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Safety first

Paul Moore looks at new options across a range of safety equipment applicable in mining, from fire safety options to gas monitoring through to worker harnesses

Fire safety is one of the key areas in keeping operators out of harms way, especially when dealing with mining machinery. However, it can be argued that the competitive nature of the free market places great pressure on the fire industry to deliver systems which minimally comply with, rather than exceed, the regulations. Too often fire protection is seen as a cost - not a vital investment for business continuity.

Coltraco Ltd, the global supplier of monitoring solutions for fire suppression systems – both portable products and fixed monitoring, told ***IM***: "In the event of downtime or shutdown to fire, there could be catastrophic effects to high value assets, such as critical mining infrastructure. The risk far exceeds the risk of choosing minimal compliance, instead of advanced real-time monitoring systems. The cost or damage to reputational integrity as a result of this downtime far exceeds the cost of integrating a real-time monitoring system."

In terms of fire extinguishing systems there exist two broad categories: sprinkler systems and liquefied gaseous systems such a clean agents, FM-200®, Novec™1230 and CO_2. The former can suffer leakage but the latter can cause greater damage given its physical pressures. "Regulations require that the extinguishing agent stored in cylinders must be checked annually. The traditional method requires turning off the system, dismantling, and weighing each cylinder. Thorough testing can take hours and several qualified, trained personnel."

Problems include low labour rate servicing crews being unskilled, unreliable and untrained; disreputable companies randomly checking a few cylinders and placing "tested stickers" on the rest of the untested ones; or many CO_2 cylinders installed left empty or partially-filled

Coltraco argues: "These issues risk the integrity of mining operations, because in the event of fire, there may be insufficient agent to extinguish it. For such safety critical operations, these systems should be permanently monitored. Yet they remain unsupervised and unmonitored 364 days a year until their annual certification check. Safety is becoming recognised as an area which must no longer be overlooked. The industry is beginning to opt for more regular inspections and even continuous 365 day monitoring. The ability to monitor autonomously, with remote diagnostics and remote relay which can provide an alarm to the Fire Safety Officer or Facilities Manager, provides confidence in the integrity of the system. Minimising the risk of fire in the long run can improve business continuity, save downtime and also the potential costly pay-out which fire damage entails.

Kirkland Lake Gold was the overall IMRC Mine Rescue competition winner this year

A copper mining project in Zambia opted for Coltraco's Portalevel® ultrasonic technology, which makes servicing quicker and requires just one person to identify the liquid level of agent inside the cylinders. There is no need to turn off

The Coltraco Portalevel® MAX is a leading handheld ultrasonic liquid level indicator for testing most common extinguishing agents

or dismantle the system. By testing in situ, the integrity of the system is maintained and there is no increased risk to people or facility by shutting down the system for the duration of maintenance checks.

The Coltraco Safesite™ technology suite includes Portalevel® MAX; a "world leading handheld ultrasonic liquid level indicator for testing most common extinguishing agents"; the Portasteele™ Calculator tablet based app converting the liquid level into agent weight/mass with ease, simplicity and ability to record and download the results; and the Permalevel® Multiplex for 24/7, 365 autonomous, continuous monitoring of fire suppression systems, with remote relay, remote diagnostics and alarm capability to alert in case of agent leak/discharge

The company concludes: "We are committed to Safety First: going above and beyond regulatory compliance, whilst minimising time and cost. Science and R&D are at our core. As the world changes, so must our industry integrate technology, to provide a bulwark against minimal, even flagrant, disregard of standards, by creating standards which all can understand and apply."

Tyco Fire Protection Products and one of its leading global brands, ANSUL®, showcased the ANSUL Experience at MINExpo 2016. The ANSUL Experience aims to immerse attendees in the simulation of real-life scenarios, showcasing how a fire protection system works in mining from detection to actuation to suppression, and featured the new ANSUL CHECKFIRE AXP Vehicle Detection and Actuation System with Quad IR Optical Sensors.

Booth visitors were able to step inside specific hazard areas, such as an engine room and electrical cabinet, typically found in a mobile mining equipment unit. Tyco Fire Protection Products representatives took attendees through a tour of the hazard areas and a fire event showing how ANSUL fire detection, actuation and suppression systems work together to help protect mobile equipment. Attendees also gained hands-on knowledge of what happens during a fault condition by interacting with the new ANSUL AXP Detection and Actuation system's control module, similar to what mobile equipment operators experience in a cab.

Raj Arora, Vice President and General Manager, Fire Detection and Special Hazard Products, Tyco Fire Protection Products, stated: "We know the mining industry works in extreme environments and some of the toughest terrains, which is why we constantly strive to enhance our products and engineer new technologies, such as the new ANSUL CHECKFIRE AXP and Quad IR Optical Sensors, to help keep people and equipment safe and protected."

The new ANSUL CHECKFIRE AXP is expandable, addressable and fully programmable for mega-class mobile equipment, including electric shovels, haul trucks, draglines and other specialty equipment. "Together with fast detecting Quad IR Optical Sensors, which provie unmatched ability to differentiate between open flames and hydrocarbon signaures, CHECKFIRE AXP provides pinpoint suppression to knock down flames at the source. Multiple protection zones are controlled by a single, operator friendly control module."

