LSM

LUBRICATION
SAFETY
MAINTENANCE

Vision – for your Safety

LSM Technologies are involved in assisting industry to mitigate fatalities, injuries and high potential incidents associated with vehicle-to-vehicle (V2V), vehicle-to-person (V2P) and vehicle-to-infrastructure (V2I) interactions.

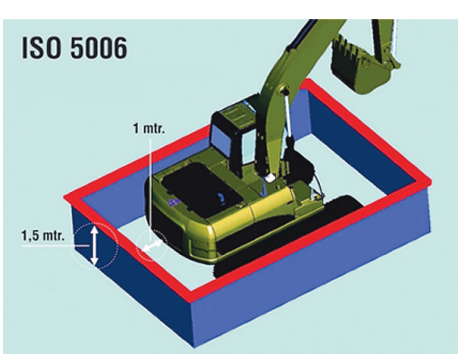
This is done utilising the Orlaco range of CCTV viewing solutions in accordance with the ISO 5006/16001 *Standards for Operator Visibility*, which became a "recommended" (or mandatory) standard in November 2008.

LSM Technologies has provided numerous presentations to industry and safety authorities regarding the new ISO standards, including:

- Queensland Mines & Energy (QME) Mines Inspectorate Brisbane offices (November 2008).
- Mine Haulage Conference (December 2008).
- Quarrying Safety & Health Conference (Townsville, April 2008 and Brisbane, June 2008).
- Queensland Mines Safety & Health Conference (Townsville, August 2008).
- In August and September 2009, QME (Department of Employment, Economic Development & Innovation) Mines Inspectorate hosted four two-day "*Operator Visibility & Proximity Detection*" and "*Collision Avoidance*" workshops throughout Queensland.

Compliance & Control Measures: ISO 5006/16001

The ISO 5006 Standard for *Earthmoving Equipment: Operators Visibility* has been in development for nearly 20 years. It became a full standard in 2006 and recommended (mandatory) in November 2008 after a two-year amnesty period.



ISO 5006 specifies that Visibility be provided on a Boundary line of 1.0 metre / 1.5 metre height from the smallest rectangle that encompasses the machine and on a circle of a 12.0 metre radius.

ISO 5006 (and 16001) is specified, endorsed and enforced internationally to mitigate "blind spot" incidents by many safety and health authorities and industries.

"*The purpose of this International Standard is to address* operator's visibility *in such a manner that the operator can see around the machine (360 degrees) to enable* proper, effective *and* safe *operation that can be quantified in objective engineering terms.*"

Like personal protective equipment (PPE), there is no legislation that requires the implementation of ISO 5006/16001. However, PPE is an accepted industry control measure which means that if an incident occurs in a workplace, then duty-of-care and regulative accountability ramifications will occur.

ISO 5006/16001 for *Operator Visibility* is also an accepted and recommended industry control measure to eliminate fatalities, injuries and HPIs associated with V2V, V2P and V2I interactions.

ISO 5006/16001 should be a company's first line of defence to:

- Mitigate 80%-90% of operator visibility incidents, and
- Reduce the risk of litigation and legal ramifications of non-compliance to a recommended International Standard and accepted industry control measure.

ISO 5006/16001 is already adopted in many specifications for equipment and vehicles in the mining and earthmoving, materials handling, construction, waste vehicles and transport industries.

A few examples are:

- British Standards – UK (BS ISO 5006).
- S.A.E. J1091 (USA).
- Safety in Mines Research Advisory Committee – COL 451 Specification – Report (South Africa).
- NIOSH / MSHA / CDC (USA).
- Mineral Resource Industry / DPI (NSW) – MDG15.

Major Causes & Contributors

It is acknowledged worldwide that approximately 80%- 90% of fatalities, injuries and HPIs involving V2V, V2P and V2I interactions are a result of restricted operator visibility around vehicles and equipment.

These "blind spots" occur predominantly:

- At speeds of 0-10 kilometres/hour
- In situations of close proximity to another vehicle or structure
- When vehicles are reversing.

First Step: Risk Analysis

There can often be some trepidation as to where to start and what technology solutions to implement onsite to improve safety performance due to the differing requirements of underground and aboveground operations.

Your first step should be the completion of a detailed Risk Analysis & Assessment to help target a solution that can meet ALARA and Zero Harm objectives.

What technology should we implement?

Defence #1: Operator Visibility

- Involves the use of visual aids such as mirrors and camera (CCTV) systems.
- Can help to mitigate more than 90% of such incidents and is therefore considered primary defence technology.
- They are often standalone systems, requiring little maintenance and no separate infrastructure to support them.
- Total capital investment is minimal.

Defence #2: Proximity Warning & Detection Systems

- These include short and long-range radars (RF tagging for personnel and equipment underground).
- These devices complement *Defence #1* technologies and can only be used in exceptional circumstances in place of CCTV and other visual aids.
- Hazard detection systems are valuable secondary devices to complement *Defence #1* and help to reduce operator interaction (eg changing camera views).
- Hazard detection systems can also prompt or warn the operator or automatically initiate a camera view should an object be detected.
- Hazard detection systems are classed as a "backup assist" devices only and should not be used on their own.
- Hazard detection and proximity devices are stand alone systems, requiring little maintenance and no separate infrastructure to support them.
- Total capital investment is minimal.

