Proximity Detection Systems – an Update

QLD MINING INDUSTRY HEALTH & SAFETY CONFERENCE
TUESDAY 23 AUGUST

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Toward Tomorrow's Queensland | Queensland Government

Today's Update…

- Background - Statistics
- Observations - current proximity trials and installations

Disclaimer

- Presentation based on observations on the day of the mine visit.

- The department does not endorse or disendorse any of the technologies or products shown in this presentation. Images are for illustration purposes only.

HPIs

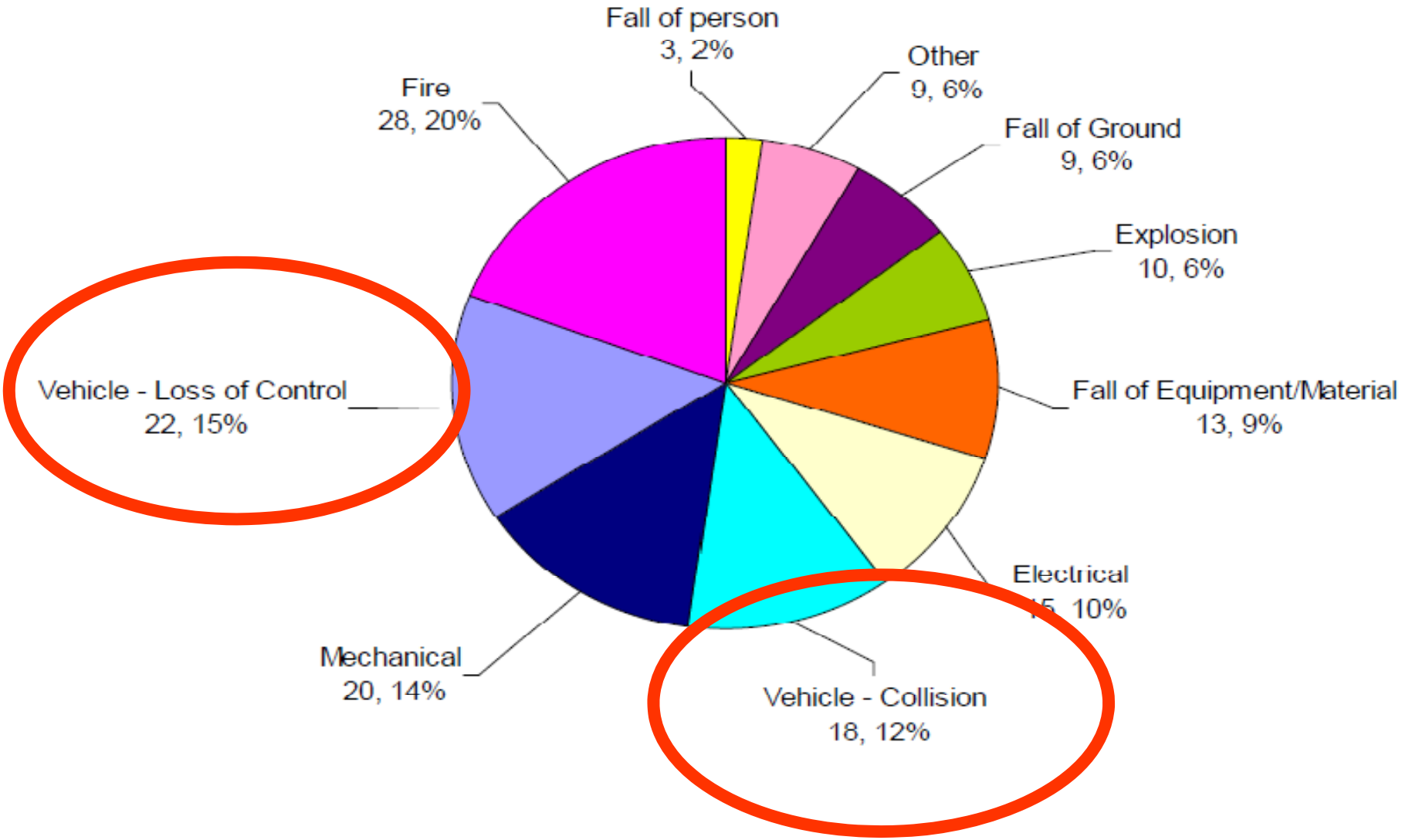


Figure 2: Twelve Month Rolling Average (147 incidents/month) by Category

‘There are only so many ways to kill people, and we know them all’