Other products featured at MINExpo included the ANSUL Checkfire 210 Detection and Actuation System is designed to provide detection, alarm and fire suppression system actuation for mobile applications like hydraulic excavators, haul trucks, wheeled loaders, dozers and graders. One of the top features of the CHECKFIRE 210 system is its flexibility in the protection of various hazard areas. With colour-coded, plug-and-play connectors, the system is equipped with two independent detection circuits configurable for multiple options, including single-zone detection, two-zone detection, cross-zoned detection, discharge pressure feedback monitoring, or alarm only.

When utilised in a stand-alone system, the ANSUL LVS Liquid Agent Fire Suppression System protects off-road equipment, including above-ground and sub-surface mining equipment (haul trucks, wheeled loaders, dozers, scoop trams, shutter cars, etc). The system features LVS agent, a wet chemical agent that is a unique blend of organic and inorganic salts and coupled with surface-active ingredients. This blend provides a strong measure of freeze protection along with the foaming properties associated with conventional Class B liquid agents. When activated, the agent flows readily into areas where flammable liquids may settle, providing both fire suppression and superior cooling of superheated surfaces while blanketing the fuel and cutting of oxygen to prevent reflash.

The combined performance of the ANSUL A-101/Twin-Agent Fire Suppression System "provides superior protection in applications where superheated equipment works around the clock, often in rugged, hazardous environments. The FM-approved twin-agent

ANSUL CHECKFIRE AXP provides pinpoint suppression to knock down flames at the source. Multiple protection zones are controlled by a single, operator friendly control module

combination is designed to protect large, non-road construction and mining equipment as well as specialty vehicles. The LVS liquid agent in the system cools surrounding areas and flows readily into spaces where flammable liquids may settle, providing both fire suppression and superior cooling of superheated surfaces while blanketing the fuel and cutting of oxygen to prevent reflash." The A-101 dry chemical agent knocks down flames, designed to flood entire spaces with agent or aim nozzles to protect specific high-hazard areas. Both systems are designed to discharge simultaneously when actuated manually or automatically with the option of extending the dry chemical discharge.

ANSUL RED LINE cartridge-operated hand portable and wheeled fire extinguishers "are the premium firefighting units chosen by safety directors worldwide in high fire-risk situations, such as mining, chemical, petro-chemical, oil and gas, aviation and power generation. Cartridge-operated means increased reliability, on-the-spot recharge, ease of service and superior firefighting performance."

As a reliable and field-proven solution, ANSUL INERGEN Systems help safeguard lives and property in mining, says the company. "Upon discharge, INERGEN clean agent floods the room and remains suspended, suppressing fire quickly and effectively. The state-of-the-art detection and control system combines exclusive AUTOPULSE microprocessor control panels with highly sensitive smoke, heat and flame detectors as well as specialized agent distribution components. INERGEN is a clean, non-conductive and natural fire suppressant that helps reduce damage to valuable assets and sensitive equipment. The clean agent is also nontoxic and doesn't produce corrosive decomposition products, making it safe for people."

ANSUL SAPPHIRE Systems are custom engineered to quickly suppress fires without causing harm to equipment, people or the environment. The SAPPHIRE System is a clean-agent system, utilising 3M™ Novec™ 1230 fire protection fluid. The fluid is a clear, colourless and low odour clean agent that instantly vaporises upon discharge, absorbing heat and providing total flooding of protected spaces. The system is especially suited for occupied spaces (in accordance with NFPA 2001), areas in which an electronically non-conductive medium is required (where electronic systems cannot be shut down in an emergency), and when cleanup of other agents poses a problem.

The ANSUL FM-200 Clean Agent Fire Suppression System uses the FM-200 (HFC-227ea) agent, which vaporises upon discharge and absorbs heat to rapidly suppress fire while leaving no residue to clean up. It is electrically nonconductive, will not short-out electronic equipment or thermally shock delicate circuitry, resulting in less damage to critical equipment, facilitating a much shorter recovery time and reducing downtime.

Finally, the AUTOPULSE Z-20 "offers big panel advantages at a lower cost for both single and multiple hazard applications. The Z-20 also provides 100-250 addressable point capability and up to 32 points of conventional zones. The Z-20 panel features templates designed to simplify fire suppression application programming, a USB port to upload programs or download critical information such as historical logs, and a 4.3-inch color touch-screen display with intuitive menu-driven interface."

Philippi-Hagenbuch offers a line of patented water tanks with remote controls to promote safety and enhanced fire protection for water truck drivers

Philippi-Hagenbuch, a global leader in off-highway truck customisation, offers a line of patented water tanks with remote controls to promote safety and enhanced fire protection for water truck drivers. With this, the operator easily controls the unit's water cannon from as far as half a mile away.

"Operator safety is our first priority," said Josh Swank, Philippi-Hagenbuch's Vice President of Sales and Marketing. "If a piece of equipment on the jobsite catches fire, it can be dangerous for operators to stay with their truck to combat the fire. The wireless feature gives operators the ability to position the truck near the equipment fire, exit the truck and control the cannon from a safe distance."

