the sustainable business model innovation as a potential solution.

Keywords: mine-to-market value chain, circular economy, sustainable business model innovation, ESG factors, risk management.



Olaf Drusche

Lecturer

Technische Hochschule Georg Agricola Bochum, Germany

Olaf Drusche is a doctoral mining and processing engineer by profession and holds an MBA. Over the past 20 years, Olaf has worked in various companies and positions, all related to mining and mineral processing. In addition to his work at FLSmidth Mining Technologies in Germany, Olaf is a lecturer at the Georg Agricola University of Applied Sciences in Bochum, Germany, in an international master's programme for the modules 'Sustainable Management and Communication' and 'Controlling, Leadership and Corporate Governance'.

Enhancing underground mine safety through rockmass instrumentation

L. Scheepers¹, P. Lenegan¹, F. Pienaar², and H. Hoogenboezem³

¹SibanyeStillwater Gold Division, South Africa

²Mining Product Developments, South Africa

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Mining operations inherently involve risks, and ensuring the safety of workers in underground mines is of paramount importance. In recent years, advancements in instrumentation have provided valuable tools for monitoring and managing safety conditions. In this paper, we delve into the role of data-driven approaches and specialised instruments in enhancing mine safety.



Lourens Johannes Scheepers

Manager Rock Engineering
SibanyeStillwater

27 years in the mining industry, all in deep level gold mines, in the rock engineering departments of Vaal Reefs, AngloGold Ashanti and SibanyeStillwater. Career focussed on the management of seismic risk and presented papers on the rock engineering aspects of mine seismicity.

Enhancing continuous risk management through integration with critical control management plans

A. Boaduo

Gold Fields, South Africa

In the mining industry, effective risk management is essential for safety and minimising health hazards. At South Deep Mine, a three-layered risk assessment strategy was developed, focusing on baseline, issue-based, and continuous risk assessments. Recognising the need for a more practical tool, South Deep Mine replaced traditional pre-work risk assessments with the SLAMM (Stop, Look, Assess, Manage, Monitor) tool in 2019. SLAMM aligns with the Critical Control Management Plan (CCMP), embedding risk management into daily tasks. However, usability challenges with SLAMM Version 3, identified through internal audits and stakeholder feedback, highlighted the need for a more intuitive and engaging tool. Consequently, SLAMM Version 4 was developed, emphasising user engagement, critical control identification, and a seamless digital integration process. This paper examines the development and implementation of SLAMM Version 4, following the ADKAR change management model to ensure smooth adoption and sustainability. The new version aims to foster a culture of proactive risk management by equipping employees to better identify and manage hazards, thus contributing to the mine's continuous safety improvements. The evolution towards full digitisation of the SLAMM process is also discussed, highlighting its potential to provide real-time data analysis and enhance overall safety performance.

Keywords: Continuous risk management, SLAMM tool, Critical Control Management, Material Unwanted Events, mining safety, risk assessment, digital integration.



Dr Adwoa Boaduo

Unit Manager - Safety
Gold Fields

Dr. Adwoa Boaduo is a mining engineer with over 14 years of operational experience, specializing in mine safety and geotechnical engineering. Over the past nine years, she has conducted impactful research on mineral-based sustainable development, aligning her technical expertise with a commitment to safe, responsible mining practices. Dr. Boaduo's unique ability to bridge practical mining operations with sustainability initiatives has positioned her as a key contributor to advancing safe and sustainable practices in the industry.

Cannabis use and its impact on health and safety in the South African mining industry

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¹Mine Health and Safety Council, South Africa

² University of Pretoria, South Africa

³University of the Witwatersrand, South Africa

Cannabis sativa or cannabis referred to as marijuana, hemp, dagga, mbanje or chamba contains the psychoactive compound Δ^9 - tetrahydrocannabinol (THC) which is reported to have short-term health benefits. For medicinal uses, cannabis reduces chronic body pains, severe nausea and vomiting, epilepsy, seizures, depression, anxiety, and sleep disorders. For leisure use, cannabis creates a feeling of relaxation, happiness, and mood enhancement. In physically demanding occupations, such as mining, cannabis has been used to enhance performance as an energy booster. In South Africa and many other countries, cannabis has been legalised for recreational use. Nonetheless, this legalisation does not provide clear guidance on the management of cannabis and its impact on occupational health and safety (OHS). Studies have reported adverse effects on workplace safety and productivity in employees who use cannabis (Kornpointner et al., 2021; Carnide et al., 2023; Hinton & Asher, 2022). Therefore, in high-risk occupations such as mining, clear guidance on cannabis management is needed. In this paper, we assessed the knowledge and perception of key stakeholders in the South African Mining Industry (SAMI) on cannabis decriminalisation and its impact on workplace health, safety, and productivity.



