The State of Occupational Safety in the South African Mining Industry: Progress, Successes and Challenges

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This paper seeks to highlight the progress, successes and challenges of the South African mining industry’s goal of ensuring that every mineworker returns from work unharmed every day. The paper presents the journey that the South African mining industry has travelled to improve occupational safety since the advent of democracy in 1994. The paper achieves this by providing an analysis of the progress that the industry has made in the reduction of fatalities and injuries as well as the performance trends of the major causes of fatalities and injuries. Further, the paper identifies key successes that the mining industry has had towards achieving the goal of zero harm. The challenges constraining the industry from achieving the desired levels of occupational safety performance are discussed followed by a set of recommendations for the acceleration of the industry’s journey to zero harm. The paper locates the state of occupational safety on South African mines within the context of the various initiatives taken by organised business, government, organised labour and mining companies over the past two decades to address the occupational safety challenges experienced by the mining sector.

INTRODUCTION

The South African mining industry has always played a significant role in the economic growth and development of the country. Mining contributes ZAR 8 for every ZAR 100 produced by the national economy and employs one in every 40 working individuals (or 2.5% of the entire workforce) (Statistics South Africa, 2017). The industry’s contribution to the economy includes ZAR 16.0 billion in taxes and ZAR 126.0 billion in employee earnings, with a total workforce of 464 667 employees (Langenhoven, 2018). The majority of the workforce is concentrated in gold, platinum and coal, accounting for 112 200, 175 770 and 81 962 employees, respectively (Langenhoven, 2018). Mining has a significant contribution to the economy of four provinces; namely, North West, Limpopo, Mpumalanga and Northern Cape (Statistics South Africa, 2017). In the North West, mining contributed over ZAR 33 for every ZAR 100 produced by the province’s economy. The South African Department of Mineral Resources (DMR) reported that mining has the following significance to the economy of South Africa (Department of Mineral Resources, 2014):

- contributes approximately 50% to foreign exchange earnings;
- accounts for 18% of total fixed investment;
- accounts for more than 30% of Johannesburg Securities Exchange (JSE) value;
- creates demand for 50% of volume of Transnet’s rail and ports;
- contributes to 93% of electricity generation via coal power plants;
- consumes an average of 32 000 GWh electricity, which represents close to 15% of national electricity demand; and
- responsible for 37% of country’s liquid fuels production through coal inputs.
South Africa is considered as one of the few countries with significant mineral endowment, as seen in Figure 1. According to Tholana et al. (2013), the country is the fifth-largest producer of gold and diamond, which increased its production by 17% in 2017 (Statistics South Africa, 2017). South Africa is the largest global platinum-group metals (PGM), manganese, vanadium and chrome ore producer.

Industrial mining in the country has always been associated with high levels of risk exposure to occupational health and safety (OHS). This is often compared with other global mining countries (Hermanus, 2007). The industry’s economic contribution, mineral endowment and license to operate in South Africa remains threatened by the OHS of mining operations. The plateauing trend of the last three years is a cause for concern and calls for a step change in the improvement of the industry’s OHS performance. The regression of occupational health and safety has motivated the need to assess the progress and challenges within the industry.

Methodology
The methodology for this paper is based on the review of various reports and literature on the OHS performance trends in the South African mining industry over the past two decades. International reports of the safety performance trends of other mining countries, including Australia, Canada and the United States, were also reviewed for a comparative analysis with the performance of the South African mining industry. A plethora of industry OHS initiatives were also reviewed and analysed against the industry OHS milestones.

INITIATIVES UNDERTAKEN BY STAKEHOLDERS TO IMPROVE INDUSTRY OHS PERFORMANCE

The mining industry has instituted a variety of programmes over the past two decades through which to improve occupational health and safety within mining operations. The section below presents a plethora of initiatives taken by industry stakeholders from organised business, government and organised labour to improve the industry OHS performance since the advent of democracy in 1994. In the mid-1990s, the first democratically elected President, Nelson Mandela, commissioned an inquiry into occupational health and safety in the South African mining industry. The Leon Commission was established to investigate occupational health and safety in the mining industry following the 1995 Vaal Reef disasters (Chamber of Mines, n.d.). The outcomes of the commission resulted in the introduction of the Mine Health and Safety Act (MHSA) 1996 that governs occupational health and safety the South
Africa mining industry. The MHSA is based on an outcomes approach guided by risk assessment and risk analysis (Hermanus et al., 2015). One of the features of the MHSA was the granting of rights to employees regarding occupational health and safety for the first time in the history of the South African mining industry.

