PROXIMITY AWARENESS & COLLISION AVOIDANCE TECHNOLOGY – OPEN CUT COAL MINES

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Contents

Executive summary

A crucial part of the NSW Resources Regulator's incident prevention strategy involves compliance priority programs for mines and petroleum sites. This involves proactively assessing emerging risks across the industry, driven primarily from incident data as well as evolving industry trends. Although these topics may also be contained within the Resources Regulator planned inspection programs, the aim of compliance priority programs is to gather further information and knowledge about how the industry is managing and controlling a specific issue.

Modern mining workplaces employ mobile equipment to mine, process and transport minerals, and to carry out required support functions such as maintenance, plus transporting people and materials. Many types of mobile equipment found in mines have historically been involved in events resulting in serious injury or death. Some examples of these events include haul truck and light vehicle interactions, excavator and dozer interactions, and light vehicle accidents. The work health and safety regulations require duty holders to manage risks to health and safety associated with plant. This priority program gathered data in relation to mine operators understanding of the controls for vehicle interaction hazards, the-engineering solutions to assist in managing these hazards - specifically proximity awareness technology (PAT), collision avoidance technology (CAT) and collision avoidance systems (CAS) - and their legal responsibilities to maintain a safe workplace.

This report summarises the assessment findings from the priority program which included 29 surface coal mines or surface coal handling facilities of underground mines from September 2021 to December 2021.

Key findings

Mines have identified the hazard of mobile plant collisions, considering both heavy and light vehicles, and had implemented a wide range of controls as part of their risk mitigation strategy to minimise the risk of heavy mobile equipment (HME) interaction on site.

Site procedural controls for the movement of vehicles included:

- vehicle hierarchy (rather than NSW road rules)
- speed limits
- road and intersection design
- vehicle separation/segregation
- traffic control/flow/management
- mine traffic rules
- overtaking rules
- signage/delineation
- operator/driver radio communication (Pos-Comms)
- competency
- spotting
- road drainage
- vehicle recovery
- bundwalls windrows

Additional controls identified at coal handling and preparation plants (CHPPs) included:

- no go and safe travel zones
- GPS positioning (some with alarmed 3D virtual exclusion zones)
- software/hardware proximity detection/alarms/emergency stops (such as stackers and reclaimers)

A variety of Proximity Awareness Technology (PAT) controls were implemented at mines, including:

- reversing mirrors
- flashing coloured lights
- reversing alarms
- chevron style permission to overtake lights on graders
- rear facing camera radar

The requirements identified above were often used in combination, and generally subject to a critical control verification process, utilising inspections, job observations and audits.

Some mines approaching closure advised they were limiting their controls to PAT.

Many mines are evaluating available OEM and third-party options, some with reference to MDG2007 and EMERST and considering the application of technology in relation to collision avoidance and proximity detection.

Of the 29 mines assessed:

- Four mines have implemented PACA technology, such as SafeMine, Wencolite, and the Hitachi autonomous truck fleet

- Six mines are currently in the process of implementing PACA technology, such as CAT Detect, Wenco, Wabtec, and SmartMine

- A further 12 mines are actively planning to implement PACA technology, and generally have development work and / or current trials occurring within their organisations

Systems

There are several third party and OEM collision avoidance and proximity detection systems being developed and trialled by mine operators, including:

- various combinations of cameras and in cabin display screens are utilised by mobile plant operators for proximity detection on a variety of mobile equipment
- iVolve/ROPPS/IVMS event mapping monitors (video forward and in cabin) fitted to light vehicles that monitors location, speed, seat belts, etc, and geofence speed warnings are generated for high trafficable areas and intersections
- Hitachi autonomous truck fleet trial in a separate production area of a mine. The fleet management system (FMS) for the autonomous haulage trucks also has a level of proximity detection for the Manned Instrumented Vehicle.
- CAT detect radar
- Hexagon
    - o Opguard proximity detection collision management technology
    - o SafeMine Collision Awareness Technology proximity detection system
    - o Guardvant camera-based fatigue and distraction management technology
- Wabtec vehicle interaction system as part of a mobile equipment improvement project
- Wenco GPS Proximity. The Wencolite Production Manager System visually displays any other item of plant that is also fitted with the system once it enters the operating zone of that item of plant. The equipment icon and its unit number are displayed on the onboard screen. Dozers and excavators fitted with APS/GPS can be linked to the Wencolite PMS
- SmartMine

Outcome

Most of the mines and CHPPs that were visited as part of the program advised they are monitoring the collision management technology trials and implementations across other NSW coal operations. Several sites advised they are actively sharing their experiences in trialling and\or implementing system to assist a whole of industry approach to minimise the hazard potential associated with vehicle interactions.

There were no Section 195 Prohibition notices or Section 191 Improvement notices issued during the assessment program.

Recommendations

Mines and CHPPs should consider:

- applying an appropriate risk ranking matrix in terms of the potential consequence of the identified hazard
- implementing elimination controls where possible, such as segregation of heavy and light vehicle corridors
- integrating multiple systems where there is tangible benefit in overlapping technologies.
- leveraging from existing technology advances within the mining industry
- advancing knowledge through industry forums and industry groups such as EMERST
- consulting with their workforce to ensure systems provide effective controls and do not distract mobile plant operators from their core functions.

Next steps

The Regulator will continue to assess the implementation of proximity detection and collision avoidance technology in coal mines through planned inspections and targeted interventions.

The Regulator, in collaboration with the NSW Minerals Council, has initiated a proactive industry engagement campaign, aimed at advancing industry knowledge and adoption of these systems. The campaign, which commenced in March 2022, involves face to face forums, and the release of an online discussion board and guidance material to further enhance industry knowledge and understanding on these systems on an ongoing basis.

Mine operators are encouraged to review the outcomes of this report and determine potential areas of improvement that may be applicable to their own operations.

Further information

For more information on safety assessment programs, the findings outlined in this report, or other mine safety information, please contact the NSW Resources Regulator:

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