Nonhlanhla Tlotleng

Occupational Health Research Specialist
Mine Health and Safety Council

Dr. Nonhlanhla Tlotleng is an Occupational Health Research Specialist within the Centre of Excellence at the Mine Health and Safety Council. Dr. Tlotleng is an NRF rated Public Health Researcher and an Epidemiologist with over ten years research experience in Occupational Health. She has published widely in Occupational Health, including reviews and books pertaining to workplace hazards and their adverse health effects. She is a member of the editorial board for several peer review journals serving as a reviewer and an academic Editor. Affiliated with several universities, Dr. Tlotleng is involved in teaching, training and supervision of postgraduate students in Public Health. She holds a Bachelor's degree and a Masters in Biotechnology from the University of Johannesburg, and she further completed an MSc degree in Epidemiology and a PhD, both from the University of the Witwatersrand.

Fraser Alexander tailings division's journey towards zero harm – A case study

S.M. Thema

Tailings and Remining, South Africa

Introduction

Achieving Zero Harm remains one of the mining industry's most desired milestones, and although this is achievable, current safety performance suggests that more work needs to be done to prevent the occurrence of incidents and injuries. Figure 1 indicates the total fatalities and the fatalities per classification in the South African mining industry (SAMI) over the last two decades. The SAMI registered a fivefold decrease from 270 in 2003 to 55 fatalities in 2023. A record low of 49 fatalities in 2022 was recorded, and although this indicated a significant milestone, it is generally accepted by all stakeholders in the mining industry that one fatality is one too many. Although this improvement is welcome, one life lost, is one too many! The journey towards Zero Harm continues.



Sephela Makete Thema

General Manager: Tailings and Remining South Africa
Fraser Alexander

Sephela Makete Thema is an experienced mining sustainability executive employed as General Manager for Tailings and Remining at Fraser Alexander, and responsible for the South African and Namibian operations. He leads a team of 1800 members that is spread across sixty-seven (67) operational sites within South Africa and Namibia. Makete has worked for several blue-chip companies in the mining industry in the past 13 years and went through the ranks from mining graduate, Shiftboss, Mine Overseer, Mine Manager, VP and Head of Operations to his current role of General Manager.

Makete is a professional member of the Southern Africa Institute of Mining and Metallurgy (SAIMM) and serves on the SAIMM Young Professionals Council (YPC). Makete is also a member of the Association of Mine Managers of South Africa (AMMSA) and is a registered engineer with the Engineering Council of South Africa (ECSA).

Psychological safety in African Mining

N. Gage

People & Communication, South Africa

The mining industry across Africa faces numerous high-risk challenges where workers' safety, health, and well-being are paramount. As companies transition to reduce harm, psychological safety is not just a buzzword but a critical factor in operational success. While physical safety is a key focus in mining, psychological safety — the belief that one can express ideas, questions, and concerns without fear of negative consequences — is essential in driving safety performance and overall team efficiency. Its importance cannot be overstated, and it is urgent that we give it the attention it deserves.



Nuala Gage

Director
Safety Collaborations Ltd

Nuala Gage is the Director of Consulting at Safety Collaborations, with a notable background in advancing safety culture and psychological safety across high-hazard industries worldwide. Her extensive work in sectors like oil & gas, mining, and energy is grounded in a unique approach that blends behavioural safety, leadership coaching, and a practical application of human factors. Nuala's work focuses on building resilient, collaborative teams that embrace safety as a core value, from leadership through to frontline operations. Known for her solutions-oriented style and cultural insight, she partners with organisations to drive meaningful, sustainable improvements in safety and communication.

Critical controls for seismic risk management in deep level gold mines

L. Scheepers

SibanyeStillwater, South Africa

The effective implementation of critical controls is key in delivering on safety targets, but which are the appropriate critical controls for seismic risk management and how are they determined?

In this paper I will list the important critical controls for seismic risk management appropriate to the SibanyeStillwater deep level gold mines and explore how one of the controls, i.e., lead-lag distance has been determined.

Planning is an overarching critical management routine and refers to long-term (LOM and BP), medium-term (three month and monthly) as well as short-term (next shift) planning. Monthly planning for example, being a critical management routine as well as a critical control, may not be interfered with by anyone. The planning dates for the different sections must be determined and scheduled one day after measuring and these meetings must take priority over other activities on the mine – all the service departments must provide appropriate input into the plan. Nearly all safety and production failures can be traced back to insufficient planning.



Lourens Johannes Scheepers

Manager Rock Engineering
SibanyeStillwater

27 years in the mining industry, all in deep level gold mines, in the rock engineering departments of Vaal Reefs, AngloGold Ashanti and SibanyeStillwater. Career focussed on the management of seismic risk and presented papers on the rock engineering aspects of mine seismicity.