To ensure alignment between government, organised business and organised labour, one of the outcomes of the Leon Commission of Inquiry was the revised MHSA passed in 1996 and the establishment of a formalised tripartite structure called the Mine Health and Safety Council (MHSC) in 1998. The mandate of the MHSC includes providing advice to the DMR minister on occupational health and safety issues, review and develop legislation recommendation to the minister, promote OHS, liaise with other bodies concerned with OHS and oversee research in relation OHS in the mining industry.

In 2003, the tripartite stakeholders agreed on a first set of ten-year milestones with which to accelerate the reduction of occupational injuries, fatalities and illnesses in the South African mining industry. These milestones entailed benchmarking the OHS performance of the South African mining industry with the levels of performance of other mining countries across the globe, including Australia, Canada and the United States. To this end, the industry sought to achieve level of OHS performance comparable with those of international benchmarks by the year 2013. To achieve this milestone, the South African mining industry set a milestone target of reducing fatalities annually by 20 percent.

In 2008, a tripartite Summit was held by industry stakeholders from government business and organised labour to review the progress that was being made towards the achievement of the ten-year milestones. It was recognised at the Summit that the industry was not reducing occupational fatalities, injuries and illnesses at the desired rate of improvement. Consequently, industry stakeholders developed a Tripartite Action Plan to achieve the OHS milestones. Further, Chamber of Mines established the Mining Occupational Safety and Health (MOSH) Learning Hub.

The mining industry introduced the Mining Industry Occupational Safety and Health (MOSH) Leading Practice Adoption System as a common approach and people-centric initiative “for industry by industry” with high-level involvement by organised labour at all levels. The main purpose of MOSH is to identify and facilitate the adoption of leading occupational health and safety practices in four risk areas; namely, dust, noise, transport and machinery, and falls of ground. The key MOSH principles include:

- objective investigation of available leading practices; taking reasonable steps to address the risks related to dust, noise, falls of ground, transport and machinery;
- a clear understanding by leadership at all levels of what they must do to enable and lead sustainable adoption (appropriately included in their performance contracts);
- early and effective involvement of those affected by adoption;
- provision of adequate training, technical support and explicit financial resources for adoption;
- monitoring of progress with the adoption and sustained monitoring of its impact through self-assessment and independent verification.

In 2010, following from the review of the broad-based socio-economic empowerment charter for the mining industry (the Mining Charter), OHS was included as part and parcel of the sustainable development elements of the Mining Charter.

At the Tripartite Mine Health and Safety Summit held on 18 November 2011, industry stakeholders approved the Culture Transformation Framework (CTF) for the South African mining sector. This culture change initiative came against the backdrop of the realisation of the importance of understanding the impact of the underlying social, psychological, behavioural and human factors on the health and safety of employees. The industry stakeholders recognised that the industry had for
many years been focusing more on technical and engineering controls than on addressing behavioural and cultural factors influencing the OHS performance of the industry.

The CTF was established to transform the culture of health and safety in the workplace through effective management of behavioural risks. The research conducted by the MHSC concluded that there is a significant relationship between organisational culture and OHS (MHSC, 2010). The CTF consists of eleven pillars, of which five were prioritised for implementation by tripartite stakeholders; namely, employers, organised labour and government, since 2012. Table I provides an outline of the prioritised pillars, their intended objectives and roles and responsibilities of stakeholders.

