BLIND SIGHT

Whitepaper

Heavy Industry Safety
People and Plant

INTELLIGENCE

BY PRESIEN

THE SAFETY IMPERATIVE

There are roughly 150 fatal accidents and 100,000 serious injuries in the Australian workplace each year[1]. Heavy industries – construction, logistics and warehousing, agriculture and forestry, manufacturing, and mining – disproportionality contribute to these statistics, with roughly 65% of all fatalities[2].

Vehicle-related accidents are by far the leading cause of fatalities, causing roughly 65% of all workplace fatalities.

The direct cost of a serious workplace accident is difficult to estimate. Industry rule-of-thumb estimates suggest $1m. However, the indirect costs of accidents have been conservatively estimated at 3 times higher than direct costs[3].

The national-level costs of these fatalities and injuries is estimated at AU$61.8 billion and AU$17 billion for associated property damage, representing 4.1% of GDP[4]. Australian businesses spend over AU$100 billion annually on prevention, insurance, and compensation[5]

However, the real state of health and safety remains unknown. Current manual reporting relies on lag indicators of actual accidents rather than real-time or even lead indicators of near-misses and unsafe behaviours.

Near-misses and unsafe behaviours are far more common than accidents but are rarely captured by current manual processes. This means that health and safety reporting is incomplete and there is no real understanding of true safety, the risk factors, how well interventions really work, and where attention should be focused.

There is a moral and economic obligation to do better.

This whitepaper summarises the available human and technical approaches to improving heavy industry safety with people and plant operating in close proximity.

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[1] Safe Work Australia, Work-related traumatic injury fatalities Australia 2019, released 20 November 2020, https://www.safeworkaustralia.gov.au/collection/work-related-traumatic-injury-fatalities.
[2] Ibid
[3] National Occupational Health and Safety Commission, 2004, The Cost of Work-related Injury and Illness for Australian Employers, Workers and the Community.
[4] Safework Australia, Cost of injury and illness statistics, modified 9th May 2017, https://www.safeworkaustralia.gov.au/statistics-and-research/statistics/cost-injury-and-illness/cost-injury-and-illness-statistics.
[5] Safework Australia, The cost of work-related injury and illness for Australian employers, workers, and the community: 2012-13, November 2015

IMPROVING HEAVY INDUSTRY SAFETY

Understanding and eliminating people and plant interactions are the key to improving heavy industry safety. There are currently several human and technical approaches, often being combined.

Human

TRAINING

General health and safety training and vehicle-specific training is critical. However, training does not prevent momentary lapses in concentration, help see small or obscured objects in challenging conditions, or provide any real understanding of safety.

SPOTTERS

Spotters are designated workers that assist with vehicle movement and operation.
Spotters are flexible and often mandatory for larger vehicle movement.

Spotters are deliberately placed in higher risk situations yet suffer the same limitations as all people: distraction, inattention, inability to see, and inability to communicate with the operator. Spotters can be an expensive solution and do not provide any real understanding of safety.

Technical

CAMERAS

Integrated and after-market camera systems are now common. The cameras are typically installed on the extremities of the machine and the display screens in the cab, facing the operator. Advanced systems now stitch multiple images to create 360° views.

Cameras require operators to be watching the screen to be effective. However, an operator is focused on their task and is rarely watching the screen(s). Placing ever more screens into the cab is also distracting.

Although some systems record video, they must be manually reviewed or post-processed to gather any safety insights.

DISTANCE/PROXIMITY

Multiple sensor types are available to measure distance, including radar, ultrasonic, and lidar. This data can be used to alert an operator and/or trigger actions, including automatically braking vehicles, when something gets within a certain distance.

Most lower-cost distance systems measure distance but are unable to identify the type of object. This is a limitation in congested and busy environments, leading to frequent false positives.

LOCATION

Location systems generally use GPS to determine the location and take action when moved into or out of designed areas. Location systems are commonly used in vehicle tracking applications, and some advanced systems can co-ordinate multiple vehicle locations.

Location systems do not detect people or other objects within the area. Objects must therefore be completely excluded from the relevant work area.

THERMAL

Thermal systems detect heat. The thermal signature can be used as a proxy for a person or vehicle.

Thermal systems can work well at night but detect heat signatures rather than the objects directly, leading to false positives and false negatives when outdoors – detecting animals and hot rocks but not detecting people in insulated clothing.

Thermal systems can provide pictures and video but they are generally low-resolution heat-maps.

TAGS

Tag systems attach a physical tag to each object. The tags are detected by a detector on the vehicle. The most common tag technology is active RFID but passive RFID, magnetic, and other tag types are used for different applications. Multiple tags may be required for each object. Multiple detectors may be used on the vehicle to allow triangulation. Tag systems can generally detect an object without line of site to the detector(s).