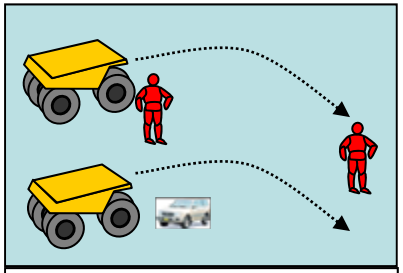
Fit for purpose equipment - Selection of the equipment

'an informal term used to describe equipment that is capable of meeting its objectives or service levels'

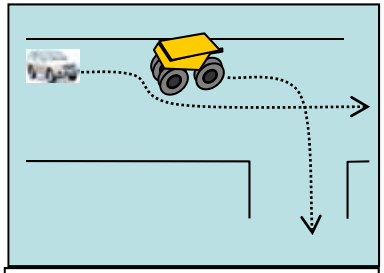
Being FFP requires suitable Design, Control and Maintenance.

- Review all **risk assessments** against local and published collision scenarios
- Verify that selected proximity detection system is in fact **able to mitigate the collision scenarios**
- **Explicit underlying assumptions** (speed, distance etc.)
- **Polar diagrams**' - show actual detection envelope, not assumed envelopes - 'clover leaf' vs actual pattern.
- Physics - understand what the chosen system **can and cannot do** - Manufacturers to declare the capabilities of their systems.

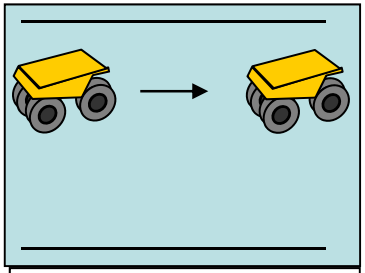
Some typical OC scenarios….