Harmony’s integrated safety journey

T. Gazi, G. Herholdt, and L. Maepe

Harmony Gold, South Africa

Background

Transitioning Harmony Gold Mining Company from a reactive safety culture to a proactive safety culture started in 2016. As core to the Safety Strategy, the four-layer risk management approach further supported the improvement plan. Whilst systems provide essential data to enable decision making, the humanistic approach was introduced to influence and encourage safe behaviours. Throughout the culture transformation journey employee health and well-being as a key element creating a proactive safety culture was highlighted.

Objective

The objective is to share Harmony’s inspirational Safety Journey, emphasising the importance and value of a multidisciplinary approach to achieve Zero Harm. The intent of the presentation is to stimulate awareness towards an integrated and collaborative effort to improve safety.

The implementation of our strategy is underpinned by three critical controls that support Harmony’s Zero Harm objective:

Systemic Supporting strategies, policies and procedures, risk management methodology and processes, human resources, group technology and procurement	Humanistic An integrated approach to mature leadership, living the harmony values and high levels of employee engagement	Health and Wellness Interventions that support employee and contractor physical and mental wellness
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Employee engagement is a critical success factor to executing our strategy, as creating awareness, and instilling personal ownership to question processes and protocols empowers our workforce to embed safety practices in work routines.

Integrated Effort

The presentation will illustrate the synergy between Risk Management, Human Resources, Organisational Development, Health, and Wellness. It will demonstrate how these components function as an interconnected system that enhances decision-making and influences safe behaviour. Lessons learned from Harmony’s experience will be used to highlight the practical application of an integrated approach.

Outcome

The presentation will illustrate that alignment and collaboration across different disciplines can result in Zero Harm. The main objective is to encourage the adoption of similar approaches leading to continual improvements in safety and employee well-being.



Gabriel (Gawie) Herholdt

Head of Department: Organisational Effectiveness
Harmony Gold

Hold more than 30 years general Human Resources (HR), Talent Management, (TM) Organisational Effectiveness (OE) and Human Resource Development (HRD) experience, with 21 years at senior management level.

Portray strong leadership abilities, further accentuated by a strong value system and an astute work ethic. Have a self-directed approach, takes initiative, rise to challenges and often challenge own abilities. Very adaptable to change and often uses this as a driver for excellence.

Accountable for the implementation, coordination and measurement of OEI initiatives for Harmony, including the Australasian and South African regions. The role drives business ownership of the company culture improvement programmes.

Previous position held include the Executive: Organisational Effectiveness at the South African Mint (5 years)

Critical risks unveiled: The imperative of broad-brush risk assessments

C. Young

Impress Solutions, Australia

In the vast expanse of the international mining sector, a critical issue has come to light: Many mining operations overlook the power of a Broad-Brush Risk Assessment (BBRA) to uncover their critical risks.

This oversight has led to a cascade of challenges, where some mining endeavours find themselves grappling with:

- Unidentified and unmanaged fatal risks, casting a shadow of uncertainty and heightened compliance risks.
- A bewildering landscape where the concept of critical risks remains enigmatic, with some mistaking the risk register for the BBRA.
- A fog of confusion surrounding the guardianship of these critical risks, leaving safety responsibilities blurred and undefined.

Yet, the solution lies within our grasp. An effective BBRA empowers organisations to:

Pinpoint with unwavering certainty every 'true' critical risk.

- Clarify ownership for each critical risk, ensuring accountability and swift action.
- Create a prioritised roster of critical risks, illuminating the path to safer operations.
- Lay the foundation for essential follow-up actions like bowtie analysis, the identification of critical controls, and the fortification of the safety and health management system.

Join us in this presentation, where we delve into the heart of an industry-leading BBRA process.

Discover practical insights that will enable your organisation to craft and implement BBRA strategies, bridging the gaps in your journey toward preventing fatalities and fortifying safety protocols.

Keywords: risk management, hazard identification methodology, critical controls



Christian Young

Impress Solutions

Christian is an internationally recognised health and safety executive whose mission is to help you save lives at work.

Christian is the founder and Chief Executive Officer of Impress Solutions an industry leading safety services company for the Australian resources industry.

Christian delivers his mission of saving lives at work by collaborating with organisations to implement simple, effective evidence-based practices.

Acoustic device for recording and tracking rock hazards on the mining face

H. Greeff¹, M. Pienaar², and J. Hanekom¹

¹Council for Scientific and Industrial Research, South Africa

²Mandela Mining Precinct, South Africa

In the pursuit of enhancing personnel safety and operational efficiency in underground mining, this paper introduces an innovative acoustic device for recording and tracking rock hazards on the mining face. This system combines advanced acoustic analysis with an ultra-wideband location system to interpret sounds produced during rock mass sounding and scaling. The location system is georeferenced to the mine's local coordinate system using available survey pegs. By integrating these technologies, each acoustic data point includes a spatial XYZ coordinate which facilitates tracking of loose rock locations throughout the mining excavation process. This dual-sensory approach advances previous methods by leveraging the innovation of acoustic technology and tailoring algorithms to specific rock types, enhanced by the tracking function so that rock hazards encountered underground can be mapped and communicated to the operational team. The collected data offers a systematic approach to hazard identification and enhances mine designs and operational strategies by providing insights into the dynamic response of the rock mass during excavation under different mining conditions. This project offers a new approach to proactive hazard management, potentially transforming how mines are operated and mine designs monitored to ensure safety and efficiency.