<table>
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<tr>
<th>CTF pillar</th>
<th>Intended objective</th>
<th>Responsible stakeholder</th>
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<tbody>
<tr>
<td>Leading practices</td>
<td>Common approach to identifying and facilitating the adoption of leading OHS practices and research outcomes</td>
<td>MHSC, Chamber of Mines and Government</td>
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<tr>
<td>Risk management</td>
<td>Eliminate risks as their source and investigate root causes</td>
<td>Individual mines, holding companies, organised labour, Chamber of Mines and Government</td>
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<tr>
<td>Leadership</td>
<td>Leaders to lead by example and walk zero harm</td>
<td>All stakeholders</td>
</tr>
<tr>
<td>Bonus and performance system</td>
<td>Prioritise Zero Harm ahead of production</td>
<td>Holding companies, organised labour and Chamber of Mines</td>
</tr>
<tr>
<td>Elimination of discrimination</td>
<td>No racism, genderism and any forms of unfair discrimination</td>
<td>Individual mines, holding companies, organised labour, Chamber of Mines and Government</td>
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In 2012, the Chamber of Mines established the Chief Executive Officers (CEO) Elimination of Fatalities Team, which was renamed CEO Zero Harm Forum, as humble acknowledgement of the importance of leading by examples and OHS leadership. The first safety focus area of the Team was Falls of Ground (FOG) because it was historically the biggest contributor to fatalities, with 40 fatalities during the previous period. It was most encouraging that the focus on Falls of Ground contributed to a 50% reduction in FOG fatalities in the first year. The Chamber’s CEO Elimination of Fatalities Team continues to lead health and safety and share experiences from the top to effectively address the key health and safety challenges. The objectives of this CEOs forum are to:

- develop a model for industry leadership at CEO level;
- model leadership behaviours to demonstrate commitment and expectations;
- share experiences and help each other deal with and solve key challenges;
- establish working protocols with industry stakeholders and community; and
- monitor and agree adjustments to industry models to suit needs.

In November 2014, industry stakeholders held the Mine Health and Safety Summit to review the OHS performance of the mining sector and subsequently agreed on another new set of ten-year milestones with clear roles and responsibilities for each stakeholder to ensure that every mineworker returns from work unharmed every day. The 2024 milestones are geared towards accelerating the industry’s journey to zero harm. The following commitments were made at the 2014 Summit:

- elimination of fatalities and injuries;
- rehabilitation of mine workers injured in the line of duty;
- elimination of occupational lung diseases including silicosis, pneumoconiosis and coal workers’ pneumoconiosis;
- elimination of noise-induced hearing loss.
• reduction and prevention of tuberculosis, human immunodeficiency virus (HIV) and Acquired Immune Deficiency Syndrome (AIDS) infections, in line with the National Strategic Plan;
• integration and simplification of compensation systems;
• implementation of the approved CTF, including a programme to deal with concerns on Women in Mining and the Rights of Workers; and
• launching and implementing the Centre of Excellence that will focus on research and capacity building of mineworkers.

The stakeholders agreed at the 2014 Summit that one fatality was too many and that the industry needed not to attach targets to fatalities. This signalled a morally conscious and caring industry. Further, the stakeholders emphasised that occupational injuries remained a challenge. For this reason, the agreement was reached that the industry needed to reduce injuries annually by 20% and this included lost time injuries (LTIs). Moreover, the stakeholders expressed a great concern of the slow progress or lack of progress thereof, on the reduction of occupational diseases emanating from dust and noise hearing loss. Table II provides a summary of the milestones agreed upon by tripartite stakeholder at the 2014 Summit on Mine Health and Safety.

<table>
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<tr>
<th>Objective</th>
<th>Milestone</th>
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| Elimination of fatalities and injuries         | • Every fatality is one too many: we will eliminate fatalities by December 2020.  
• Every mining company must have a target of ZERO FATALITIES.  
• Up to December 2016, 20% reduction in Serious Injuries* per year.  
• From January 2017, 20% reduction in Lost Time Injuries (LTI**) per year.                                                                 |
| Elimination of occupational lung diseases      | **To eliminate Silicosis:**  
• By December 2024, 95% of all exposure measurement results will be below the milestone level for respirable crystalline silica of 0.05 mg/m³  
**To eliminate pneumoconiosis:**  
• By December 2024, 95% of all exposure measurement results will be below the milestone level for platinum dust respirable particulate of 1.5 mg/m³  
**To eliminate Coal Workers Pneumoconiosis:**  
• By December 2024, 95% of all exposure measurement results will be below the milestone level for coal dust respirable particulate of 1.5 mg/m³ (<5% crystalline silica)  
All the results are based on individual readings and not average results                                                                 |
| Elimination of noise-induced hearing loss      | **Through the quietening of equipment:**  
• By December 2024, the total operational or process noise emitted by any equipment must not exceed a milestone sound pressure level of 107 dB.  
**For the individual:**  
• By December 2016, no employee’s Standard Threshold Shift (STS) will exceed 25 dB from the baseline when averaged at 2000, 3000 and 4000 Hz in one or both ears. |