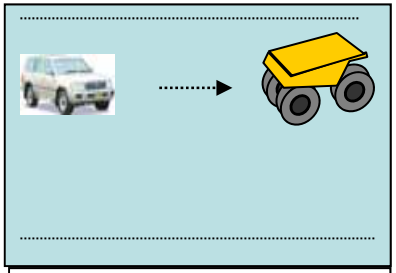
V2V V2P slow speed e.g. Parkup areas



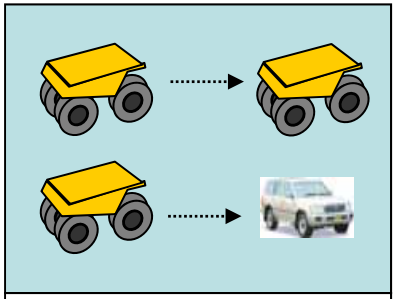
V2V – overtaking collision



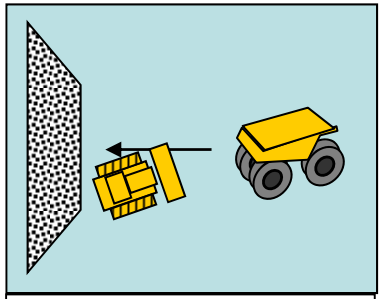
V2V – high speed rear end collision



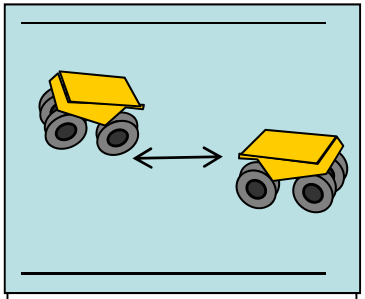
V2V - rear end collision



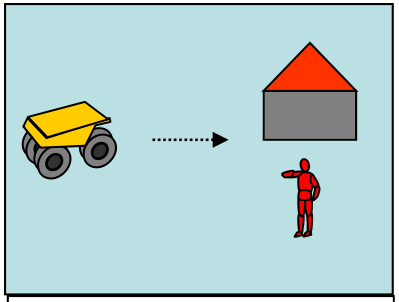
V2V – slow speed rear end collision



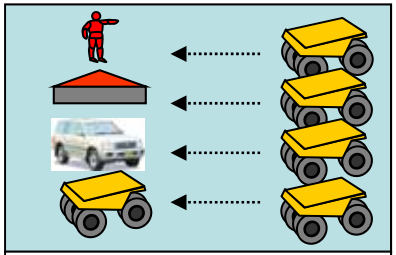
V2V collision or reversing over dump



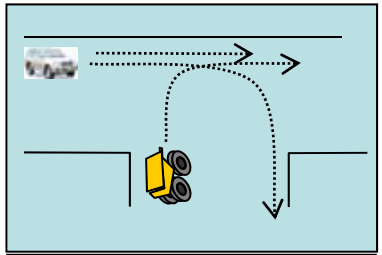
V2V – head on collision



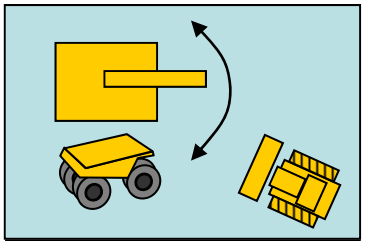
V2I or V2P forward collision



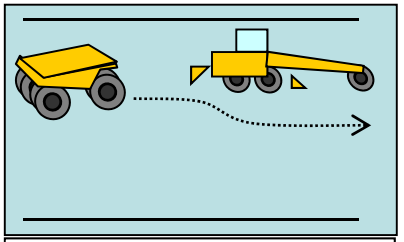
V2V V2P V2I reversing collisions



V2V collision - intersection

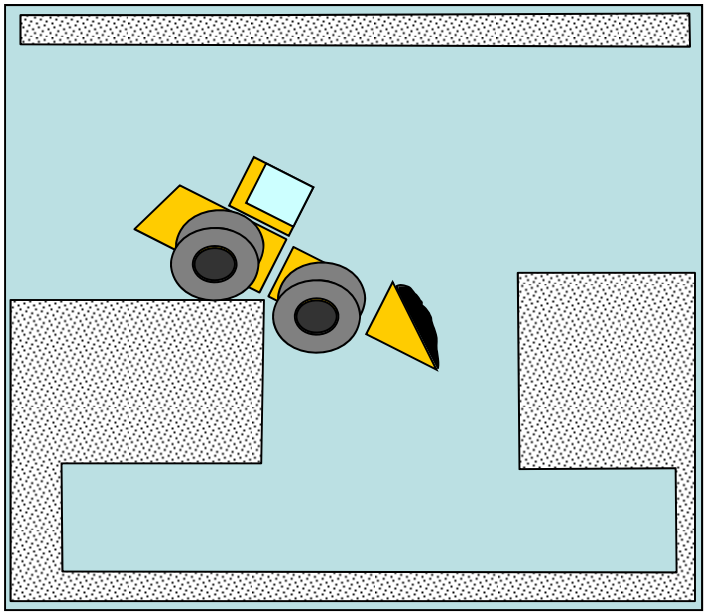


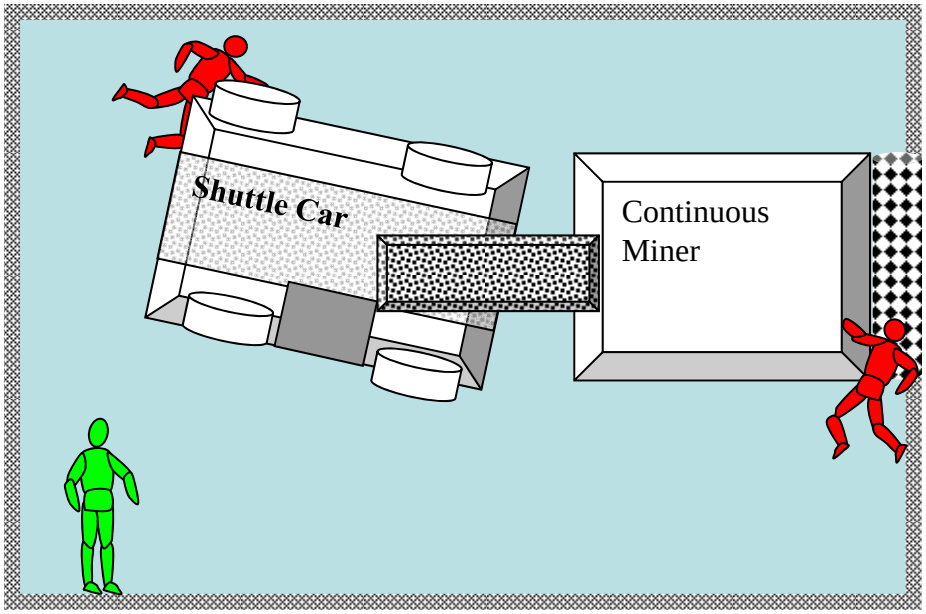
V2V collision – mining face



V2V collision – fast –slow moving vehicles

Typical Underground Scenarios, there are <u>many more</u>…..

