Department of Employment, Economic Development and Innovation

Safety Alert

Mines

Office of the Commissioner for Mine Safety and Health

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Proximity-detection systems — selecting the right one for your mine site

This alert highlights the factors to consider when assessing and selecting a proximity-detection system for your site.

Mine safety in Queensland has improved significantly in some areas over the last few years — yet fatalities from vehicle collisions continue to contribute disproportionately to deaths in the industry, and workers' lives are at risk by the way in which vehicles interact at a mine site.

Part of the answer is to install proximity-detection systems in all vehicles. Some mine sites have already installed them, and we commend them for this. However, site visits and discussions with mine staff have revealed safety flaws with some of the systems being trialled and installed.

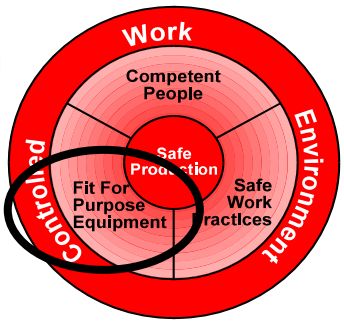
From our observations, not all proximity-detection systems are being selected sensibly, and not all are effective in managing collision hazards and risks.

The advice below is intended to help you select the right system and to maximise its benefits.

Quick checklist before installing a proximity-detection system:

- Have you captured all possible scenarios that can occur at your mine?
- Have you checked whether your chosen proximity-detection system can deal with those scenarios and resultant risks?
- Are you sure of what your chosen system can and can ***not*** do?
- Have you clarified any underlying assumptions inherent in your chosen system (vehicle speed, separation distances, detection distances etc.) to ensure that they do not conflict with or lessen the capability of the system?
- Have you considered the human element?
- Are competent personnel available to install and maintain the system?
- Have you also considered hard controls such as mine traffic separation, road and intersection layout, and procedural controls such as better communications?

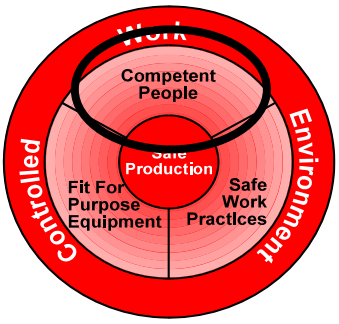
Fit-for-purpose equipment:



1. **Review all risk assessments** covering collision awareness and proximity detection. Ensure all collision scenarios applicable to the mine are captured and properly described, and that effective controls are identified.
2. **Compile collision scenarios** using local operator knowledge and site-specific information, supplemented with information from industry bulletins etc. to ensure all hazards and scenarios are captured.
3. **Verify** that the chosen proximity-detection system is in fact able to mitigate the collision scenarios and resultant risks identified for the site to 'as low as reasonably achievable levels'. Ask the manufacturer to provide detailed information on what their system can and can *not* do. Underlying assumptions must be made clear to avoid dangerous misunderstandings. The role and reliance on human performance of the operator must be clarified.