Tag systems cannot detect objects without their own system tags. This makes them unsuitable for use around the public and where different systems may be in use. Tag management becomes a logistical challenge at scale and in uncontrolled environments, particularly if a system requires multiple tags per object.

INFRARED

Infrared systems emit infrared light and detect the reflection from high-vis or suitably reflective materials.

Infrared systems detect reflection rather than objects directly, which can result in false positives, and objects without reflectivity are invisible.

MOTION SENSORS

There are multiple motion sensor types, including passive infrared (PIR), microwave, ultrasonic, and vibration.

Motion sensors are generally unsuitable for mobile and outdoor applications, due to the combination of background movement and relatively static objects of interest.

EARLY EDGE AI

Early edge AI systems generally rely on rudimentary shape analysis for object detection. For example, a person might be detected based on 'boxes' around the head, torso, and limbs. The AI has been trained to detect certain arrangements of 'boxes' as people.

Early edge AI systems only detect certain objects, generally people and vehicles, and only in certain poses. For example, they do not detect a child or person lying down or with legs apart, as the 'boxes' no longer correspond to what the AI has been trained on.

Early AI systems cannot be updated to modern AI techniques.

MODERN EDGE AI

Modern edge AI systems can quickly and accurately detect any object that the system has been trained on, without relying on any tags or markers, certain poses, or server connection. This has only been possible in the last few years, thanks to increases in processing power.

Modern edge AI can provide video and metadata of all detections for reporting. Modern edge AI's only significant limitation is it must be able to see the object.

CONNECTED AI

Connected AI systems process video streams on servers. This can be used to detect and track objects, count, determine behaviours, and more. Connected AI systems have access to significant processing power and can run multiple video streams with high-performance AI models in real-time.

Connected AI systems for safety require a guaranteed always-on, high bandwidth connection between the server and site. This is generally not possible, even in cities.

Connected AI systems rarely have field hardware and no way to communicate back to field users prevent an accident.

BLINDSIGHT

Blindsight is a modern edge AI safety system for mobile plant and fixed infrastructure. Blindsight stops accidents by alerting vehicle operators to people (and other specified objects) in their blind spots, and automates health and safety reporting, including video.

Blindsight is creating a new standard in health and safety, where the accident is prevented and near-misses and unsafe behaviours are automatically captured and reported.

FOR OPERATORS

Blindsight provides increased situational awareness to prevent accidents without taking control away from the operator or recording the operator.

FOR HEALTH AND SAFETY

Blindsight provides comprehensive and automated insights into safety, allowing benchmarking of the real rather than manually reported safety profile, what systems are working or not working, and where to focus for interventions.

FOR MANAGERS

Blindsight reduces the risk and associated direct and indirect costs from accidents, moves from lag to near real-time indicators, and provides the data required to create sustainable behavioural change.

BLINDSIGHT IS DISTRIBUTED IN AUSTRALIA, NEW ZEALAND AND SOUTHEAST ASIA BY POSITION PARTNERS.

Learn more:
www.positionpartners.com.au or 1300 867 266

Position Partners
Shaping New Dimensions

SOLUTION COMPARISON

	PEOPLE		TECHNOLOGY									
	Training	Spotters	Cameras	Distance/ proximity	Location	Thermal	Tags	Infrared	Motion sensors	Early edge AI	Modern edge AI	Connected AI
Does not rely on human attention	✗	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓
Alerts site users	✗	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	Maybe
Alerts off site users	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓	✓
Provides detection data	✗	✗	✗	✗	✗	✗	Maybe	✗	✗	Maybe	✓	✓
Provides video	✗	✗	Maybe	✗	✗	Maybe	✗	✗	✗	Maybe	✓	✓
Does not require special markers or identifiers	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓
Can detect without line-of-sight	✗	✗	✗	✗	✗	✗	✓	✗	✗	✗	✗	✗
Can detect in the dark	✗	✗	Maybe	✓	✗	Maybe	✓	Maybe	✗	✗	Maybe	Maybe
Can differentiate objects	✓	✓	✗	✗	✗	Maybe	✗	Maybe	Maybe	✓	✓	✓
Can work without 4G connection	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗
Can be remotely updated/ improved	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓	✓
Can detect at long distances (>50m)	Maybe	Maybe	Maybe	Maybe	✗	✗	✓	✗	✗	✗	Maybe	Maybe

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BY PRESIEN

Suite 113
4 Cornwallis Street
Eveleigh, NSW 2015
Australia

blindsight.ai