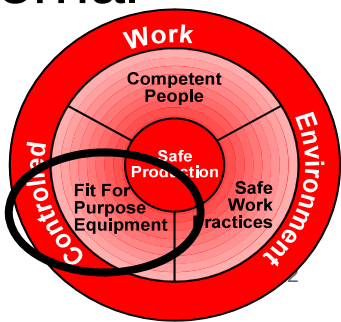




No Go-Zones !

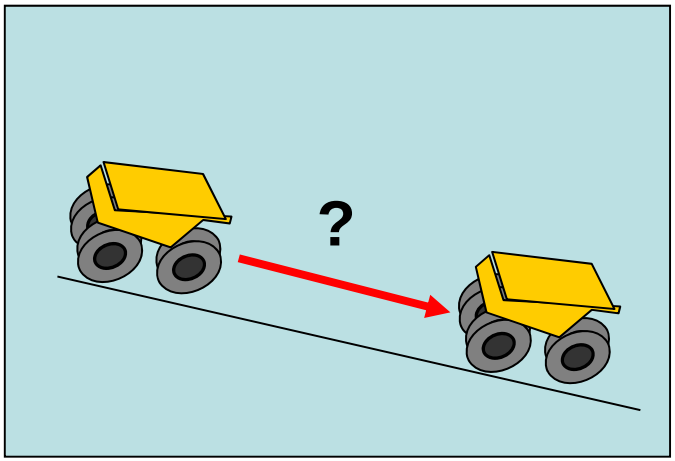
Fit for purpose equipment - Selection of the equipment

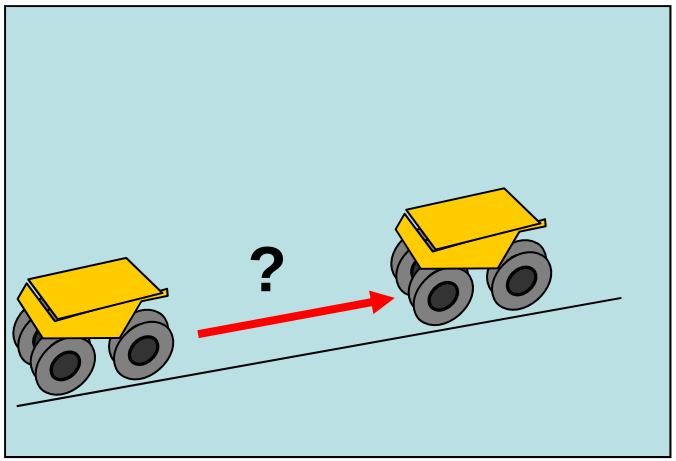
- **Manufacturers to declare** if their systems are ‘collision awareness’ or ‘avoidance systems’, EVIDENCE
- Change management – **disabling of system functions – residual risk?**
- Hardware – veiling (**reflection**), **clarity** of display etc.
- Placement of screens/ alarming units – should be within periphery of vision
- Sites to **check for inference** with other radio frequencies
- **Maintainability** – easy and safe access to all external hardware must be achievable

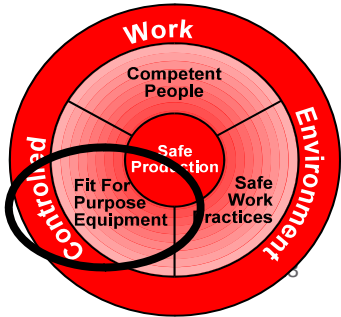


Fit for purpose equipment - Selection of the Equipment

- Combination of screens and method of alarming – <u>intuitive exception based alarming based on criticality</u>
- **<u>Future proofing</u>**
- **Verify that current site vehicle separation distances are sufficient** for the range of operating speeds and conditions
- **Can CA system cater for your separation distances?**