Keywords: acoustic analysis, UWB location, rock hazard detection, mining safety, algorithm development



Heinrich Greeff

Principal Rock Engineer

Council for Scientific and Industrial Research

Heinrich launched his mining career in 2010 post university studies in physics, mathematics, and applied mathematics. Certified in rock engineering in South Africa, he specialised in ultra-deep-level gold mines before designing ground control systems in Canada, enhancing safety. Back in South Africa, Heinrich simplified ground-penetrating radar workflows for wider adoption. As CSIR's Principal Rock Engineer, he now leads the Geotechnical Sciences department, promoting innovative mining practices and technologies.

Update of the South African mining rock stress measurement database

Z. Nkosi

Mine Health and Safety Council and BKM Engineering, South Africa

The deep-level mines of South Africa face significant challenges related to rock stress. With over a century of mining having taken place, operations now lie at depths ranging from ~1 to 4 km below the surface, within highly stressed rock. In such environments, mining activities pose serious risks to both mineworkers and infrastructure in proximity to mining regions. Mineworkers are particularly vulnerable to falls of ground, rockbursts, mining-induced fracturing, and large damaging seismic events. Consequently, an enhanced understanding of seismogenic processes, coupled with consistent and accurate stress measurements, becomes imperative for the implementation of effective risk mitigation strategies in deep and highly stressed ground conditions.

In response to these challenges, the Mine Health and Safety Council initiated this project aimed at providing a comprehensive and up-to-date repository of rock stress data¹. This project aims to address several key objectives, including reviewing existing projects such as SIMRAC GAP 511 and SIM 160202, updating stress measurement data, developing a user-friendly web-based application/system for stress measurement records, and compiling an operator manual to guide users.



Zamaswazi Nkosi

Research Delivery Specialist (Mine Safety)
Mine Health and Safety Council

Zamaswazi Nkosi, is an accomplished geoscientist deeply committed to addressing geological and geotechnical challenges within the mining sector to enhance mining safety. She holds a Master's degree (MSc - Cum Laude) in Geology, a BSc (Hons) in Geology, and a BSc in Geology. Currently, she is pursuing a PhD in Geology, specialising in Geology, Geophysics, and Rock Engineering. With hands-on experience in participating in international and South African mining and geotechnical projects, Zamaswazi has demonstrated her expertise across various mining-related fields. Her professional experience extends to advanced mining research, where she has conducted geophysical surveys, seismic imaging, and subsurface characterisation. Zamaswazi has contributed to various research projects, publishing her findings in peer-reviewed journals, and books and presenting at industry conferences and workshops. Zama plays a vital role in advancing mining research initiatives, ensuring compliance with regulatory standards, and fostering collaboration among project teams.

Study on good ledging practices and the development of virtual video training material based on good ledging practices

Z. Nkosi

Mine Health and Safety Council and BKM Engineering, South Africa

Ledging can be defined as the process of establishing the initial footwall ledge for a stope by taking the first cut from the original raise. This process ensures the formation of a suitably supported, robust, and competent centre gully for the life of the raise line being mined. However, the ledging process is associated with several inherent risks and hazards due to the span of unsupported hanging wall exposed before the installation of permanent support. Ledging is an essential phase of the mining process as it often determines the stability and longevity of the raise or centre gully.

This project was initiated by the Mine Health and Safety Council to address concerns about the current shortfalls in ledging-specific training content in the South African Mining Industry (SAMI) and to improve the safety and productivity of the ledging process. The project aimed to review ledging best practices implemented in the industry and develop a guideline document in consultation with industry experts and practitioners.



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From suspicion to submission – An occupational lung disease handbook

V.G. Govender

Masakhane Strategic Health Consulting (Pty) Ltd, South Africa

From the suspicion of an occupational lung disease (OLD) to the submission for compensation, occupational medicine practitioners (OMPS) in the South African Mining Industry (SAMI) practice under the Occupational Diseases in Mines and Works Act No. 78 of 1973 (ODMWA)¹ and its Regulations. These OMPs collectively hold decades of institutional knowledge in the practical implementation of the ODMWA. While the science has advanced considerably, laws and guidelines remain outdated and fragmented. Without updated guidelines, OMPs are challenged to provide the optimal management of their patients afflicted with OLDs.

