

SHEQ

ON THE TRAIL OF ZERO HARM

Safety in the mining environment starts with project safety files and continues until the end of the mine's life. Digital technologies are significantly improving this arena

By Rodney Weidemann

Contrary to popular perception, the mining industry has not been slow in its adoption of digital transformation. In fact, it is an industry that for some time has been shifting its business models in a digital direction, but for a far better reason than most businesses.

Whereas most organisations leverage digital technology to assist in optimising processes, or in maximising the value of existing applications, the mining industry in South Africa – which operates on the principle of zero harm – has been using digital transformation to help safeguard employees in a number of ways.

According to Ingrid Osborne, co-founder and CEO at Saryx Engineering, digital technologies offer a safety aspect right from the start of a project. She notes that contractor management, and the management and control of safety files, remains time-consuming if it is still a manual process, while also being resource-intensive and unreliable.

"Often, when an incident occurs, relevant contractor information is not immediately at hand or easily accessible, creating uncertainty that could possibly lead to fines or penalties. For this reason,

Saryx created HSEC Online®, a solution that digitises the cumbersome manual safety file system and streamlines the contractor management process.

"Through this digital platform, mines – like other organisations – can action requests, submit documents for approval, and track compliance levels. The latter from an individual and company level, through to a site level and finally to a group level," she says.

"Zero harm can always be tracked through to percentage compliance. A compliant company is a safe company, especially when it comes to the compliance of people and equipment. HSEC Online® allows mines to digitise checklists and define priority documents for certain occupations and job descriptions, thereby ensuring that when tasks are executed, the necessary processes are followed and tracked to completion by a qualified person."

She says collecting data in the form of actual plant information, pictures or documents, for all these actions, adds certainty and transparency. And doing this on a regular basis, with reminders, creates a consistent history of events which shows credibility.

"When an accident occurs on a mine, it generally involves a critical injury and/or death. During these stressful times, the burden of proof lies with the mine to ensure that they have done everything practically and legally required of them to prevent such an event from occurring.

"It is essential therefore to be able to confidently access the information relating to the company, person(s) or equipment involved. Fast search-and-find algorithms ensure that these documents are immediately accessible and printable as evidence. Recommendations are easy to implement and come into effect immediately."

In fact, she adds, with HSEC Online®, there is never a valid reason to have expired or invalid documents within a system. The solution has the necessary system checks to ensure this does not happen built into it.

"This is a system that reduces workloads by up to 90% and reminds you of things to come, actions to take, is proactive rather than reactive, and is super easy to manage. It boils down to the simple fact that it is incredibly powerful for an organisation to have real-time line-of-sight of compliance for every company they oversee," says Osborne.



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GOING VIRTUAL

The Dekra Institute of Learning, in collaboration with Virtutech, has recently launched a virtual reality (VR) and 3D PC based e-learning platform, designed to train people working in dangerous industries like mining.

Denis Vaden, COO of Virtutech, points out that VR is a highly effective technology for teaching safety training, because the trainers don't have to put the person being trained through dangerous procedures or processes. This is especially desirable and helpful for individuals who have not had any experience regarding the specific processes or physical environment. The VR experience simulates the real-world situation as closely as possible without having to experience potential danger.

“By making use of a VR headset, the trainer is able to simulate the relevant environment, ensuring it mirrors the real-life

situation as closely as possible. Thereafter, when the trainee is placed in a real-world situation, there is a familiarity with systems and processes, as well as the environment,” he says.

“In addition, VR technology promotes efficient and effective knowledge retention. A survey from global professional services company PwC has found that an individual's knowledge retention via VR learning can be almost 300% improved, compared with many other forms of training. This is because learners are in a situation in which they are immersed in the environment with no distractions, which facilitates a deeper learning process.”

Vaden notes that VR training can be very cost-effective, especially when compared to the much higher costs of simulation systems, which provide training for only one person at a time. VR training, on the other hand, allows for multiple headsets to be

ADDITIONAL SAFETY MEASURES

While the latest digital technologies are playing key roles in keeping mine workers safe, there are other solutions that are also being implemented that – although not digital in nature – keep both employees safe and employers legally covered.

Since its decriminalisation, the use of cannabis has become more socially acceptable, but it causes functional impairment, which can compromise the quality of work.

“Mining is an area of employment where there is a significant possibility of higher-than-normal rates of cannabis use. Add to this the fact that it is a very dangerous environment, and there are clearly a number of rules an employer has to follow, to ensure that workers under any kind of influence do not enter or remain on a mine,” notes Rhys Evans, MD at ALCO-Safe

“While it is legal for personal use, this is only in a private space, so it doesn't overrule the Mining Safety, Occupational Health and Safety or the Road Traffic acts. The challenge lies in how to test for it. An alcohol test, for example, tests for current intoxication, but the nature of the original urine- or blood-based based tests for cannabis is such that this tests for the metabolite of the drug, rather than the chemical itself – something that with this drug can remain in your sample for a number of weeks.”

There are, however, now saliva-based testing methods that test specifically for the primary compound, THC, he says, and the window of detection in such a test is, on average, only between two and eight hours.

“This is a much more practical, efficient and speedy test than the other types, and more crucially, if a worker does smoke in their private time on a weekend, and gets tested in the week, they will not display a positive result, making it much fairer as well.”

