WHOLE BODY VIBRATION

RISK TO EARTHMOVING MACHINERY OPERATORS

Approximately a quarter of Australians are exposed to whole body vibration (WBV) in their work. WBV occurs when vibration is transmitted through the entire body via a supporting structure. Earthmoving machinery operators are exposed to WBV through the seat or floor of the machinery they are operating. WBV can lead to lower back pain, vertebrae and disc injury, and other health issues.

Not a lot is known about the specific effects of WBV on bones, muscles and joints, however research has shown that WBV can have negative impacts on the human body. WBV is believed to cause lower back issues such as degeneration of the lumbar vertebrae and disc hernia. It has also been linked to disorders of the joints and muscles; cardiovascular, respiratory, endocrine and metabolic changes; problems with digestive systems; reproductive damage in females (pregnant and post-pregnant women); impairment of vision and/or balance; muscular fatigue, stiffness and discomfort.

Earthmoving machinery operators are at risk of injury from WBV from various sources, including engine vibration for extended periods of time, traveling on rough roads or uneven work surfaces, and equipment activities such as ripping, carrying loads (load type and density), slewing activities and other movements that can create increased output needs of the plant, and therefore increased vibration. Other factors such as age, condition and maintenance of plant, seat design, cabin layout, machine speed, task design and machine capabilities can also contribute to WBV exposure. WBV is transmitted to the operator via the seat or floor of the machinery through the legs, buttocks and back.

According to SafeWork Australia, from 2000-2008 there were about 400 workers' compensation claims per year relating to exposure to WBV. The claims amounted to about $61million in workers' compensation payments over the eight-year period. WBV is clearly very costly to the workers compensation system, but also to the individual and their quality of life.

ACCORDING TO SAFEWORK AUSTRALIA, FROM 2000-2008 THERE WERE ABOUT 400 WORKERS' COMPENSATION CLAIMS PER YEAR RELATING TO EXPOSURE TO WBV. THE CLAIMS AMOUNTED TO ABOUT $61MILLION IN WORKERS' COMPENSATION PAYMENTS OVER THE EIGHT-YEAR PERIOD.

Currently, Australia does not legislate any exposure limits for WBV; however Australian Standard 2670.1 – Evaluation of Human Exposure to Whole Body Vibration – does provide recommended limits for comfort, fatigue, and health and safety. In the absence of Australian exposure standards for WBV, workplaces have sought guidance from international sources, such as the EU Vibration Directive (2002) to direct initiatives to prevent injury to workers exposed to vibration. The EU Directive states an exposure limit of 1.15m/2 and vibration dose value of 21m/s1.75 over an eight-hour period.

A recent NSW coal mining study found that nearly 80 per cent of workers reported back pain within the past year and the plant they were operating produced vibration levels that exceeded the EU Directive eight-hour exposure limit and vibration dose value. The results of the study were inconclusive as there is currently no direct evidence to link back pain and associated disorders with WBV as the conditions may have been caused by other tasks undertaken by the miners. Although further research is needed to establish a clear cause and effect relationship before Australia can legislate an exposure standard, there is sufficient evidence to recommend that workplaces control the risk of WBV to workers. Safework Australia has included vibration in the Model Code of Practice for Hazardous Manual Tasks (2011) as a potential hazard that should be identified, assessed and controlled.

The Model Code of Practice identifies WBV as potentially causing lower back pain and conditions of the lumbar vertebrae and discs and uses the example of operating heavy earthmoving machinery as a risk factor. Instead of focusing on an exposure limit, the Code requires hazard identification, risk assessment and risk controls to be put in place in relation to WBV.

The first step in managing the risk of WBV is to identify tasks where workers may be exposed to WBV. Consider the type of activities undertaken, equipment and plant used, work environment, design and layout, work duration and frequency, age and physical capabilities of workers, condition of equipment, and any previous injuries or reports of pain, aches, muscles stiffness etc. Ensure this is undertaken in consultation with relevant persons (such as machine operators) to gain as much information as possible from people who are actually doing the work.

The next step would usually involve a risk assessment. Where the risk is well known and controls are available to eliminate or reduce the risk, then a risk assessment may not be required. It is recommended that the value of the outcome of an assessment be determined prior to investing resources into this activity. For example, if WBV has been identified as a risk to workers, implementing controls, such as low-vibration machines, installing suitable seats, improving the suspension system and adding dampening materials, may reduce the risk as far as is practicable without the need for a detailed assessment.

Where a risk assessment is required it must look at the tasks being undertaken, the duration and frequency of time spent exposed to vibration and the amplitude of the vibration. A vibration sensor can be placed on the seat of a machine to pick up the vibration being transmitted through the operator's body. The results can be compared to AS 2670.1 and EU Directives as relevant. A risk assessment can be useful to help prioritise risk controls. For example, some activities may result in higher WBV exposure for some workers than for others, and so controls can be implemented in these areas first.

Risk controls must follow a hierarchy. This includes eliminating the risk where possible. If the risk cannot be eliminated, then it must be reduced as much as practicable via one, or a combination of the following – substitution with less hazardous options or isolation of the hazard from persons and engineering controls. If risk remains then administrative controls may be used and if risk still remains, personal protective equipment (PPE) can be used to reduce the risk.

In some instances, eliminating WBV may be achievable – such as operation of equipment using remote controls. In most other cases, WBV risks can be reduced through a combination of substitution, isolation and engineering controls.

Examples may include:

- Purchase of low-vibration machinery with suitable seat and cabin set-up
- Installation of appropriate operator seats on a suspension system of springs and dampers. The seat should dampen vibration at all frequencies, but is more important at lower frequencies (such as between 1-8Hz).
- Dampers installed on equipment and engine mountings
- Reconditioning work surfaces where possible
- Speed-limiting devices installed on machinery
- Use of machinery suited to the tasks and ground surface
- Regular servicing and maintenance to reduce vibration from worn or missing parts. Maintenance programs should include assessment and maintenance of seats, suspension systems and dampening materials
- Operation of equipment with acceptable or manufacturer-suggested speeds and capabilities
- Installation of improved suspension systems
- Correct tyres and tyre pressure for working surface

Administrative controls could include the following:

- Changing the system of work – including pushing tasks rather than ripping where possible
- Set limits of weights of loads (well within SWL) and consideration of types of loads, load positioning and load density
- Provide longer and more frequent rest breaks
- Consider job rotation to reduce individual's exposure to WBV
- Correct set-up and adjustment of seats, mirrors etc.
- Back-strengthening exercises (where medically approved)
- Training about the hazards associated with WBV and how to recognise possible symptoms of exposure

Where risk still remains, personal protective equipment such as insulated boots or floor mats may be used. The effect of this type of PPE may be minimal, however, consideration should be given to higher order controls wherever possible.

Given the high costs associated with WBV it is important that workplaces implement suitable controls to eliminate or reduce the risk associated with it. Through identification, assessment and use of appropriate controls, workplaces may be able to prevent injuries associates with WBV.

Lee Kibeiks is employed by Safetyculture.com.au as an OHS Consultant.