Vanessa Govender

Director, Occupational Medicine Specialist
Masakhane Strategic Health Consulting (Pty) Ltd

Dr Vanessa Govender is a registered Specialist in Occupational Medicine and Director of Masakhane Strategic Consulting Pty Ltd. She has 30 years global experience in health leadership, strategy and policy development for the mining and related sectors. She attained her Medical Degree, Diploma in Occupational Health and Masters in Public Health (Policy and Management), Travel Medicine and International Executive Development qualifications from the University of Witwatersrand, South Africa, and Aviation Medicine from the University of Pretoria. She serves as an honorary lecturer at the Wits School of Public Health and is an Associate of the Colleges of Public Health Medicine in South Africa, and serves as alternate member on the Medical Advisory panel of the Tshiamiso Trust.

Empowering miners: The key to safer underground operations

N. Weideman¹, D. Piketh¹, M. Armstrong¹, and M. Pienaar²

¹STRATAFY, South Africa

²Mandela Mining Precinct, South Africa

Narrow reef mines in South Africa present significant challenges due to the effects of drilling and blasting on complex geological structures at extreme depths. These environments carry higher risks, particularly concerning the stability of the hanging wall and side walls, which can be compromised by human activities and natural rock mass instability. Recognising these dangers, the Stratafy Seeker, a sophisticated tool, enhances miner safety through providing additional safety steps in the operations, without hindering current productivity. This device uses photogrammetry to scan the region of interest and delivers near real-time 3D representations to a user's handheld device. Although technologically advanced, the Stratafy Seeker's user-friendly design and comprehensive monitoring capabilities empowers miners to operate more safely and effectively. Stratafy's commitment to continuous innovation and field testing ensures that the Seeker will remain a vital tool for enhancing safety and efficiency in underground mining operations, ultimately safeguarding the well-being of workers and improving overall operational resilience.

KEYWORDS: Narrow reef mines, Stratafy Seeker, photogrammetry, enhancing miner safety, real-time 3D representations



Neil Weideman

Project Director
Stratafy Ltd.

Neil Weideman is an accomplished project director with over 28 years of experience in the mining industry. He is dedicated to enhancing operational practices, particularly in annual report preparation and regulatory compliance. His consulting work has guided organizations in navigating complex industry standards. In addition to his consulting expertise, Neil has specialized in photogrammetry processing for 8 years, contributing to volumetric calculations and GIS technician projects that drive operational efficiency. His role in GIS platform development spans 4 years, during which he has been instrumental on the steering committee, shaping strategic technology initiatives for the mining sector.

With a strong understanding of the underground environment and extensive experience in risk reporting, Neil is adept at overseeing projects that prioritize safety and operational excellence. His diverse skill set and commitment to innovation make him a valuable asset in any mining initiative.

A look at reducing the environmental impact of mining and metallurgical processes by employing circular economy principles and the challenges of implementation

A.C. McHaffie

Bind-X (Pty) Ltd, South Africa

Mining and metallurgical processes are essential for resource extraction but often have significant environmental impacts, including pollution, resource depletion, and ecosystem degradation. In response, the mining and metallurgy industry has made concerted efforts to move towards implementing integrated circular economy principles. The efforts have focused on developing innovative technologies to provide sustainable solutions, emphasising the sustainable use of materials through the entire lifecycle—from extraction to production to disposal. However, despite its potential, the implementation of these principles faces challenges. These include technological limitations, high initial costs, regulatory barriers, and the need for industry-wide collaboration. Furthermore, the transition from traditional linear models to circular systems requires a shift in mindset, both within industry and among stakeholders, alongside the development of supportive policies and infrastructure. This paper explores how circular economy strategies, such as closed-loop production, sustainable material sourcing, and innovative recycling technologies, can be applied in mining and metallurgy to reduce waste, lower energy consumption, and mitigate environmental damage. The case study of slag generation, commercial use initiatives investigated, and legislative steps taken to have slag approved as a beneficial waste will be the focus of this paper.



Mark Hocker

Chief Executive Officer
The Boiler Room

Mark Hocker, founder of The Boiler Room, is a pioneering force in multimedia, eLearning, and 3D animation in Southern Africa and internationally. Originally from Sydney, Australia, Mark's career began with a degree in computer programming, excelling in languages like Cobol, Basic, and C. His early accomplishments in 3D animation caught the attention of top Australian television producers, leading him to create logos and special effects for prominent television channels and world-renowned music bands. He was also invited to lecture on 3D animation by the Australian Film and Television School.

At just 21, Mark had achieved remarkable success and travelled extensively, working with major UK networks such as the BBC, ITV, and Channel 4. Upon visiting South Africa, he saw untapped potential in 3D animation and introduced the technology to key institutions, including SABC, M-Net, and SAPS. He also developed and taught courses that became foundational in South Africa's animation education.

In 1999, Mark established The Boiler Room, which has since become a leading content provider, specializing in high-end 3D animation, eLearning, and immersive VR and AR training. The Boiler Room is renowned for its innovative safety training and VR workplace simulations, which serve top clients across Southern Africa and beyond.