“On the other hand, we still recommend to clients that in high-risk environments like mining, they introduce regular, but random, testing to act as an even greater deterrent.”

“I suspect that due to the leniency in law and the attendant reduction in stigma, use of cannabis is increasing in SA. At the same time, we remain a very industrialised economy, so many workplaces are dangerous. Therefore, simple, easy-to-apply tests like this will only become more necessary as we move forward,” he says.



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Safety at mines should be paramount.

acquired and used to train multiple trainees simultaneously. In this way, VR training can be highly leveraged for teaching mine safety, as it scales significantly better than some other forms of training.

"VR training can be custom-developed with specific training modules in mind for specific companies, who guide us through their standard operating procedures and requirements," he says. "We are able to scale some of our existing products and training programmes, for example the working at heights programme. This means that the existing programme can be leased, whereby the software can be rented to the mine as a monthly package, which further assists with cost savings."

Christopher Mörsner, head of the training division at Dekra IOL, says: "Dekra IOL is currently engaging with various mines, and the VR training is used here to simulate the operation of heavy equipment, where it is costly to buy the equipment that learners need to be trained to use."

"Without VR technology, mining processes on the ground must actually be stopped in order for training to take place. It is much easier and more cost-effective in this regard to use the VR headsets. In addition, the VR training supports safety training – simulating real-life situations and demonstrating potential consequences. VR technology is an extremely effective medium in which to train people for situations where safety is paramount – such as on a mine."

DIGITAL TECHNOLOGY ONSITE

Recent global safety reports suggest that there has been a gradual but steady improvement in mine safety over the past decade. According to Ramesh Dhoorgapersadh, general manager for safety, health, environment, risk and quality at BME, safety is something that needs to be ingrained into every activity, in line with

recognised standards and procedures.

"The blasting philosophy of BME is expressed through innovation in our product development and our leading initiation technologies. This also means aligning our policies with customers' own safety protocols and broader regulatory requirements," he says.

Tinus Brits, BME's global product manager – AXIIS™, adds that electronic detonation systems play an important role in achieving safe blasting. They allow detonators to be accurately initiated within milliseconds of each other, staggering the energy release rather than having five or six holes detonating at the same time. Reducing the charge mass per delay ultimately reduces the resulting vibration.

"We design our electronic detonators in such a way that key blast impacts are both measurable and predictable. With our integrated blast planning software, mines can simulate each blast before it is implemented – so that they can predict aspects like ground vibration, thereby ensuring it will be within the required parameters."

He emphasises that mines apply world-class standards in this regard, such as the US Bureau of Mines blast-induced ground vibration criteria. These include the requirement that any blasting in the vicinity of communities, structures, houses, roads or other receptors requires a minimum safety radius.

Where BME conducts blasts on behalf of customers, therefore, it applies a blasting radius of 1km from any people or communities, and 500m from any material that might be negatively affected.

"For every blast, seismographs are then used to measure the resulting ground vibration and air blast. This confirms that the blast did indeed achieve the simulated design parameters, to fall within the regulated limits," says Brits. ■

THE THREAT OF FIRE

Mining vehicles such as excavators, haul trucks and even drag lines are high-value assets that operate in arduous conditions where there is a high fire risk. This means that pre-shift and weekly inspections on mining vehicles are essential to ensure that the fire prevention system is in good working order.

According to Michael van Niekerk, CEO of ASP Fire, the design and installation of a vehicle fire-protection system requires that mining vehicles are subjected to a hazard identification and risk assessment of potential fires. Each vehicle needs to be assessed carefully within its specific operating environment to understand what hazards and fire risks that vehicle is exposed to.

"Inherent fire risks include the turbochargers and brake system overheating, as well as high-pressure hydraulic systems and electrical equipment that may ignite a combustible or flammable component of the vehicle," he says.

Although dry chemical powder (DCP) extinguishers are highly effective in fire-fighting, they offer minimal cooling properties. This can result in reignition of flames, especially in liquid fuel and rubber fires. The powder inside DCP extinguishers can also compact due to vibration when placed on a moving vehicle.

"A much more effective and 'greener' solution," he continues, "is water-mist hand-held extinguishers. Utilising water as the main agent and nitrogen as a propellant, these can extinguish most types of fires, including rubber and plastic, diesel and petrol fires, and electrical fires rated up to 245kV."

He notes that the atomised mist generated by the extinguisher increases the surface area of the water by more than a hundredfold. The micro-droplets rapidly turn into cold steam when meeting burning or very hot materials, further increasing the surface area by 1 600 times. The endothermic reaction effectively cools down any hot surfaces in the immediate environment.

"Not only is the fire extinguished, but any hot spots also cool down without any thermal shock. The thermal heat radiation barrier created allows the operator to approach the fire without sustaining burns to deploy the extinguisher. A protection mechanism eliminates any false alarms. This consists of a heat-sensitive pressurised activation tube that requires heat to rupture and open a differential valve on the main cylinder to activate the system."

A further solution offered by ASP Fire is an aqueous film forming foam (AFFF) for fire-extinguishing and vapour suppression of hydrocarbon fuel fires, he says. "The AFFF blanket blocks oxygen supply to the fuel and cools any hot flammable liquid by effectively sealing the surface," he says.