PHIL's water cannon delivers a powerful stream of 300 gallons of water per minute. For example, a 48,500-gallon tank gives an operator about 160 minutes of use before a refill.

Unlike traditional water tanks, which generally use only 80% of the rated capacity, PHIL engineered its HiVol Water Tanks to use 100%. Philippi-Hagenbuch calculated the dynamic centre of gravity of the fluid within the tank to make their water tank series with the lowest weight and greatest carrying capacity of all off-highway truck-mounted water tanks — as much as 60,000 gallons. With a yield of 180,000 psi and a corresponding Brinell hardness of 450, the corrosion-resistant, superior-grade steel used by Philippi-Hagenbuch is more than three times harder than the steel used in most competitive water tanks, which translates to longer life and up-time.

PHIL Water Tanks are fully customisable to any off-highway articulated or rigid frame truck. An insulated version of its tanks is also offered for cold weather climates, predominantly used in building ice roads in the far north to remote areas.

Cables and hoses

The Falcon Series Connectors from **Trolex** have been engineered for the purpose of bringing miners "the world's most robust and easy to use Ex d connection system for heavy-duty power and data cables." Incorporating live disconnect possibility in the hazardous area, a virtually instantaneous connect/disconnect system, and a making-off procedure that reduces assembly times from hours to minutes, the new series connectors "will save you both time and money, and deliver connections that you can really trust" says the company.

The Falcon Series rear-loading assembly system allows complete cable termination in just a few minutes and requires no specialist tools or equipment. The incoming cable is independently terminated on the removable end-cap in the

normal way and prepared ready for connecting the cores to the contact insert.

A cutting gauge is incorporated to ensure that the cable conductors are trimmed to the optimum length. Connections can be crimped or soldered and easily hand assembled into the double-insulated contact cartridge. The cartridge is then simply loaded into the rear of the connector and fixed in place with two cap-head screws to complete the operation.

This two-point radial fixing has the added benefit that cable rotation is completely eliminated. The user can terminate; load and fix with complete assembly in a matter of minutes.

The Falcon Series revolutionary two-stage bayonet coupling system "provides exceptionally fast mating and de-mating with maximum safety and a high tolerance of debris and contamination in tough site conditions with just a twist, push and fix

"Flame paths are shrouded at all times and are never exposed to potential damage. In combination with the live disconnect option of the products, this rapid connection protocol will save time and money in the harshest industrial environments where safety and productivity need to be maximised. The result is increased uptime for key machinery and temporary equipment. Falcon may be parted in the hazardous area for short periods to allow maintenance or change out of equipment, following normal risk assesment proceedures. The electrical power source must originate from the socket side of the connector so the socket can be user installed in either the plug or receptacle to suit the application. Alternatively, as all contact operations are contained within full Ex d protection, pilot circuit interlocking can be employed where regulation demands, to automatically isolate the system before disconnection is completed."

Fixed versions of the Falcon receptacles are equipped with mounting bushes for direct fitting with Ex d or Ex e gland entries. A flange mounting version is also available for surface mounting onto Ex e enclosures. Electrical connections are fully encapsulated for explosion protection with a choice of wire length to suit the application.

Manuli Hydraulics' Mining Division has announce the release for sale of the new Sliderlock hose connection system. An innovative new concept designed to ensure the integrity of staple lock hose connections, Sliderlock it says is a unique product in the mining industry.

Featuring a spring loaded cover to ensure that the staple is fully retained in even the harshest conditions, Sliderlock further enhances the traditional staple lock connection design which has been in use in underground mining applications for over 50 years.

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Aside from improving safety and performance, the Sliderlock cover also minimises dust ingress and, combined with Manuli Flushfit™ staple lock fittings, "provides a compact, snag-free design which allows for a more space-efficient arrangement of connections without the risk of excessive hose abrasion. To support our OEM customers, the Sliderlock system is interchangeable with existing male end designs which use Flushfit, and is also complimented by a dedicated range of adaptors."

Gas monitoring

Tyco Gas & Flame Detection has announced that the PS200 portable gas detector is now available with a new catalytic bead sensor option that provides an increased battery life of up to 80 hours in diffusion mode and 20 hours in pump mode. "Both lightweight and durable, the instrument is ideal for protection in hotworks and confined space applications. The PS200 monitors and displays up to four hazardous gas conditions simultaneously, detecting all possible combinations of methane, oxygen, carbon monoxide, hydrogen sulphide, and a wide range of flammable gases. Operator interface and calibration are intuitive and easy by toggling between simple one-button functions."

During normal operation the large LCD screen displays battery life and real-time gas concentrations, but when a hazardous condition occurs users are alerted by three alarm functions: vibration, red flashing LEDs, and audible buzzer. To ensure the highest level of personal safety, the PS200 is also fitted with an optional man down/motion sensor that activates alarms if the instrument is not moved within a pre-set time. Other features include an optional built in remote sampling pump for confined space entry, manual backlight screen for poor lighting conditions, a customised user identification code setup, calibration due date display and standard datalogging that can be downloaded with a USB connection to a computer. Accessory components available separately include an Auto Bump and Calibration Station, a 5-instrument multi-charger and an assortment of coloured boots/instrument covers.