In November 2016, the Mine Health and Safety Council (MHSC) and its tripartite stakeholders held the biennial Mine Health and Safety Summit to review progress on the implementation of the occupational health and safety (OHS) milestones, targets and actions agreed upon by tripartite stakeholders at the 2014 Mine Health and Safety Summit. The MHSC was then mandated to develop actions as part of the pledge that was signed by tripartite stakeholders at the Summit. The Chamber’s CEO Zero Harm Task Team members and the Chamber Council approved the declaration of actions prior to the signing of the pledge at the 2016 Mine Health and Safety Summit. Presented in Table III is the declaration of actions (the pledge) that was signed by the tripartite stakeholders at the Summit.
Table III: 2024 Occupational Health and Safety Pledge.

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<tr>
<th>Pledge</th>
<th>Action</th>
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<tr>
<td>Tripartite Visible Felt Leadership and relationship building</td>
<td>Principals and leaders of all stakeholder groups commit to meeting at least on two facilitated sessions on health and safety per annum. The representation would comprise Union Presidents and General Secretaries (GSs), the DMR Minister, Deputy Minister, Director General (DG), Chief Inspector of Mines, Principal Inspectors and mining CEOs.</td>
</tr>
<tr>
<td>Trust deficit</td>
<td>All stakeholders will address the issue of trust deficit amongst the stakeholders moving from a transactional to transformative approach.</td>
</tr>
<tr>
<td>Communication</td>
<td>All stakeholder organisations - the MHSC, organised labour, Government and employers - will commit to improving communication across all levels to ensure that the message of Zero Harm reaches all mine employees and contractors, and in so doing support and permeate actions intended to improve occupational health and safety (OHS) throughout the industry.</td>
</tr>
<tr>
<td>Empowerment of supervisors and employee empowerment</td>
<td>Stakeholders will collectively and collaboratively empower supervisors, health and safety representatives and employees through extended visible felt leadership and empowering conversations. This will not only be implemented by employers but also other stakeholders from organised labour, Government and MHSC. Tripartite stakeholders will also strive to empower women in mining on safety and security challenges, personal protective equipment and hygiene issues that impact them.</td>
</tr>
<tr>
<td>Annual company health and safety days</td>
<td>Each mining company will commit to hosting an annual health and safety day tailored to their respective needs as part of their overall health and safety campaigns.</td>
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The objective of the above was to reinforce tripartism, raise the bar on tripartite visible felt leadership as per the CTF to harness the achievement of the 2024 milestones and accelerate achievement of the industry goal of Zero Harm.

**PROGRESS AND SUCCESSES**

One of the highlights of the industry’s journey to zero harm since the advent of democracy, following the implementation of the recommendations of the Leon Commission, has been effective collaboration between stakeholders from government, business and organised labour. Through the tripartite institution, the MHSC, industry stakeholders have collectively contributed to the improvement of the industry’s OHS performance over the past two decades. The outcomes of the implementation of various OHS initiatives have significantly reduced the number of fatalities and injuries in the sector as shown in Figure 2.

Over the past 23 years, mine fatalities have been reduced by 88%, testimony to the significant efforts of all parties involved – management, employees, government and trade unions. In 2016, there were 73 fatalities in the South African mining industry, compared with 77 fatalities in 2015. This marked an improvement of 5% year-on-year. 2016 marked the fourth consecutive year in which fatalities were reduced below 100 deaths in the entire history of the South African mining industry. It was also the ninth consecutive year in which the industry reduced fatalities. In addition to the reduction in the number of fatalities, there was a significant reduction in fatality rates per million hours. Gold, platinum and coal reduced their fatality rates by 63%, 79% and 86%, respectively, while other commodities had an overall improvement of 80%. The reduction in fatalities came on the back of an
overall employment growth of 7% between 1993 and 2017 (Statistics South Africa, 2017; Chamber of Mines, 2017). An increasing number of mines are achieving fatality-free performance over 12 months. Figure 3 shows the improvement of OHS performance as expressed in fatality rates per million hours worked. The fatality rate is a reliable measure of OHS performance across the globe and it provides an accurate measure of a company’s or industry safety performance.

