No-go zones are identified in IDS GeoRadar's IBIS Guardian software, which creates geofenced zones and hazard maps, and is correlated with radar alarms

Site safety in the front seat

Donna Schmidt talks with US vehicle safety technology company PRECO Electronics, part of Sensata Technologies, and Swedish sensor and monitoring specialist Hexagon AB about their work to improve vehicle and personnel safety on the job site

I f there were a central topic to safety at a mine site, it would be vehicle and personnel safety. As long as these are ensured, the mine can be a success, and its staff can work with confidence and will trust the operator.

Powered haulage-related injuries and fatalities still consistently rank as one of the most common mining incidents worldwide. US mines alone have seen powered haulage deaths in a single year meet and exceed the 50% mark of reported incidents numerous times.

The hazards of personnel safety do not much differ between operations; workers at gold or silver mines face the same inherent work dangers as those working at copper or coal mines. Likewise, preventing and eliminating hazards and keeping workers safe can be achieved by best practices and technologies that apply no matter what the mined commodity.

Mining Magazine reached out to two well-established companies in the mine safety sphere to discuss best practices and get an update on new technology.

PRECO'S TAKE
According to business development vice president Tom Loutzenheiser, there are many mine sites across the ▶

▶ world's mining regions that are seeking to improve safety. However, as the number of mines increase, so do personnel numbers and, in turn, the number of potential liability issues.

"In some of the most inhospitable parts of the globe, mine owners and operators face many significant and multifaceted risks throughout the mining cycle, from environmental responsibility and liability to health and safety," he says. "The US Mine Safety and Health Administration has identified countless fatalities between personnel and mobile mining equipment that were avoidable if the best practice of 'installing and maintaining collision avoidance/warning technologies on mobile equipment' had been implemented."

In response to the need, PRECO introduced PreView Sentry X, the newest version of its PreView Sentry platform. The system is focused on blind spot concerns, which remains a consistent issue for many mining equipment units because of their rigid frames and for articulating trucks.

It has a narrower field of view, which the company says offers support to all of the same installation points as its predecessor system, the original PreView Xtreme. At the same time, it extends the range capability up to 30 metres.

The new release also improves on the Xtreme version with an upgraded frequency from 5.8 GHz to a globally approved 200 MHz section of the 24 GHz RF band, which can support North America, Europe, India and Japan along with other global markets.

"PreView Xtreme has played a critical role in the success of countless applications," Loutzenheiser said. "Sentry X is the latest step in supporting our customers with purpose-built blind spot solutions for the heavy-duty industries."

He also notes that, as the adoption of proximity detection grows globally, warning systems have developed further, and many mines are progressing towards more intelligent technologies.

"Until [the release of this new system], installations which required sensors with narrow fields of view could not take advantage of the leading sensor's flexibility and range capabilities. Now, with Sentry X, they can."

PRECO also points out that, in the exchange between supplier and mine, it is essential to acknowledge the operator's role. That includes their respective level of attention to tasks and level of distractions – the number of which are growing both outside and inside of the cab, according to Loutzenheiser.

In short, operators must focus on keeping up with production, but at the same time tailor their actions to environmental changes occurring around their equipment.