The new GasHawk from Trolex delivers up to a full week's battery life even with infra-red sensors installed. The unit employs superior engineering for operational efficiency, with its inductive wireless charging system and a hot-swap battery that can be changed out even in the hazardous area. GasHawk delivers long lasting protection so that your people can produce more and charge less.

GasHawk provides reliable accurate monitoring in the harshest conditions. IP67 rated and IECEx/ATEX M1/Ma approved, GasHawk is tough, rugged and built to last. Described as "the world's foremost personal gas detector for mining" it has an inductive charging system with no exposed contacts, which eliminates charge failure due to corrosion, build-up of dirt and dust, and failure to engage contacts.

The new GasHawk from Trolex delivers up to a full week's battery life even with infra-red sensors installed

Charging intervals are massively reduced - with up to seven days continuous use even with infra-red sensors operating. The intrinsically safe battery pack can be changed-out even in the hazardous area. Up to six gases can be monitored simultaneously; and it has an optional integrated pump for remote sampling and confined space entry applications as well as a bright, clear illuminated display for easy viewing in varying light conditions; and a full data-logging and easy-download feature allows users to demonstrate compliance.

"All consumables for GasHawk are passed on to our customers at cost price – which means on average you pay a massive 80% less than from our competitors. All replacement cells are included in which will typically reduce your cost of ownership by over 50%. A wide range of toxic and flammable gases can be monitored simultaneously, and selected gases have STEL and TWA alerts. Any exceeded gas set point triggers an audible warning, multi-colour LED visual and vibrating alerts to the user. Alarm set point levels can be configured to suit local working conditions."

Honeywell recently announced the MicroRAE gas monitor, which is says is the industry's first wireless four-gas monitor that operates with all major wireless communications protocols — including Bluetooth™, Mesh, GPS, and Wi-Fi. The MicroRAE also can be paired with an intrinsically safe smart phone (available from Honeywell) to transmit gas readings over a cellular network.

"Extending wireless gas monitoring capabilities to include the broadest range of communications platforms in a single device will enable companies with wireless and non-wireless infrastructures to reap the benefits of real-time monitoring and remote safety management," said Thomas Negre, Global Marketing Director, Honeywell Analytics.

For those that already have a Wi-Fi or mesh network, MicroRAE will extend their capabilities by ensuring continuous wireless coverage; for example, when a worker goes beyond the network range or otherwise can't connect to the network, the worker's smart phone will continue sending gas monitoring data, location and Man Down status to the real-time monitoring software. And for customers that don't have a wireless network, MicroRAE gives them a way to start experiencing the benefits of real-time, wireless gas monitoring without the cost and perceived complexity of setting up a network.

Real-time, wireless gas monitoring allows remote stakeholders to view critical information within seconds, from anywhere, so they can respond quickly and assuredly to mitigate or prevent safety incidents and process malfunctions.

"Practical applications extend to carrying out a man-down rescue or plant egress with greater confidence and better outcome or identifying an equipment malfunction in its early stages so costly downtime can potentially be averted. Both the wireless and non-wireless versions of the detector are the first of many Honeywell Analytics products to feature Bluetooth™ Low Energy (BLE). BLE capabilities are enabled by apps on the intrinsically safe smartphone, the first of which is Honeywell's Safety Communicator™, which pushes gas readings, location and other data from the detector to Honeywell's ProRAE Guardian™ software. Through ProRAE Guardian, remotely located safety managers can view information from plant locations in real-time and respond proactively to safety incidents in their earliest stages of development."

Honeywell has announced the MicroRAE gas monitor, the industry's first wireless four-gas monitor that operates with all major wireless communications protocols

The MicroRAE monitors H_2S, CO, O_2 and combustible gases (LEL) in its standard four-gas configuration. There is also a sensor configuration of LEL, O_2, CO and HCN available, making the unit suitable for a wide range of applications including waste water treatment, manufacturing, utilities and telecommunications, firefighting, construction, petrochemical/ chemical, confined spaces and various industries with toxic and flammable gas hazards.

The unit includes other features of note, including asset and location tracking via an integrated GPS capability ensures that companies can determine the precise location of the worker carrying the detector. It also has an agnostic communications platform – the unit can switch back and forth from Bluetooth to WiFi or mesh wireless communications as needed, and is compatible with Honeywell's ConneXt Plus, Pro or Loneworker systems.

Over-the-air software upgrades are possible, with data or software update packages for firmware managed quickly and easily through wireless transmission.

Finally, the unit is as lightweight and as small as previous non-wireless, Honeywell four-gas portable detectors.

Strata and ground monitoring

The RMT Trolex Remote-Reading Telltale System (RRTX), the company says "can deliver outstanding safety improvements alongside huge, quantifiable efficiency savings to virtually any underground mining operation."

"Typical savings and productivity improvements of around $1.75 million per annum can be achieved, from an investment of less than 10% of that figure, with injury and health-related reports reduced by up to 65%. Savings and reduced incidents occur not only through a safer and more stable environment, but also through the more intelligent distribution of costly support collateral and the subsequent reduction in handling and usage of heavy machinery and inventory. Whichever way you look at it the RRTX System is good for your people and good for your business – and comes with the Trolex two year warranty and a lifetime of support from a company that has been protecting lives and improving efficiency in the mining industry for over 50 years."