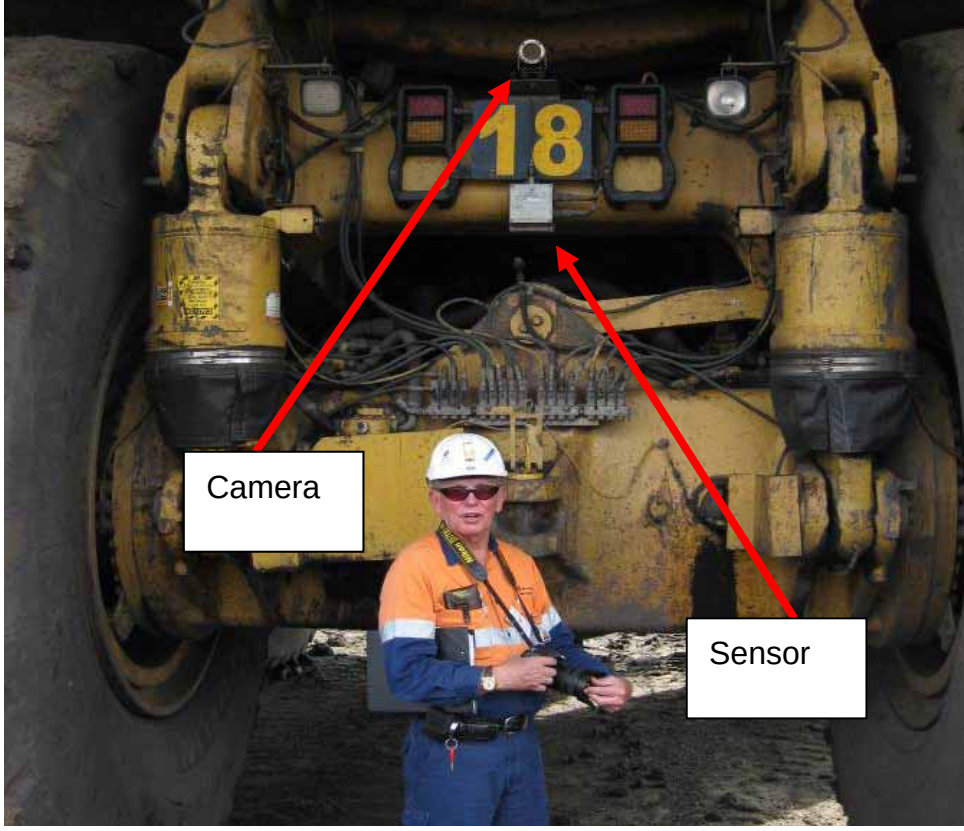




Stopping distance

Acknowledged braking capability

Behavioural expectation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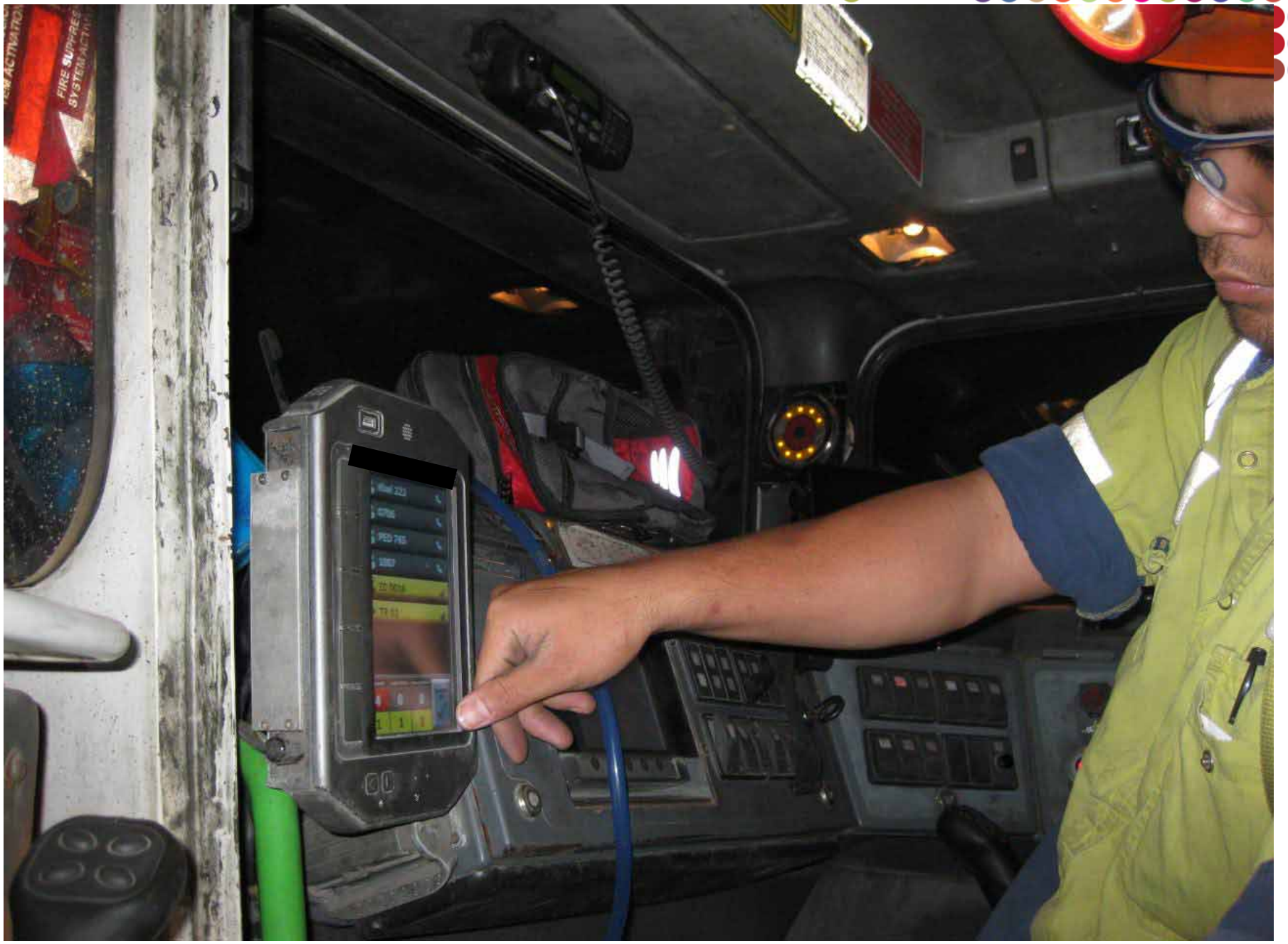
Camera
Sensor