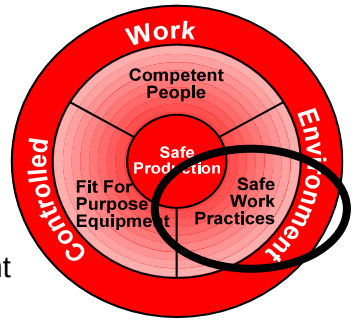
4. **Follow** change management protocols whenever you decide to disable some proximity-detection functions. It is important to verify that full collision protection continues to exist and that risk has not increased.
5. **Ask the manufacturer** of scanning-type detection systems (RFID, laser, radar etc.) to provide 'polar diagrams', which show the actual detection envelope of their systems under working conditions, not assumed envelopes. (Assumed envelopes are often shown as 'clover leaf' patterns, which do not reflect true conditions and so can give the vehicle operator a false sense of protection.)
6. **Treat with caution** any risk assessments facilitated by the manufacturer of the system.
7. **Ascertain** whether the system is a collision 'awareness' or collision 'avoidance' system, and ask for sound, logical and unambiguous evidence. Current proximity-detection systems are too often considered and called 'collision avoidance systems' — this is misleading as it can make organisations and people believe that they have achieved a level of safety akin to risk 'elimination'. Systems that rely on the operator to take action should not be classified as 'collision avoidance'.
8. **Check** potential inference with other radio frequencies to eliminate any unsafe or nuisance conditions (e.g. interference with fuelling installations, locking mechanisms on light vehicles).
9. **Choose screens** that do not suffer from veiling (glare and reflection) but provide a clear image even in bright light. This type of technology is available. Be aware that using rubber shields on screens to lessen veiling may not be effective.
10. **Place** display screens and alarming units optimally — i.e. taking into account limited cabin space and the operator's orientation. Do not place displays and alarming units outside the operator's viewing range. For instance, placing the alarming LED under the dash at knee height outside the operator's (peripheral) vision is ineffective.
11. **Do not place** screens in front of important vehicle safety information.
12. **Choose a system** that is intuitive to use and effective in its application, provides minimal operator intrusion and requires the least amount of mental processing by the operator to make the right decision. (For example, some systems comprise several individual systems/displays, adding to the existing complexity of the operator's workspace. Manufacturers should combine these into one 'unit' with display/alarming functions operating 'by exception' and gradual escalation of the criticality algorithm. Over-alarming will result in the operator ignoring the alarm.)
13. **Review** braking distances for all vehicles, for the full range of operating speeds and conditions. Sites must verify that current site vehicle separation distances are sufficient in normal and abnormal situations. Operator response times must be considered in establishing safe braking distances.
14. **Ensure** easy and safe access to all external hardware. A sensor or camera placed in a readily accessible position will get inspected and cleaned more often than if installed out of reach, requiring an access platform.
15. **Consider** the system's ability for future upgrades to allow incorporation of other technologies to provide higher levels of protection against collisions, and provide additional levels of redundancy (future proofing).

Competent people



16. **Appoint** dedicated site champions to ensure an effective implementation of proximity-detection systems. These champions are the link between the site — operations and maintenance — and the proximity-detection manufacturer.
17. **Have** dedicated site and supplier maintenance personnel at hand to ensure a successful commissioning and implementation of the system.
18. **Include** proximity-detection information in simulator training modules.

Safe work practices:



19. Establish operational protocols to ensure consistency of approach.

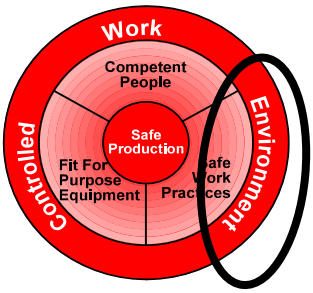
20. Review and update relevant site procedures including pre-start checks to ensure proximity-detection systems and their importance as a safety control are assured, recognised and embedded in the safety management system.

21. Review proximity-detection system requirements for all contractor vehicles. Problems can be foreseen where contactors service different mines where different systems are in use. Commonality of approach and rule-set must be assured.

22. Design and roll out a comprehensive training and assessment program that outlines how to use the system effectively. This training program must be made an integral part of the site's overall training program. It is important to incorporate a section that explains what the system **can** and **can not** do. Similarly, it must be explained that so called nuisance alarms may be in fact real alarms due to the system's design and capabilities.

23. Consider appropriate operational protocols if proximity-detection equipment breaks down.

Safe work environment:



24. Consider (in addition to proximity-detection systems) pit layout, intersection, haul road, dump designs, road separation, vehicle speeds and separation distances, as well as communications protocols, to create an inherently safer operating environment.

Conclusion

Proximity-detection systems can save lives — but they are not a 'silver bullet'. They are an added layer of control in a multi-layered safety management system to lessen risks from vehicle collisions.

Hard controls, such as changes in mine traffic design, road layout, and equipment design changes, together with process controls and softer controls such as improved communications and procedures, must be considered also.

The above information and suggestions should be used as minimum to select a suitable system and approach for your site.

Every miner home safe and healthy every day

Stewart Bell
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Please ensure all relevant people in your organisation receive a copy of this Safety Bulletin. Any such advice supplied to site should reach those who require it, and it should also be placed on mine