"Traffic and personnel moving around the equipment are at risk ▶

MineEnterprise CAS Analytics, a module for data visualisation and analytics, offers mine management a visual view of areas it wants to monitor
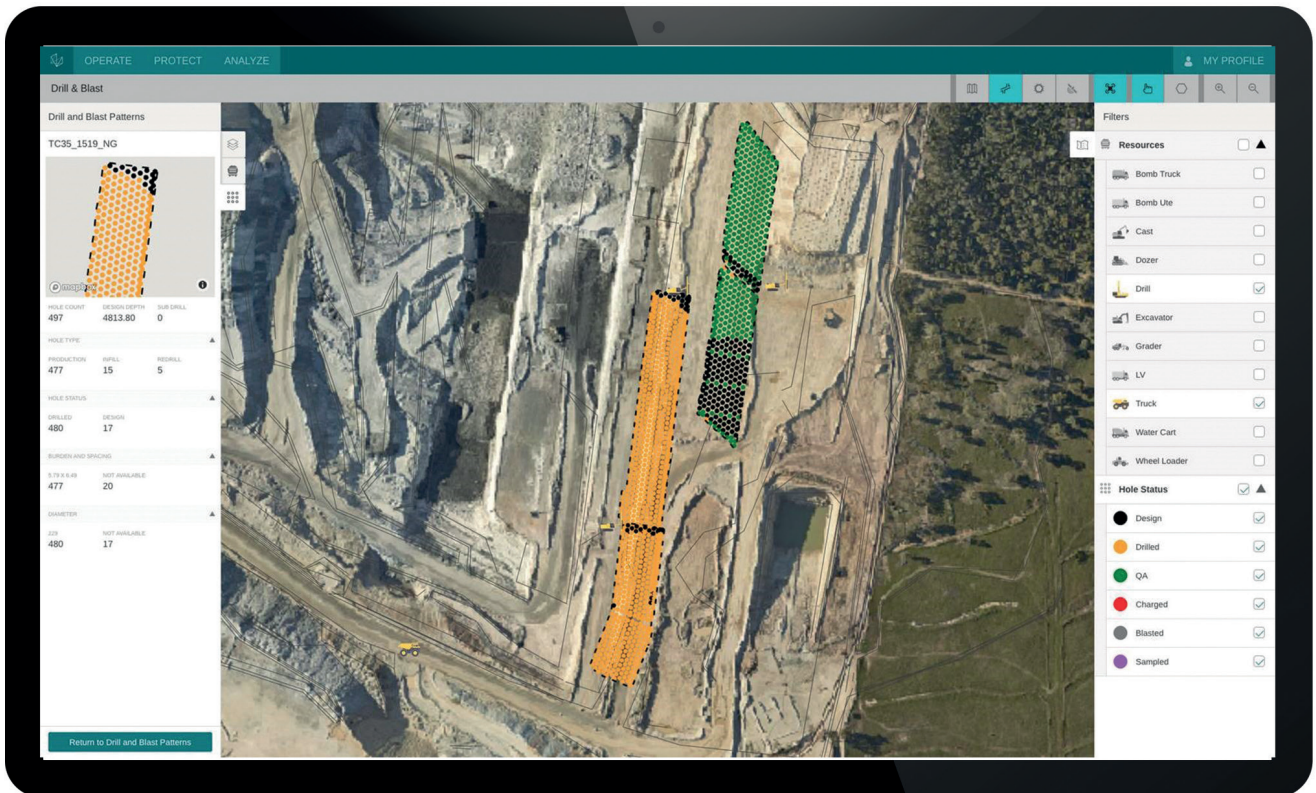
▶ when operators are distracted by in-cab HMIs and the task at hand, which is why PRECO advocates for safety solutions that offer operators the *right* information at the *right* time to minimise distractions. This way, operators are made aware of possible collisions and are given the tools so they may take action to avoid an incident."

Loutzenheiser says that, over the company's involvement in the industry, it has become apparent that adding intelligent collision mitigation technologies to existing infrastructure is more vital than ever before. Implementation allows customising systems for a site's specific operating environment, thereby minimising its downtime and increasing productivity while also reducing risk to workers and other assets.

Part of that future, he adds, is already being pursued at numerous sites: a transition to a fully automated operation.

"Given the highly competitive nature of mining, experts say that most mines will have to adopt autonomous-vehicle technology to remain competitive.

As the technology cost goes down and evidence of its effectiveness becomes increasingly apparent, the use of safety technology and semi-autonomous mining equipment will become the rule, not the exception," he says.

"At the moment, collision mitigation technology brings operators the machine awareness and level of autonomy needed to increase productivity and improve safety within the worksites."

HEXAGON'S TAKE

Hexagon MineProtect portfolio manager Marcus Bayuelo says that the varied and numerous dangers miners face every day cannot be effectively addressed by point solutions.

"Poor visibility, blind spots, fatigue, distraction and slope instability – to name a few of the risks – can only be mitigated by a comprehensive safety response," he notes.