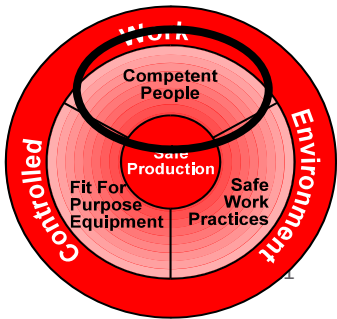


Competent People

- **Site champions** - effective acceptance and utilisation of proximity detection systems

- Dedicated maintenance personnel to ensure a successful commissioning and implementation of the system
  - Who is going to maintain proximity detection and automation systems – **specialised skill**

  - Proximity detection issues - **simulator training**

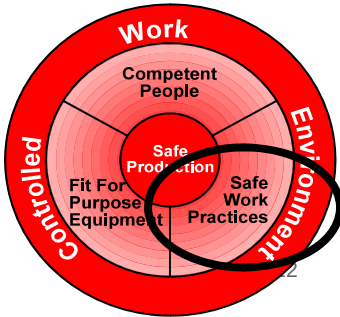


Safe Work Practises

- **<u>Review and update relevant site procedures incl. prestart checks</u>**
- **<u>Review 'Operations rules</u>**' i.e. if systems deemed safety critical, then operational procedures must ensure consistency of approach
- **<u>contractor vehicles</u>** operating at different sites. Commonality of approach and rule-set. AS4240

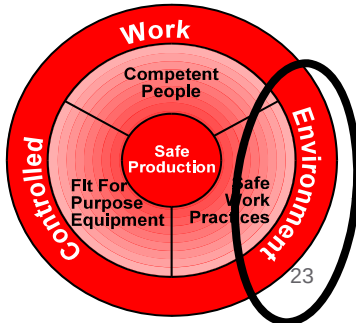
- **<u>Training program</u>** Incorporate a section that explains what the system **can do and what it cannot do.**

- 'Nuisance' alarms or conditions may be in fact real alarms due to the systems design and capabilities (**<u>physics</u>**)