The RRTX system employs a series of multi-height instruments to monitor strata movements in key areas of the mine. The units are simply strung together along a series of up to 4 'daisy chains' using a standard twin-core connection cable. Once installed the multi-height instruments require no on-going maintenance and a simple annual system check is all that's required to maintain a fully functioning solution. The instruments used in the system are highly accurate monitoring devices (+/-0.5mm) which have no moving parts and are unaffected by water - providing exceptional longevity and reliability. Each 'daisy-chain' can have up to 100 units linking into a local controller or a surface PC as required.

The surface PC software has been written to provide a simple user-friendly interface, displaying the current status of the strata movements in real-time as well as an historical trend analysis of all installed telltales. Individual warning and action levels can be set for each unit – both as absolute levels, or as rates of change. Appropriate personnel can be automatically informed by e-mail and SMS when these pre-set levels have been reached. The software is designed to automatically detect when telltales are removed or added to the system and will determine their location and function through a simple question and answer session with the surface operator.

The system auto-performs diagnostic checks, informing the operator appropriately when actions need to be taken. Substantial safety improvements and cost reductions are achieved by producing real-time information which facilitates the intelligent distribution of support collateral, and through providing early warning of movement trends and potential critical incidents of ground fall and collapse.

"Installation, set-up and maintenance is incredibly easy and cleary demonstrable financial and personnel benefits often result in a return on investment within two months of the installation of the system. A series of independent user studies in operational mines have demonstrated the value of installing Remote Reading Tellltale Solutions into the critical areas of the mine such as face installations and belt transfer chambers."

Cost-savings on standing supports through increased spacing was an average of 25%. Up-time improvements on longwall operations have led to an increase of 40% and more on production rates. And Trolex says an up to 65% reduction in injury/incident related reports can be achieved through better hazard warning and reduced usage of heavy equipment. The minewide remote system information is relayed direct to the mine SCADA.

A new compact and convenient ground penetrating radar system developed locally by Reutech Mining has just been introduced to the market and is set to help increase mine safety as well as making a contribution to increased productivity. What is more, although the system is more user-friendly than comparable products currently available, it will be available at a competitive price. It was exhibited at Electra Mining 2016 from 12 to 16 September at the Nasrec Expo Centre in Johannesburg.

"We believe in designing innovative radar products that solve complex problems in simple ways. This passion drives our desire to think outside of the box; to rethink old problems and reimagine new solutions. It has led us to a product that improves underground mining productivity and safety in a revolutionary way" says Jan de Beer, Reutech Mining Executive.

He explains that the Sub Surface Profiler (SSP) is a low-cost, light-weight ground penetrating radar (GPR) designed specifically for the challenges of the underground mining environment: "It weighs less than 4.5 kg and its patented, compact ergonomic design allows for one-handed operation by one person in much the same way as a paint roller. The SSP is extremely power efficient, and makes use of small, rechargeable batteries which can be replaced during underground operations, allowing operation of the SSP to continue indefinitely."

The data collected is wirelessly transmitted to a tablet computer, where it is processed in real time, thus giving instant feedback about fault structures, up to 6m inside the rock mass, present within the rock while scanning. "This improves dynamic decision making, and allows for the precise management of ground-fall risks, as well as the optimal utilisation of support mechanisms in an environment where every second counts" adds De Beer.

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The development of the system was prompted by the safety and productivity challenges faced by underground mines internationally. Reutech worked with a leading South African mining group which needed a better solution to address ground-fall risks. A ground-fall event can have a devastating impact on the bottom line of any underground mine: "It could lead to a loss of life, damaged equipment and even mine closure" says De Beer. "If one can accurately identify fault structures hidden inside the rock – structures that cannot be seen by the naked eye - and also if you can improve the flow of information once a fault structure has been identified, it facilitates quicker decision making. This is key to successfully managing the risk associated with a ground-fall event."

GPR has been used to help identify fault structures since the mid-1980s. However, adoption in the mining industry has been slow, because traditional GPR systems are heavy (weighing more than 20 kg) and difficult to use in the small confined spaces, since they often require more than one person to drag a heavy box along an underground tunnel. Battery life of the older systems is extremely limited and in addition, the data gathered is typically post processed, which means that information on rock structures and potential instabilities only becomes available hours after the initial scan.

De Beer points out that the "biggest drawback has probably been in the cost involved in implementing the technology. A typical mine requires several GPR units, making this a big capital expenditure." Reutech Mining sat down with the client and started thinking of how we can make this better: "How can we rethink an old problem and reimagine a new solution? How can we design an affordable product that improves on the standard set by the costly, impractical and power-hungry systems which do not make use of up-to-date, readily-available communication technologies?"

They started mapping the production process, which typically comprises of the five phases of planning, drilling, blasting, support and loading. "If you can improve the turnaround time on any one of those phases without compromising on safety, the entire operation becomes more productive. But it was in optimising the support phase that they experienced their biggest challenge" says De Beer. "The support phase is a critical step in the entire process where the ground-fall risks are identified and managed through implementing roof support mechanisms. This is how the convenient, cost-effective and efficient Sub Surface Profiler came about."