Figure 2: Number of fatalities by commodity.
(Other includes diamonds, chrome, copper, iron ore, and all other not specified above.)

Figure 3: Fatality frequency rate by commodity, 2003–2016.

In 2016, there was a decrease in the number of serious injuries, as seen in Figure 4 of 476, from 3138 in 2015 to 2662, a reduction of 15%.
Further, progress in the reduction of major causes of accidents has also been realised in the recent years. Initiatives such as the adoption of the MOSH leading practices and the focus of the Chamber’s CEO ZERO Harm Forum have contributed to the reduction of these fatal risks. This, however, does not mean that fall of ground and transport risks do no longer pose a serious challenge, as seen in Figure 5, to the industry’s OHS performance.

![Figure 4: Number of serious injuries by commodity, 2003-2016.](image)

![Figure 5: Number of fatalities by commodity.](image)

South Africa’s Safety Performance Against International Mining Countries

Hermanus (2007) acknowledged that South African mine safety performance has improved, but not to rates comparable with other mining countries like Australia, Canada and the USA; however, six years later, in 2013, an international comparative analysis showed that the safety performance of the South African mining industry had reached levels that are comparable to international benchmarks. The analysis revealed that the safety performance of South African coal mines was better than the performance of coal mines in the USA. Figure 6 indicates the fatality rates per million hours of South Africa in comparison with other countries. It is worth noting that industry has had a downward trend and surpassed Canada’s safety performance in 2015.
Between 2003 and 2016, South Africa recorded the biggest safety performance improvement against international benchmarks at 70%, followed by the US at 50%, whereas Australia and Canada regressed by 16% and 60%, respectively. South African coal mines performed better than US coal mines up to the end August 2017, with an overall fatality rate per million hours of 0.04 against 0.06, as seen in Figure 7 (Chamber of Mines, 2017).

CHALLENGES

The South African mining industry has made considerable progress to improve its OHS performance since 1994; however, the industry’s OHS performance still remain a great cause for concern. Against the backdrop of a consistent downward trend in the reduction of the number of fatalities since 2007, the last three years up to 2016 showed a plateauing trend in the reduction of mining fatalities. This
indicates a challenge that the industry stakeholders need to deal with if the acceleration of the industry’s journey to zero harm is to be realised. 2017 was a year in which this challenge of the plateauing trend in the reduction of mining fatalities manifested itself with a regression in the number of fatalities. The industry recorded 88 fatalities in 2017 and this marked the first regression in ten years. Fall of ground and transport-related incidents remain a challenge in the South African mining industry. These are major risks and causes of mining accidents in the mining workplace. Hard-rock mines, including gold and platinum, continue to experience a high number of fall-of-ground accidents, resulting in fatalities and injuries. 2017 was particularly challenging for the industry following a spate of seismicity-related accidents resulting in multiple fatalities. Deep-level gold mining has been plagued by seismic events associated with their depth and most of the deep-level mines are still labour-intensive, use conventional mining methods, and their underground working stations are located far from the shaft resulting in long travelling times for mine employees.

Following good progress in the containment of seismicity related fatalities over the years, in 2016 and 2017, it was observed that there was an increase in rock bursts accidents while rock falls decreased. Falls of ground contributed to 37% of the industry’s fatalities. A total of 32 fatalities were reported in 2017, 14 of which were due to rock bursts. The number of rock-burst incidents has doubled since the 2016 statistics. Some of the deep-level operations are locked into existing mine designs that are not optimal for OHS and production output (Neingo & Tholana, 2016). Most gold and platinum mines are mining at challenging depths that are prone to seismic activity. To address this challenge, task teams have been established at the Chamber of Mines and MHSC to collate information and conduct research to identify gaps and rock-burst leading practices in deep-level mining.