Striving for zero harm in the development end

E. Adlard

Salzgitter Mzansi (Pty) Ltd, South Africa

Deep-level hard rock mining is inherently hazardous, and whilst fatality rates have decreased over the past 20 years, a single fatality is one too many, and too many reportable accidents annually result in personal and family hardship and significant lost production. Outside of stopes, the locations for the highest number of accidents are haulages, crosscuts, and in the development end. Recognising this, Salzgitter Mzansi implemented a Six-Step zero harm procedure when redesigning its pneumatic throw loaders, resulting in the operator being able to safely and wirelessly remote control the units under fully supported hanging. Concurrently, the company converted its flagship HL380U loader to a more powerful all-electric machine, resulting not just in major power savings and performance improvement, but with the added benefits of reducing noise, eliminating pollution, improving workspace illumination, and facilitating the acquisition and pre-processing of environmental and performance data.



Edward (Ted) Adlard

Chairman

Salzgitter Mzansi (Pty) Ltd

Commenced career as an engineer at Durban Roodepoort Deep gold mine, progressing to manager of Wolvekrans Colliery, during which time I was elected a Fellow of SAIMM. Currently chairman of Salzgitter Mzansi (Pty) Ltd, a manufacturer of hard rock mining equipment with a strong presence in the underground platinum mines.

AI-assisted geophysical safety measurements in underground mines

T. Schicht¹, S. John¹, S. Lüning¹, and B. Kratz²

¹K-UTEC, Germany

²Castalytics, Germany

Safety is of utmost importance in underground mining. Geophysical methods help to create a safe work environment inside the mines. In this paper we present (1) seismic monitoring and (2) roof radar measurements supported by artificial intelligence. K-UTEC has more than 50 years of experience in seismic monitoring for underground mines worldwide. Castalytics specialises in AI- assisted solutions for the mining industry.



Dr. Sebastian Luening

Executive Director

K-UTEC

Sebastian studied geology at the University of Göttingen and received his PhD and Habilitation degrees from the University of Bremen. Sebastian has been employed in the natural resource sector for 25 years, initially in oil and gas, now in mining. He previously worked for Lasmo in London, RWE Dea in Hamburg and Galp in Lisbon. He has extensive project experience in North Africa, Arabia, Sub-Saharan Africa and South America. Today, Sebastian serves as Executive Director at the mining engineering company K-UTEC where he is responsible for the mining and geoscience departments.

The journey of the SAMI on the 2014 MHSC Milestones

W. Deyssel

Minerals Council, South Africa

The Mine Health and Safety Act of 1996 as amended, mandates the Mine Health and Safety Council (MHSC), to arrange and coordinate a tripartite summit at least every two years to review the state of health and safety within the South African Mining industry (SAMI). The intent of the industry milestones is to accelerate the journey of the SAMI towards zero harm through the implementation of risk-specific activities. With 2024 being the 10th anniversary of the 2014 Occupational Health and Safety milestones, the focus is to build on the significant progress made by the tripartite stakeholders in striving for the target of zero harm to ensure that every mine worker returns from work unharmed every day. The Occupational Health Milestones, agreed to by the principals representing the state, organised labour and employers, for achievement by December 2024 included the elimination of silicosis, pneumoconiosis, noise-induced hearing loss and reduction and prevention of TB and HIV infection. The presentation will reflect on the journey of the SAMI on achieving the milestones over the past 10 years, highlighting the performance of the industry on the milestones stipulated above, the challenges and what would be required for the industry to move forward with these milestones.



Willie Deyssel

Deputy Head of Health: Occupational Hygiene
Minerals Council South Africa

Willie Deyssel is currently appointed as the Deputy Head of Health: Occupational Hygiene within the Health Department of the Minerals Council South Africa. Willie was appointed in various Mine Ventilation and Occupational Hygiene roles within Anglo American platinum during his 18 years tenure at mining and process operations, 18 months as an Occupational Hygiene Consultant and was also previously appointed in the role of Principal Adoption Specialist: Noise within the MOSH Learning Hub of the Minerals Council

Willie graduated with a Master's degree in Public Health: Occupational Hygiene from the University of the Witwatersrand in 2017 with his Dissertation titled: PERSONAL NOISE EXPOSURE IN PLATINUM CONCENTRATOR OPERATIONS IN THE BUSHVELD COMPLEX OF SOUTH AFRICA and is also the holder of the Certificate in Mine Environmental Control, issued by the Chamber of Mines of South Africa. He is a Member of the Mine Ventilation Society of South Africa (MVSSA) and is also a member of the Southern African Institute of Occupational Hygiene (SAIOH) as Registered Occupational Hygienist (SAIOH) by profession and has over 25 years of Occupational Hygiene and Mine Environmental Control experience within the South African Mining industry.