De Beer concludes: "Reutech Mining has been and continues to be a successful provider of the world-leading movement and surveying radar systems for the surface mining industry in 24 countries on six continents. Reutech systems have provided information that saved numerous lives and enhanced safety in the surface mining workspace. We now bring the same quality and ingenuity to the underground environment, and look forward to contribute even more to this new mining segment."

Harnesses and fall protection

Falls are still a cause of death in mining, especially during mine infrastructure construction, and yet compliance with current safety standards is still an issue. One reason workers don't utilise proper fall protection equipment is comfort. The **3M** Personal Safety Division and 3M's Fall Protection Business (former Capital Safety) business are two leaders

The ExoFit STRATA features a number of solutions-based elements, including a first-of-its-kind LIFTech™ Load Distribution System

in personal protective equipment and fall protection products – and have introduced a solution for this problem, the DBI-SALA ExoFit STRATA harness. It is the first full-body safety harness designed and tested with data-driven, third-party research, resulting in a harness that is more comfortable, cooler and lighter to wear.

"The safest harness is the one workers actually wear. Since launching the harness in the fall of 2015, hundreds of workers have made the switch to ExoFit STRATA," said Tim Thompson, Soft Goods Manager at Capital Safety. "Workers and managers alike have caught on to the overall benefit of utilising equipment that compliments workers while on the job, and leaves them feeling comfortable even after they end a shift."

The ExoFit STRATA features a number of solutions-based elements, including a first-of-its-kind LIFTech™ Load Distribution System. LIFTech takes the weight off a worker's shoulders and redistributes it down to the hips, reducing forces on the shoulders up to 85% when compared to leading harnesses. PolarMesh™ padding keeps users' backs cooler with greater air flow. A Revolver™ Vertical Torso Adjuster and Tri-Lock Revolver™ Connectors, which offer added security around the legs, allow wearers to adjust their harness to the perfect fit. An EZ-Link™ Quick SRL Adapter helps workers efficiently attach their personal SRL—such as the DBI-SALA Nano-Lok™ SRL—reducing the time it takes to connect and disconnect by up to 80%. Tech-Lite™ Aluminum D-Rings allow for optimal reliability without adding significant weight to the harness.

In July 2015, Capital Safety partnered with ergonomics specialists from the Sweere Center for Clinical Biomechanics and Applied Ergonomics at Northwestern Health Sciences University to create data-driven research to further validate the need for greater innovation in harness development. The research looked at key worker complaints, such as the load on the back and shoulders, limited range of motion, and body temperature while wearing the harness. The results confirmed that each of the first-of-a-kind innovations incorporated into the ExoFit STRATA directly addressed these issues in a measureable way.

A safe and effective rescue plan always starts with self-rescue. With this in mind, the 3M Fall Protection Business launched the DBI-SALA® Self-Rescue, a detachable self-rescue device. The device easily connects to a worker's current safety harness, providing a fast, effective method of escape from suspension, while minimizing risk for the wearer, coworkers and rescue personnel.

"Self-rescue is the safest approach in a rescue situation as it can be activated by the wearer immediately, and it keeps coworkers in the surrounding area out of danger," said Chris Coyle, Hard Goods Product Manager at 3M Fall Protection. "With the DBI-SALA Self-Rescue device, we wanted to create a solution that was among the quickest and easiest to deploy in the field. It's a smarter way to rescue."

Self-Rescue features a patent-pending EZ-Link™ D-ring to simplify connection, a secondary rescue ring for assisted rescue, and a sealed, padded package to protect the descent device from damage during use. In an effort to ensure reliable performance in the field, Self-Rescue has gone through rigorous testing. The sealed design allows the product to perform as expected after it has been soaked in water for two hours and frozen in temperatures of -40°C. "With 50- or 100 ft versions available, the self-rescue device is among the most flexible and adaptable ever created."

Hearing and sight protection

3M Hearing Protection Solutions has announced its latest hearing protector fit test system to help combat hearing loss – the most commonly recorded occupational illness in manufacturing. The new E-A-Rfit Dual-Ear Validation System from 3M measures the effectiveness of earplugs and earmuffs, providing accurate, quantitative results for both ears simultaneously. In less than five seconds, seven standard frequencies are measured for both ears, generating a Personal Attenuation Rating (PAR) to validate hearing protection and assist with hearing protector selection.

"The E-A-Rfit Dual-Ear Validation System from 3M provides employers with the resources and confidence needed to better protect their workforce," said Pegeen Smith, Technical Service Specialist. "The dual-ear system enables companies to quickly identify employees at risk for noise-induced hearing loss, assist in training employees, and help with hearing protector selection."

While other systems typically rely on the employee's subjective response to test signals, the 3M fit-testing system measures sound pressure levels objectively, both outside and inside the hearing protection. The test can be performed in relatively high levels of background noise. Results are not affected by the hearing level of the employee.