The company developed its MineProtect portfolio to address that comprehensive need. It integrates a mine's systems for collision avoidance, operator alertness, personal protection, vehicle interven-

tion and slope monitoring. More recently, Hexagon added what it has called the industry's first straightforward integration of systems for safety and radar-based slope stability hazards.

The single platform was created through teaming its mining division with sister company IDS GeoRadar; what resulted was an upgraded version of its flagship safety product, MineProtect Collision Avoidance (CAS), which now has over 40,000 placements globally.

The new CAS features real-time equipment visualisation and alerts for hazardous areas to both people and machinery, with workers and equipment being covered by the protection of potential events in 'no-go zones' at a mine.

"No-go zones are identified in IDS GeoRadar's IBIS Guardian software, which creates geofenced zones and hazard maps, and is correlated with radar alarms," Bayuelo explains. "Guardian's integration with CAS and complementary MineProtect solutions, Personal Alert and Tracking Radar, ensures that alarms are automatically triggered when a no-go zone is approached."

Having an extra layer of information, the miners and operators have access to better risk evaluations, and of course the benefit of greater safety. The system also includes Hexagon's autonomous connected ecosystems strategy, which has brought together into a single platform what was previously a group of siloed processes.

The 3-D radar displacement map shows vehicles and machinery in real time. Traffic management, based on slope hazards, can be further optimised using the same system through real-time monitoring data from IDS GeoRadar's complementary solutions Hydra-X, IBIS-FM and IBIS-ArcSAR.

Hexagon has also seen success with its MineEnterprise analytics portfolio, which it combined with CAS Analytics for a Mexican gold mine client. MineEnterprise, Bayuelo notes, has become highly effective for mines because it offers the needed data at the right time so action can be taken or improvements can be made.

"Safety technology is only as sound as the people operating it;

The PRECO PreView Sentry X blindspot monitor

[and] change management and a culture of safety are integral to technology's effectiveness in managing, monitoring and reinforcing a zero-harm approach," he says.

MineEnterprise CAS Analytics, a module for data visualisation and analytics, offers mine management a visual view of areas it wants to monitor, with targets defined as expected business outcomes.

It offers a way for operations to control critical risk events via replies, heatmaps and live dashboards, and is a window to the mine's traffic management safety and solutions for fleet management, fatigue detection, vehicle intervention and personal protection.

All of this is in one place, on a single platform that can be accessed by multiple users for tasks such as creating maintenance repair schedules, a mine manager's need to observe productivity and safety trends, and current status reports and locations of staff for supervisors.

Bayuelo notes that the project involved changing behaviours, which is often mining's toughest obstacle.

"Before implementing CAS Analytics on-site, Hexagon and the mine management team undertook a thorough assessment of safety culture in the mine," he says. "After a series of discussions, the team created key performance indicators and objective key results as the foundation of a positive shift in the mine's workplace."

From there, the mine, which Hexagon has not identified, created a matrix of roles and responsibilities to ensure consistent communication of all actions among the workforce for every shift, week by week and month by month.

As a starting point, the operator and Hexagon developed a baseline to ensure there was a full understanding of what the "status quo" was for the mine site. Using those details they could identify current risk exposition and compare those with weekly and monthly reduction targets.

"For example, a target of near-miss or critical event reduction of 15% month over month would drive to a reduction of 50% of mine incidents," Bayuelo notes.

As a result, the mine saw a 31% reduction in critical events within the first two months of CAS and CAS Analytics being fully operational and, in the months following go-live, a 15% reduction in critical risk interactions per month.

"This is not only driven by the on-board tools, but the monitoring and enforcement of the controls via data analysis, and a strong change management policy to ensure information is communicated to all relevant stakeholders in a timely manner," Bayuelo says.

No matter the system in use, the technology employed or the size of the mine's payroll, Hexagon's position is solid: the most important assets coming out of a mine are the people who make mining possible.

"To take zero harm seriously," Bayuelo says, "mines need a comprehensive, integrated safety portfolio to mitigate numerous risks, underpinned by an enterprise solution to transform safety data into actionable intelligence, backed by a proven change management methodology to ensure a meaningful safety culture prevails." ▾