The dynamics of and limits to reliability-based safety management in complex socio-technical systems: A mining industry case study of safety rule violation behaviour

T. Mariri and A. Odendaal

Stellenbosch University, South Africa

Study Background

The reliability-based approach to the control of risk is largely informed by authoritarian high modernism¹, that is, a “strong belief in scientific, technical and managerial expertise, particularly through stronger and stringent administrative ordering”. Also referred to as Model 1 approach or Safety-I approach, the approach is driven by the view that safety rules must be formulated by competent experts and serve the primary purpose of protecting the system from the potentially fallible sharp-end operators.

Safety rules, as the operational work system level representation of the safety management system, are designed and implemented to improve safety through controlling employees’ performance variability. Rules are essentially meant to create a structural environment within which organisations’ productivity goals are or ought to be safely pursued by the system actors, particularly those tasked with the responsibility of carrying out or supervising production. However, because organisations are complex dynamic emergent socio-technical systems, the influence of safety rules on employees’ behaviour and, by extension, on safety is also complex and dynamic. As self-determinists, employees continually make planned behavioural choices, including choices related to non-compliance with safety rules.

The employees’ behavioural choices, in complex dynamic socio-technical systems, are, however, not random but a function of the structural environment created by the very system, under the custodianship of the system’s architects, the organisation’s management.

Essentially, therefore, employees’ inherent human need to exercise behavioural discretion presents an uncomfortable management dilemma. On the one hand, the organisation’s management ought to exercise its formal and legal prerogative, as well as the responsibility for safety rule design and enforcement. On the other hand, management also ought to accept the reality that, in complex dynamic socio-technical systems, safety rules are not all followed and/or followed in the manner intended by management as the rules custodians. Management’s safety rule design and enforcement hegemony is continually challenged by employees’ own self-determined safety rule compliance choices.



Tendai Mariri

Lecturer

Stellenbosch University

Tendai, a registered Industrial Psychologist with the Health Professions Council of South Africa (HPCSA), is a Lecturer and Researcher in the Department of Industrial Psychology, Faculty of Economic and Management Sciences at Stellenbosch University. He holds a Masters’ degree in Industrial Psychology (Fort Hare University) and is completing a PhD in the same discipline (Stellenbosch University). He holds a professional certificate and is a Danida fellow in OHS (COWI/DFC, Copenhagen). Mariri’s research interests are broadly in sustainable development, labour matters, including decent work and corporate sustainability. His research specifically focuses on safety, in particular, the application of system dynamics to model and seek sustainable solutions to dynamic and complex safety behaviour-safety management challenges of high-risk industries. Tendai has published research articles in journals and has presented at various national and international conferences

Is the mining industry ready to embrace virtual reality?

M. Hocker

Boiler Room, South Africa

Introduction

For over 25 years, The Boiler Room has pioneered advancements in 3D computer animation, eLearning, maintenance solutions, and accident reconstruction within the industrial and mining sectors. Recognising the need for innovative approaches in training, we have embraced virtual reality (VR), creating over 100 VR experiences that reimagine learning for a new era. Through more than 100 successful VR simulations currently deployed, we are witnessing a fundamental shift in training methodology, transforming traditional learning into interactive, immersive environments uniquely crafted for the mining industry. Our offerings include advanced VR maintenance systems, trackless mobile machinery (TMM) simulators, and fully immersive 'A Day in the Life' experiences that give trainees a real-world sense of working in hard rock and soft rock mines. Such applications bridge theoretical knowledge and hands-on practice, immersing employees in simulations that enhance knowledge retention and operational competence. Despite VR's promising benefits, adoption within the mining sector has been uneven, challenged by content quality, skill-level usability, high costs, hardware limitations, and practical issues like motion sickness. These factors have led some industry players to question whether VR can genuinely meet the mining industry's complex training needs.



Mark Hocker

Chief Executive Officer
The Boiler Room

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Assessment of the managers' certificate of competency part c examination during 2010-2019

N. Ndiweni and M. Mpanza

University of Johannesburg, South Africa

The Mine Health and Safety Act (MHSA) No 29 of 1996 introduced a statutory requirement for all mining operations in South Africa to ensure that they appoint competent persons to manage health and safety risks in the workplace. To enforce this requirement, the Department of Mineral Resources and Energy implements and controls the issuing of certificates of competence (CoC) for specific mining-related qualifications. These include CoCs for engineers, mine managers, mine overseers, and surveyors. The government-issued certificates of competence are notorious for their difficulty and high failure rate. It has been over 20 years since the first Mine Managers' Certificate of Competency (MMCC) was introduced but the high failure rate for this CoC persists and this is a concern for mining stakeholders. This paper examines the content of the MMCC examinations over a ten-year period to uncover what is frequently asked in this exam. A mixed-method approach was used, involving a literature review, content analysis of the MMCC Part C examinations, and the quantification of examination question types and patterns.