Transport-related accidents are one of the major challenges affecting OHS performance in the South African mining industry. The industry continues to incur high number of transport-related accidents resulting in fatalities and injuries. This is another area in which the industry has been experiencing a stagnant performance in the recent years. For instance, in 2016 and 2017, the industry recorded 23 transport-related fatalities. To this end, in 2017 at Chamber of Mines, through the leadership forum of Chamber-member CEOs, collision management systems were initiated to address transportation-related accidents by adopting people-centric collision-management systems. This entailed collaborating with original equipment manufacturers and suppliers. The objective of the project is to co-ordinate the industry, and to provide the necessary guidance and support to effectively address the regulatory requirements to:

- facilitate adoption of collision management systems by the set dates with minimal disruption to production;
- discover a South African people-centric collision management system solution with global application although manufactured locally in the interests of job creation;
- develop and incorporate change management tools (behaviour change principles) for inclusion in the outcome documents of the collision management systems sub-committee; and
- develop and pilot a user-friendly behaviour measurement tools to measure the change in employee and leader behaviour at operational level.

Similarly, in the light of the magnitude of the challenge of transport-related incidents, the MHSC commissioned a research project on collision management systems through its Centre of Excellence. Collision-management systems is not only a challenge facing South African mines: it is also a global challenge facing mining companies in Australia, Canada, United States and the rest of the world. It is for this reason that in November 2017, the International Council on Mining and Metals (ICMM) convened an innovation summit involving mining companies, original equipment manufacturers and suppliers to develop technology that will effectively address transport-related incidents in mining operations. This is also where critical control management of key OHS risks becomes important. Critical control management is a globally recognised risk management process of managing the risk of materially unwanted events (MUEs) or “catastrophic” events that involves a systematic approach to ensure critical controls are in place and effective. The identification of critical controls on OHS risks is
part of the 2024 OHS milestones actions for the South African mining sector. To this end, the Chamber of Mines has been facilitating the adoption and implementation of critical control management of OHS risks amongst its member-companies since 2015. Useful lessons have been identified from this process for ease of adoption, collaboration and implementation by other mining companies seeking to apply the critical control management process to their OHS risks.

Another area that remains a challenge in the sector is the effective institutionalisation of a desired OHS culture. Behavioural safety is still a challenge, despite the approval of Culture Transformation Framework (CTF) for the South African mining sector in 2011. Employees at the rock-face still engage in numerous unsafe acts that threaten their health and safety at work. Frontline supervision is another area that needs to be addressed as the industry accelerates its journey to zero harm. The latest report from the Mine Health and Safety Inspectorate (MHSI) revealed that poor supervision constituted a high percentage towards Sections 54s (production stoppage) issued to the mines by the regulator. The MHSC needs to identify research projects that will address and enable mining companies to address frontline employees’ and supervisors’ behavioural safety at the point of production.

The well-being of employees is one of the areas of concern and challenge within the mining industry. A study conducted by Masia and Pienaar (2011) focusing on the relationships between work stress, insecurity and safety compliance in the South African mining industry found a direct relationship between stress and insecurity. Job insecurity is considered as a work stressor, mainly related to doubts about continued employment (Masia & Pienaar, 2011). According to the findings, stress and insecurity have inverse relationships with safety compliance. With current commodity challenges, some mining employees are often challenged by issues of job security and financial stability.

CONCLUSION

The aim of this paper was to discuss and examine progress, successes and challenges of South African mining industry’s goal of ensuring that every mineworker returns from work unharmed every day. The paper presents the journey that the South African mining industry has travelled to improve occupational safety since the advent of democracy in 1994 and provides an analysis of the progress that the industry has made in the reduction of fatalities and injuries, as well as the performance trends of the major causes of fatalities and injuries. Key successes that the mining industry has had towards achieving the goal of zero harm are identified. The final section of the paper examined and discussed challenges constraining the industry from achieving the desired levels of occupational safety performance. All in all, the paper locates the discussion and argument presented on the state of occupational safety on South African mines within the context of the various initiatives taken by organised business, government, organise labour and mining companies over the past two decades to address the OHS challenges.

REFERENCES