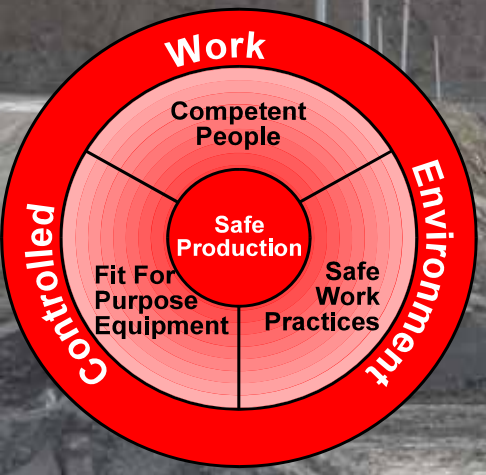


Controlled Working Environment

- Proximity detection equipment must not be considered as the primary solution to mitigate collision risks.
- Must also consider their pit design & layout – intersection, haulroad, dump designs, road separation human behaviours etc.
- **Inherently** safer operating environment



Example of a well delineated and well designed ‘walkway’ to the truck ‘go line’



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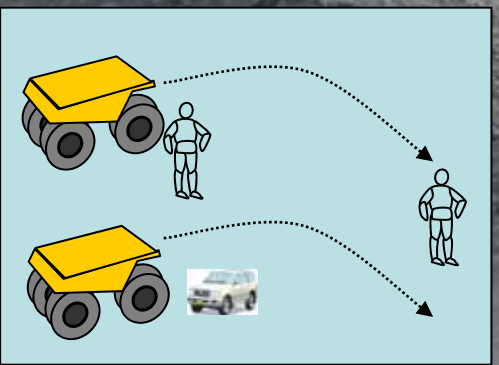

‘Isolation’ – hard barriers

Safety alert

Mines Inspectorate

Safety alert 154
Published 16 April 2008

Well Done! Collision Saved by Centre Rill on Haul Road

Mine Type: All surface mines

Incident: A Cat 785 driver was taking the last load of the shift to the dump and attempted to drink from a water bottle. The driver's left hand was used to steer and the right to balance the water bottle for drinking. In doing this, the truck drifted toward the left side of the road. As the driver corrected the steering, the water bottle overbalanced. The driver was distracted sufficiently to lose control of the truck, which was brought to rest by the centre safety rill of the haul road. At the time, another vehicle was approaching in the opposite direction and there was a high probability that a head-on collision would have occurred.

Downhill Safety Rill

Centre Safety Divider

Uphill Safety Rill

Equipment: CAT 785 Rear Dump Truck

Hazard: Unplanned movement / loss of control

Causes: Driver not maintaining full attention to driving the truck

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Market Place

- Collaboration - several prox detection OEMs integrating their systems into ‘one’

- GPS (high speed) plus radar (slow speed) – opencut
- ‘Magnetic bubble’ plus … - underground
  - ability to create non-detection envelopes
  - Some machinery OEMs allowing prox system to ‘manage’ some machine functions – eg. braking
- Combined systems better than sum of all

What can it do? Other uses – detection of fixed hazards

Powerline hazard – Pyrolysis

Q: Is the system capable of helping here?

Some CAS Technologies

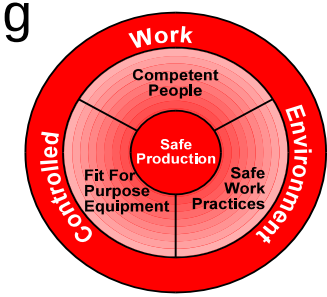
- RFID – tags and readers
- Radar
- ‘Magnetic bubble’
- Laser scanning
- GPS – surface only
- Cameras

- Combination of the above

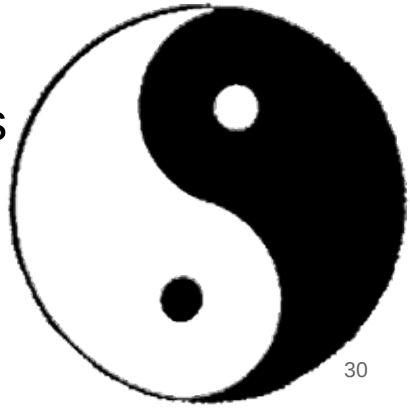
Selection of technology(ies) critical for <u>effective</u> control of collision hazards and resultant risks

In Summary

- ‘What is the problem, then look for solutions’ – **effectiveness**
- **Solution MUST control the risk – to an acceptable level**
- (V2V, V2P V2I) Accidents are preventable
- CA systems are not the complete answer but are an essential part of the solution
- Must also look at human factors – human ‘unreliability’
- Proximity detection technology is available or rapidly becoming available
  - Opencut and Underground metalliferous - available now
  - Underground Coal – requires IS certification – late 2011



- Need a side by side integrated combination of approaches
- Must be embraced – life saving technology



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