



A NEW GUARDIAN FOR MINER SAFETY

By Jeanne Grunert

Mines pose unique safety challenges. Dark and damp conditions, low ceilings, poor visibility, and a noisy environment make it imperative that mine owners do everything they can to prevent accidents and fatalities.

In the demanding conditions of an underground mine, even the most cautious and vigilant miner can meet with an accident. According to the Mine Safety and Health Administration, six miners have died, and 61 suffered lost time injuries from being struck by mobile equipment in underground areas since 2020.

Innovative Wireless Technologies (IWT) hopes to reduce that number to zero with its Guardian Proximity System.

The Lynchburg, Va.-based wireless technology company has developed a new proximity detection system that automatically reduces speed when it senses people within a specific distance to the vehicle. The distance is dynamic based on speed and will completely stop the vehicle before a collision. It also provides audible and visual warnings using an easily recognizable “traffic light” color system, notifying miners to move out of the way of nearby shuttle cars.

For operators of shuttle cars, continuous miners, and other underground vehicles, the Guardian Proximity System provides a critical measure of protection that can save lives.

Intelligent collision avoidance

The Guardian Proximity System is a tamper-proof, vehicular-mounted system that acts as another set of “eyes” to provide

drivers with an added means of detecting people in the challenging visibility conditions of mines. The cost-effective system offers a reliable means to detect people within the vicinity of moving vehicles. It offers safe, smooth automatic stops and requires no driver intervention.

IWT's dedication to mining safety made the development of Guardian a natural outgrowth of its wireless technology innovations. Jeremiah Colling, IWT's director of Marketing, said that part of the impetus behind its development came from one of its core customers. The company had a serious vehicle-person accident and desired to improve safety within its underground mines. Knowing IWT's capabilities to innovate safety solutions for the mining industry, they were confident that IWT could help them improve safety.

“They said, ‘We are committed to employee safety and need to ensure they are protected,’” said Colling. Although the company uses camera-based systems on some vehicles, they found these lack many necessary features. “A driver still needs to watch the camera at all times, which is impossible to do while also focusing on his job.”

The solution IWT created is the Guardian Proximity System. Its innovative design addresses the challenges of poor visibility in underground environments through accurately identifying miners within nearby proximity of vehicles. Best of all, no driver intervention is required. The system automatically engages the throttle and brakes, adjusting the braking distance based on speed. Drivers can pay attention to operating the



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machinery while Guardian ceaselessly scans the environment for personnel.

How the system works

Guardian operates with a vehicular-mounted Command Unit and lightweight tags worn by miners. The Command Unit is the system's "brains" and interfaces directly with the vehicle's throttle and braking system. The tram-adaptive feature increases the safety thresholds as the speed increases to ensure adequate time for sensing and braking.

Sensors are strategically placed around the vehicle to provide comprehensive protection. The scanners work near high-voltage lines, through curtains, and around obstacles to detect personnel. The Display unit mounted within the car enables the driver to access real-time data, control the display lighting, and ensure awareness of potential collision scenarios.

As the distance closes between a vehicle and a person wearing a tag, the system flashes yellow warning lights as it is braking the vehicle. The vehicle will eventually stop, and sensors will illuminate red before a miner can reach the vehicle, ensuring no collision. As the miner moves away from the vehicle and the sensors indicate a safe distance between the vehicle and the miner, the tag light turns green, and the vehicle is able to resume travel. This easy-to-understand "traffic light" system means little learning curve for workers to recognize safe or unsafe distances and faster adoption of the system within the mine.

Improve safety without high costs

Unlike legacy systems, Guardian's operation is unaffected by nearby electromagnetic fields generated by mining equipment. It operates through curtains, near high-voltage wires, around blind spots, and in changing and challenging environments. Best of all, the solution improves miner safety without impeding production, allowing mines to operate more efficiently and safely.

Paul May, product manager of IWT, pointed out that the RF frequency of the system offers numerous benefits to mine owners. "Not all RF frequencies propagate well throughout a mine," May said.

"With Guardian, we offer a cost-effective safety solution that uses frequencies in the gigahertz range and allows us to sense tags well in advance of a potential collision."

Another cost-effective aspect of the system is built right into how it operates: "The car brakes gently so as not to lock up the brakes." This attention to detail ensures a smooth stop, potentially saving a great deal of wear and tear on the engine, yet another cost-saving feature.

Less susceptible to interference

Other proximity detection systems are available to mines, but they do have limitations. For example, many systems



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are susceptible to interference. Older technologies based on electromagnetic fields are susceptible to interference from high-voltage wires, which reduces the degree of safety they can offer.

The technology employed by the Guardian Proximity Detection System works reliably in all areas of the mine, including near high voltage wires. And it is incredibly accurate. Guardian's technology determines the distance from its sensors based on the time it takes radio waves to travel between the tag and sensors. This is called Time of Flight, and the accuracy of ranging calculations are down to inches.

Easy to operate and use

Guardian is easy to operate and use. Once the Central Command Unit and sensors are installed on the vehicle, the next step is for workers to carry the tags. The tags are rechargeable, allowing workers to plug in their tags during their off time, so the tags can recharge. They are carried in a small, unobtrusive ballistic nylon pouch affixed to the worker's belt and clipped on quickly at the start of the shift. The small size, combined with the lighter weight, makes them much easier to carry, and the protective pouches keep tags free from dust, moisture, and scratches.

IWT seems to have thought of everything with this system, including different tag privileges according to job function. Operators can pair their tags to vehicles at the start of the shift to ensure their equipment functions efficiently despite proximity of the driver.

"The vehicle operator's tags are paired to the vehicle," said Colling. "Otherwise, vehicles would be unable to move

because they would sense tags very closely and prevent driving."

This simple step makes it easy for mines to maintain their inventory of tags and easy for workers to use them. The easier it is to use the system, the higher the potential for worker compliance, user adoption, and ultimately improved safety.

IWT: Complete mine safety solutions

It is no surprise that IWT is the innovator behind the Guardian Proximity System. Founded in 1997, the company has focused on safety products for the mining industry for nearly two decades. IWT offers intelligent, scalable mining solutions that improve mine safety, efficiency, and productivity. Their product line for the mining industry includes communications, data and analytics, gas monitoring, tailings, and now – proximity detection. Every mining product created by IWT is rigorously tested for effectiveness and safety.

Guardian was built to solve an important problem: improving mine safety. Whether used on its own or as part of IWT's numerous mine safety solutions, it provides a great leap forward in worker safety and accident avoidance.

Although the Guardian Proximity System is still undergoing regulatory review, interested parties should contact IWT for further information as it is available for pre-sale. Interested parties should visit www.guardianprox.com for more information or to get in touch with the company for further details on the system.

About the author: Jeanne Grunert is a freelance writer, founder of Seven Oaks Consulting, and author of eight books.