Microseconds from Disaster

Collision Prevention Technologies for the Modern Mine Site

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Introduction: The Risks of Mine-Site Collisions

It goes without saying: the mine site is dangerous work space.

Despite the best efforts of operators, the unavoidable interaction between heavy machinery and people presents an ongoing risk to the safety and wellbeing of all mine-site workers.

According to the Queensland Resources Council, people-vehicle and vehicle-vehicle collisions remain the most common cause of serious mine-site injuries and fatalities, both in Australia and across the Western world.[1]

Recent Australian data reveals that up to 35% of mining fatalities are the direct result of vehicle interactions, with 53% involving pedestrians and vehicles.[2] In the US, over 40% of serious injuries (fatalities and permanent disabilities) in the mining industry involve accidents classified as 'struck-by or caught-in machinery and powered haulage equipment'.[3]

Yet the risk of potential death or injury isn't the operator's only consideration. After all, even a minor collision could prove a significant financial cost to the business in lost productivity, equipment repairs and machine write-offs.[4]

The surge in mining activity over the previous decade has – not unexpectedly – driven a proportional increase in the size, mass and speed of mining machinery (from trucks, dozers, and graders, to underground LHDs).[5] Yet, as the scale of these machines increases, so too does the potential risk and magnitude of on-site collisions.

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Of course, while the eager adoption of heavier equipment has met this insatiable mineral demand, it has also exacerbated a number of existing challenges for equipment operators, adversely affecting driver visibility, expanding operator blind spots and greatly reducing the vehicle agility.[6]

As mine operators across the globe confront ever-riskier scenarios, many have sought out technologies to alleviate these driver-side impediments. With the advent of sensor and laser guidance technologies in the 1980s, many have seen enormous value in adapting precision detection systems for on-site machinery in a bid to prevent the potentially ruinous consequences of vehicle collisions before they can occur.

Navigational Challenges of the Modern Mine Site

The remote mine site is an ever-evolving landscape; machine operators must be prepared to navigate a host of environmental obstacles: from weathered haul roads, constricted mine shafts, roadside windrows and stock pile movements, to any number of moving vehicles, pedestrians and road-side equipment.

For surface mines, the limited visibility offered by large machinery can make road-side obstacles, pedestrians and other vehicles difficult to see, and even harder to avoid.

For sub-surface mines, conditions can prove even more precarious: drivers are not only required to navigate equipment through confined spaces, but must confront the added challenges of dust, poor lighting and expanded blind spots.

Even within the confines of the driver's cabin, operators must face a series of potential impediments: from lack of light, daytime glare, constant radio communications and noise, sudden loss of vehicle control, driver fatigue, and impenetrable GPS and cellular (GSM) black spots.

In the far-flung reaches of the remote mine site, cellular and GPS black spots remain an unavoidable fact of life. This strictly limits the capacity, effective operation and repeatability of traditional navigation systems, limiting their use considerably.

What's more, in an effort to maximise productivity, our transition to shift-based working arrangements has meant a substantial increase in night-time operations. The risks of fatigue and driver error are heightened significantly during these periods.

Why Proximity Detection Technologies Could Be Your Lifesaver

Few could doubt the skill and technical precision required to navigate the modern mine site. However, it is a regrettable fact of life that person-operated machinery is invariably fraught by the vagaries of human error.

Even the most experienced machine operator (whether in-situ or remotely controlled) will face unavoidable distractions across the mine site. Passive Operator Guidance systems, such as mirrors and complementary cameras (reverse, side and blind spot), while a critical driver aid, are still prone to the traps of human slip-ups.

In today's efficiency driven mine-sites, avoidance of potential hazards demands not only individual ability, but a combination of advanced driver-assistance technologies.

As the ultimate collision prevention technology, proximity detection sensors (PDS) provide exceptional safety assurance for drivers and machine operators. Modern PDS systems will immediately detect the presence of people and/or vehicles in the hazardous area of a continuous mining machine, forewarning drivers of any potential hazard.[7] Once triggered, an audible warning signal is activated instantly; if the operator fails to respond to the hazard in time, the system will automatically shut down the machine to prevent collision.

One of the most important innovations in PDS and collision awareness technologies has been within the cabin itself, allowing potential incidents during loading/unloading and driver mishaps (such as microsleeps) to be proactively detected and immediately flagged.

As a testament to its success, over 50% of mine sites across Queensland deploy collision avoidance technologies,[8] with most experiencing a significant reduction in collision-related deaths and injuries. Of course, while such systems may be viewed as the 'silver bullet' in the prevention of fatal collisions, any collision avoidance technology must be viewed as part of a coordinated risk management solution across the modern mine-site.[9]

Offering the world's most advanced proximity awareness and collision detection technologies, SICK is dedicated to delivering fit-for-purpose sensory solutions across the modern mine-site: from above ground to below.

Key Features of the SICK System

Value Across the Board: risk reduction can be appreciated across all operations with the installation of just a single system.

Machine-Centric: SICK systems are designed to operate independently, and do not require further hardware installation onto fixed infrastructure or other vehicles to be effective.

Minimum Downtime: SICK systems can be deployed immediately after installation, requiring minimum site downtime.

Application Specific Design: designed specifically for use on moving vehicles: haulage vehicles, excavators, wheel loaders, dozers, among others.

Above Ground or Below: SICK systems provide targeted solutions for both above ground and sub-surface mining operations.

Why Choose a SICK Solution?

SICK is a pioneer in sensor, safety system and auto-identification technologies. As the market leader in precision sensor technologies, SICK is dedicated to the provision of high-quality and failsafe sensor systems for a host of industrial applications.

SICK sensors form an indispensable part of the safe working lives of people around the globe, exceeding best practice requirements for Australian industry.

With an uncompromising commitment to customer satisfaction, SICK prides itself on the excellence of their service. At no extra cost, SICK's expert team will offer a complete needs-based analysis and site-based consultation to determine unique challenges or potential site-hazards across the worksite.

SICK provides clients with full operator training, system installation support, and periodic maintenance programs that evaluate system operability and performance at regular intervals to ensure optimal performance.

To learn more about SICK's leading range of proximity detection technologies, contact us at **+61 (03) 9457 0600** or **sales@sick.com.au**.

[1] N. Guenther & H. Salow, 'Collision Avoidance and Operator Guidance - Innovating Mine Vehicle Safety', SICK AG, in Queensland Resources Council, 2012
[2] T. Horberry & T. Cooke, 'Collision Detection and Proximity Warning Systems for Mobile Mining Equipment: A Human Factors Exploration', University of Queensland, 2010, p. 237, Cited: Bell, S. Collision Detection Technology Overview, 2009
[3] Centres for Disease Control and Prevention (CDC) USA, 'Mining Topic: Proximity Detection', 2012
[4] T. Horberry & T. Cooke, 2010, p. 237.
[5] N. Guenter & H. Salow, 2012, p. 1.
[6] T. Rasche, ''Too Close for Comfort' – The Case for Proximity Detection and Vehicle Collision Avoidance Systems', 2009, p.1.
[7] L. Zeiler, 'Proximity Detection Systems – Safety Inside the Red Zone', Coal People Magazine, p.114, 2006
[8] N. Guenter & H. Salow, 2012,
[9] T. Rasche, 2009, p. 2.

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