Once the measurement is complete, the software displays the PAR along with a pass/fail indication for the worker's noise exposure level. The system helps ensure proper use of the hearing protection and identifies earplug or earmuff models offering the best protection, such as the popular E-A-R Classic Earplugs from 3M or the PELTOR Earmuffs X Series from 3M.

The E-A-Rfit Validation System includes all the hardware and accessories needed, including a speaker, software, stand, dual-element microphones, cables and a trial quantity of probed test plugs.

In eyewear, 3M has added its innovative Scotchgard Anti-Fog Coating Technology to two new safety eyewear models. The Solus 1000 Series safety eyewear and Goggle Gear 500 Series splash goggle from 3M now feature an anti-fog coating to help keep

Duraflow is a lightweight and ergonomically designed Powered Air Respirator (PAR) with sophisticated real-time air flow control technology

workers seeing more clearly on the job.

For workers in mining jobs that require physically demanding tasks, the safety eyewear is designed to keep lenses clear of fog and steam – even when workers are in hot and humid conditions or climate controlled areas. The coating is bonded directly to the lens and retains its effectiveness for at least 25 washings, enabling workers to wear their safety eyewear longer.

"Seeing clearly is crucial," said Javi Troncoso, Marketing Manager, 3M. "When workers have to remove their eyewear to clean and de-fog them, they expose their eyes to potentially dangerous workplace hazards and debris."

Breathing and dust monitoring

The new TX8001 Dust Monitor from Trolex allows users to instantly detect the precise content of respirable dust in the atmosphere so that you can take appropriate action to stay safe and to ensure mine workers are fully protected from dust related health hazards.

The units are highly accurate (up to five times more accurate than the old technologies currently in use), and extremely rugged, and due to the unique low-flow design that requires no pumps or filters, they function well even in extreme environments with high humidity and dirty atmospheres.

"The patent-protected technology is the first of a new generation of dust monitors that make compliance with dust-related legislation quicker, easier and lower cost. The TX8001 Dust Monitor has been developed with nothing but safety in mind. Every feature is designed to ensure that fast, accurate respirable dust information is conveyed to those who need it most - at the time and atthe point of need. Attributes include:

- Instantaneous respirable dust level display
- 15 minute and 8 hour TWA displays
- Accurate to within ±5% compared to ±25% of current industry standard models
- Open flow device - no pumps or filters required
- Expensive and time-consuming filter analysis not required
- In-built visual alarm, data-logging and RS485 communications
- Optional Wi-Fi communications
- Patented technology is a world-first

The instrument can form part of an advanced dust control strategy providing information on the correct timing for the deployment of safety equipment or dust suppression systems, enabling users to maximise efficient working, maintain safe working conditions and to ensure that permitted exposure levels (PELs) are never exceeded.

"In tests the TX8001 performed as well as highly accurate laboratory analysis equipment in detecting respirable dust in the atmosphere. However the new technology doesn't just perform in the lab – it has also demonstrated its accuracy and durability in the field, in challenging applications in tunnel construction and mining."

Respiratory expert **Scott Safety** has introduced Duraflow, a lightweight and ergonomically designed Powered Air Respirator (PAR) with sophisticated real-time air flow control technology. "The new solution gives complete wearer assurance of respiratory protection to focus on the job rather than the protective equipment itself, in a multitude of hazardous situations and industries.

Mark Andrews, Global Product Line Manager Powered Air, Halfmask & Airline at Scott Safety said: "Our design intent for Duraflow was to bring to the market a reliable, durable powered air product at an affordable price for those currently using respirators with filters fitted directly to the mask (negative pressure mode)."

Duraflow's automatic monitoring features ensure the airflow rate is maintained at precisely the correct level to afford protection for the user. Visual and audible diagnostics alert the user of any drop in airflow below the required level or when the battery needs re-charging. Two high energy density battery options are available – standard and extended duration, which can be selected depending on shift coverage required - less downtime, more working time.

Duraflow will help employers meet the needs of workers across all demographics with its low respiratory burden. Changes in lung function in older employees working in manual positions can reduce their ability to undertake certain active tasks. By providing workers with a cooling stream of purified air, Duraflow can for some workers make the difference between whether a job can be completed or not. "Highly versatile, Duraflow is compatible with a plethora of Scott Safety headtops, filters and accessories, protecting workers from a variety of environmental hazards."

The new 3M Versaflo™ Powered Air Purifying Respirator TR-600 "represents an evolution of technology" says the group. Designed to endure heavy use and long wear, the respirator can help enhance comfort, endurance and ease of use.

The lightweight respirator is engineered to increase comfort – even for long shifts. The ergonomic design fits close to the body, allowing for greater movement in tight work spaces. It offers multiple airflow rate options for user comfort, and belts designed to be wide and contoured with flexible air channels to minimise heat buildup.

The TR-600 has two powerful lithium-ion battery options, reducing downtime by performing up to eight hours. Audible, visual and vibratory alarms reflect filter and battery status to keep workers informed and to help avoid low-airflow situations and automatic low-power shutdowns.

"The user-friendly design features intuitive, interactive touch points, and provides tool-free maintenance," said Chris Sneden, Marketing Manager, 3M Personal Safety Division. "It also meets IP67 standards with cleaning and storage plugs to enable full submersion, for easy cleanup and decontamination."