Defence #3: Collision Avoidance & Awareness Systems

- These systems are usually RF and/or GPS communication systems.
- They are primarily utilised for fleet management purposes regarding positioning of plant.
- They can provide information on activities such as vehicle congestion, dedicated "no-go" zones (eg blast areas and overhead power lines), non-compliances (eg contravening speed, intersection stops) and mapping of haul roads.
- They provide a degree of safety for less than 2-5% of incidents and these situations could well be more successfully mitigated by other methods and procedures.
- There is no accepted or known safety standard for their use.
- These devices and systems require costly maintenance, service support contracts for software and hardware updating, extensive support infrastructure and dedicated personnel to monitor and report data.
- Initial capital investment is high and there are often ongoing servicing costs.
- They are designed primarily for HME/LV and do not address close proximity on equipment such as telehandlers, forklifts, tyre handlers, motivators, drag lines and shovels or cranes.
- These systems can contribute to operator "information overload" and may hold associated risks if an operator is distracted by reading a computer screen while moving.
- There can be considerable latency in attaining real-time information.
- They can be subject to interference and drop-outs by solid objects such as workshops and buildings and other site RF communications systems.

Defence #4: Procedural/Non-Technology Mitigation

These options include:

- Berms at intersections to stop HME from "cutting corners".
- Road rules for overtaking onsite.
- Elimination of service vehicles and personnel from haulage roads.
- Pedestrian berm walkways, especially in park-up areas.
- A restriction on the number of intersections along haulage roads.
- Restrictions on vehicles reversing where possible (eg forward only into and out of workshops).

Quality, Robustness & Fit-for-Purpose

The mining, earthmoving and construction industries are arduous operating environments requiring carefully-selected "defence" technologies which are fit-for-purpose.

Reliability, durability and performance are key criteria in selecting your technology and their importance on the net effects on safety, equipment damage and productivity cannot be overlooked.

A primary aspect to consider is your "park-up" policy should any of your defence technologies fail.

For example: should a camera or radar fail, what will you use as a safety device or control measure? Or will your operator need to "park-up" and wait for the system to be repaired or replaced?

The issue with not utilising quality "fit-for-purpose" technologies is the impact they may have on your business if they do fail.

If you do not have a "park-up" policy and the machine continues to operate, safety may be compromised and risks of an incident increased, bringing with it substantial duty-of-care ramifications.

If you do have a "park-up" policy and the device or defence fails frequently, there may be a substantial risk of equipment damage and associated loss of productivity – and safety.

ISO 16001: Earthmoving machinery: Hazard Detection Systems & Visual Aids Performance Requirements and Tests can assist in the correct selection of quality visual aids and hazard detection safety and control measures as well as providing fit-for-purpose performance criteria.

Ensure your technology providers meet the ISO 16001 standards and that they support their devices with a minimum one year warranty.

Remember the common expression: "*There is alway a cheaper alternative as long as the end results and consequences are ignored.*"

We have implemented our safety system, so what now?

Once the chosen technological and procedural "defences" are in place, you should consider recording and logging data for analysis and validation in the event of an incident.

The recording and collection of data remotely to a base from *Defence #3* can be completed simply without taxing bandwidth and available storage systems (GPRS-RF-Wifi) or adding additional technology infrastructure. *Defence #3* information is usually considered non-critical and so can be downloaded with some latency via "hot spot" download points.

By contrast, the recording of *Defence #1* and *Defence #2* data would require extensive technology infrastructure and network bandwidth and could overload common transfer systems. They would all have partial latency when it comes to attaining real-time storage and collection of video images and radar data.

A more effective technical and commercial solution would be to mount an endpoint black-box device in the vehicle that could collect and store real-time proximity warning and CCTV imaging data and also be robust enough to survive an incident for post analysis.

More than Safety: Productivity & Damage Control

Sometimes new safety and health initiatives can be met with initial resistance due to high costs.

However it is important to remember that the mitigation of incidents associated with V2V, V2P and V2I interactions, especially resolving operator visibility and blind spots, will not only increase safety but also reduce damage and will enhance productivity.

The initial investment in safety technologies provides an immediate return and also enormous long-term savings relating to:

- Reduced damage of vehicles, berms, stationary objects, buildings, V2V impacts etc.
- Avoidance of obstacles on roads that can damage vehicles and tyres.
- Quicker turnaround of vehicle working cycles.
- Increased operator awareness and lower fatigue.

Share Value, Investor Returns & Loss of Productivity

It is already legislated in some industries and fast becoming a requirement in others, for public companies to record, disclose and report HPIs, injuries and fatalities to health and safety authorities as well as to their investors.

Besides the human loss, substantial costs are involved in safety incidents with litigation, fines, compensation, loss of productivity, and even permanent closure of worksites and organisations.

A recent report by CITI Group (*ASX100 Companies & More – Injury and Fatalities Data Presented and Interpreted, Safety Spotlight June 2009*) shows there safety and health incidents have a direct link to a company's share value and investor returns.

LSM Technologies is committed to the ongoing development of technologies and systems as an industry champion to continually improve our clients' objectives of enhancing their safety and health, equipment damage control and productivity.

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