The key findings showed that examination papers had 63% of the questions being descriptive and 37% keyword-based. Candidates are required to be qualified and experienced before attempting the MMCC Part C examination. During examination preparation, candidates must compile a reading indexing system of the Ez Law MHSA book to guide their search for correct answers during the open-book examination. The researchers found this a helpful strategy to assist candidates in succeeding in the MMCC Part C examination and a comprehensive list of related topics are provided in this paper.

Keywords: MMCC Part C, mining examination, competence, MHSA



Ntabiso Ndiweni

Mining Engineering Lecturer
University of Johannesburg

- 35 years of mining experience
- DMRE Principal Inspector of Mines (1997 to 2004)
- Mining Department Lecturer at UJ (2005 to date)
- Mining Industry MHSA-related training (2005 to date)
- MMCC Part C Coaching (2005 to date)
- Auditing systems on SOPs, training and competence management

Leveraging digital twins and virtual reality in mining incident investigations: Unlocking the 'Black Box' of incident data

J. van Dalen and H. Dippenaar

Dayenu Mining Consultants, South Africa

In the context of achieving a 'Zero Harm' status in the South African mining industry, we need to unlock the 'black box' of data on the incidents and accidents that stand between the Zero Harm status and the 1907 serious injuries reported in 2023. The utilisation of digital twin and virtual reality (VR) technologies enables us to take a transformative leap from traditional investigation methods. This new methodology has the potential to gain new insights and identify new opportunities to transform incident investigations and enhance the value that such an incident investigation adds to the overall investigative processes.

My work has been dedicated to the development and testing of new methodologies that harness the power of digital twins, VR, and the use of robotics to access areas that have been off-limits until now. These cutting-edge technologies offer the potential to overcome the conventional limitations of incident analysis. By accessing areas that have been off-limits due to dangerous conditions, we can now access the black box data of an incident scene, such as a fall of ground, through remotely operated vehicles. The black box data can be reconstructed, and critical spatial data can be extracted: for example, the angle and spacing of permanent support in an area that experienced a fall of ground incident. The digital twin and VR environment enables investigators to access the scene of the incident without the risks associated with an underground investigation.

The data is not only limited to spatial data but also includes visual data, allowing us to see where it was never possible to see before. This approach empowers us to visualise and analyse intricate sequences of events through a digital reconstruction of the incident scene, as well as the timestamp data that might be available in the vicinity of the incident. This could assist in determining the root cause of an incident and make better recommendations to prevent recurrences. The conference's objectives align closely with the research, which aims to identify a methodology that can save lives, reduce incidents, and enhance the learning from incident process to add value towards achieving a Zero Harm state in the South African mining industry.



Jaco Johannes van Dalen

Senior Mine Planner

Dayenu Mining Consultants

As a dynamic and innovative mine planner with a strong background in mine surveying, I have built a robust career in the mining industry since 2010, starting with Anglo Gold Ashanti and later advancing to my role as a Mine Planner at Harmony. Backed by 6 years of mine rescue service experience, I bring a unique perspective on safety and emergency response, ensuring that all technological solutions I develop prioritize the well-being of personnel and operational continuity. I am currently working as a Mining Consultant with Dayenu Mining Consultants, a role I have held for the last 2 years, where I continue to apply my expertise in leveraging advanced technologies to optimize mining processes and drive value through creative problem-solving.

Improving occupational health, risk, and safety management: the syncromine risk management software module by Mineware Consulting

W. Minnie

Mineware Consulting, South Africa

The Syncromine Risk Management Software Module by Mineware Consulting is a system for improving health and safety in mining operations. It addresses the challenges and risks of the mining industry, which has seen a rise in fatalities in the last few years. It helps identify, analyse, prevent, and mitigate hazards and risks that affect the organisation and its employees. It uses a holistic risk-based approach and a closed loop control structure to manage and monitor risk at all levels. It is a comprehensive and integrated solution for risk management with AI enhanced assistance that helps the user cover all the bases. With over half a decade of data being analysed at one of our clients we can share some of the successful metrics achieved year-on-year along the journey.



Werner Minnie

Head of Business Development
Mineware Consulting

Werner Minnie is an accomplished professional with over two decades of experience in the mining and software sectors, specializing in Mine Technical Systems, and business development. His career journey began in IT infrastructure and project management, where he played a pivotal role in implementing critical systems within the mining industry. Over the years, Werner advanced into leadership roles, including Mine Planning Manager at Gold Fields and Head of Business Development at Mineware Consulting, where he has been instrumental in driving growth, establishing strategic partnerships, and delivering tailored software solutions to clients such as Anglo Gold Ashanti, Harmony Gold, and Sibanye Stillwater.

Renowned for his strong client relationship skills and deep understanding of technical systems in mining, Werner has continually aligned business and technical strategies to meet evolving market demands. His expertise spans consulting and the integration of complex mine technical systems, making him a key figure in supporting and advancing the technological needs of the mining industry.