3M's TR-600 respirator can be used in a wide variety of applications such as in mining – leveraging an extensive range of NIOSH-approved filters and cartridges. It also is compatible with a variety of headgear, offering integrated protection for eye, head, face, skin and respiratory protection.

Mine rescue

Focus FS, a leading provider of industrial worksite systems, announced the release of their latest software product, Shift Rescue. The announcement happened during the 10th International Mine Rescue Competition (IMRC), hosted by Workplace Safety North and Ontario Mine Rescue, which recently took place in Sudbury, Ontario in August 2016. Shift Rescue is an all-in-one under oxygen mine rescue incident application used to digitally capture incident data including team captain information, briefing officer reports, map viewing and mark-ups, photo sharing, activity alerting, and post-incident reporting. "Shift Rescue will significantly enhance and improve how information is collected and shared during an under oxygen Mine Rescue event," says Nicole Darbaz, Director of Products and Marketing at Focus FS. "The system collects and distributes critical rescue information during both team training and live rescue events. Shift Rescue applies to mine rescue competitions such as IMRC, but most importantly, it's been developed for annual mine rescue team training and real-life incidents."

The application is deployed on rugged tablets and is used underground where network connectivity may or may not be available. The information collected underground is shared with the briefing officer and control group above ground who assess the information and make time critical decisions.

From August 19 to 26, 2016, 27 teams representing 13 nations competed in different events at the IMRC including an underground scenario, firefighting, first aid, and more. Focus FS with the help of Ontario Mine Rescue developed the Shift Rescue product to be deployed and used during the competition. "We could not have chosen a more suitable venue to launch our Shift Rescue product," says Jeff Brown, President of Focus FS. "This is a globally

recognised competition with mine rescue personnel from around the world. Early feedback we have received from mine executives, mine rescue teams, and the industry in general has been very positive. The exposure has been tremendous."

The overall IMRC winner was the team from Kirkland Lake Gold. "The 10th International Mines Rescue Competition was a real milestone in the competition's history. The event's organisers, Workplace Safety North and Ontario Mine Rescue, focused on a realistic setting with educational benefits", says Dräger's Business Manager Mining for North America, Kathryn Kasper.

Both the mines rescue and firefighting events were set in real underground mining operations. A network of cameras was used to send a live transmission to a public viewing area. This created an unique opportunity for all to share with and learn from each other.

"Dräger was proud to once again be a platinum sponsor of this event and to continue our support of the original Drägerman", says Dräger CEO Stefan Dräger. The next event will be the IMRB conference in 2017 in Russia. Results of the IMRC 2016 were as follows:

Emergency Underground Scenario

- First – Canada, Kirkland Lake Gold
- Second – Canada, Compass Minerals, Goderich Mine
- Third – Ireland, Boliden Tara Mines

Firefighting

- First – Poland, Bytom
- Second – USA, MSHA Mine Emergency Unit No. 1
- Third – Canada, Cameco McArthur River

First Aid

- First overall – Australia, Peabody Energy Wambo Coal
- Second overall – Ireland, Bolden Tara Mines
- Third overall – Canada, Cameco McArthur River

High Angle Rope Rescue

- First overall – Poland, KGHM White Eagles
- Second – Canada, Cameco McArthur River
- Third – Canada, Vale Sudbury West Mines

Theory

- First – Canada, Compass Minerals, Goderich Mine
- Second – Goldcorp Americas
- Third – Canada, Vale Sudbury West Mines

Technician

- First – Russia, EMERCOM
- Second – China, Shaanxi Coal and Chemical Group
- Third – USA, MSHA Mine Emergency Unit No. 1

The Holmes Mine Rescue Association (HMRA), a division of the Joseph A. Holmes Safety Association, also recently named longtime Dräger employee, Kent Armstrong, as its "Man of the Year." He received the distinction for his contributions to mine rescue in the US during an HRMA luncheon in Branson, Missouri.

The HMRA Man of the Year award is given to individuals or institutions that have made outstanding contributions to mine rescue. Dräger has been manufacturing mining safety technology since the start of the 20th century. In particular, its respiratory protective devices for rescue teams have been so successful that they are known as "Drägermen" within the North American mining industry to this day.

"This year's recipient of the HMRA award is among the most qualified individuals of all time," said Jim Vicini, Presient, HMRA. "Kent has been instrumental in the formation of the HMRA and promoting mine rescue in the US. Any time the mine-rescue community needed help, Kent was the first to offer assistance. He's not only a leader, but his advice is taken as one of the foremost experts in the world. His service to mine rescue is greatly appreciated as evidenced by this prestigous award."

"While I am grateful to receive this award, it's not so much a personal distinction for me. Rather, it represents the high degree of recognition that Dräger receives throughout the entire mining industry," said Armstrong, who has worked in mining for more than 35 years, 23 of which with Dräger.

"For more than 100 years, Dräger has been an active proponent of mining safety, which is why this award means so much," said Stefan Dräger, CEO, Dräger. "We promise to continue to do everything in our power to increase mining safety through intelligent technology and practical solutions." ***IM***