TerranearPMC Safety Share

Week of April 16, 2012- Occupational Vibration

Vibration, one of the physical occupational hazards in the workplace, is the result of human contact with vibrating machinery, tools or equipment. Depending on the exposure, vibration has the ability to affect specific parts of a person's body, including bones, joints, organs as well as critical biologic systems.

Occupational vibration hazards are generally divided into two subcategories: **Segmental Vibration** and **Whole Body Vibration**. The health effects vary considerably from situation to situation as factors such as ergonomic design, damping and attenuation, resonance and exposure time have a great influence on the exposure characteristics and intensity levels that may be experienced by employees. The main concern stems from vibrational energy waves, much the same as noise, that is transferred from the energy source (i.e. a hand tool or vehicle), into the body of the exposed operator. This energy is then transmitted through the body tissues, organs and systems, which, in turn, cause various effects on the structures before it is dampened and dissipates. The body being much the same as a machine can tolerate certain levels of vibrational energy but eventually starts to deteriorate and fail as long-term damage is done and natural processes and systems of the body are disrupted.

Segmental vibration exposure affects specific organs or segments of the body. The most widely studied and most common type of segmental vibration exposure is *Hand-Arm Vibration* (HAV) exposure, which affects the hands and arms. Workers may be exposed to HAV when operating hand-held power tools such as road breakers & chain saws, soil compactors or when holding materials being worked by machines such as pedestal grinders. Exposures may result in a range of health effects including damage to sensory nerves, muscles and joints in the hands and arms. One of the more common health effects caused by HAV is *vibration induced white finger*. This is a condition characterized as a tingling or numbness in the fingers due to affected blood vessels and nerves. If the situation is not corrected, the sufferer may loss those fingers affected.

Whole body vibration (WBV) energy enters the body through a seat or the floor. It affects the entire body or a number of organs in the body. When a worker sits or stands on a vibrating floor or seat, the exposure affects almost the entire body, thus causing a vibration exposure to the whole body. Drivers of some mobile machines, including certain tractors, fork lift trucks and quarrying or earth-moving machinery or those who work on vibrating floors, may be exposed to WBV which are associated with back pain.

The longer you are exposed and the higher the level of whole-body vibration, the greater the chances of suffering a back injury. Once you begin to suffer back pain, continued exposure to vibration is likely to make the pain worse. Prompt action to protect workers from vibration should stop the damage from getting worse.

Vibration is a complex hazard that does not have one control measure that will solve all problems. It requires a comprehensive approach using sound occupational health and safety principles. This usually requires the use of combining a number of control methods within the areas of engineering, administrative and personal protective equipment (PPE). PPE, such as anti-vibration gloves are available and are designed to reduce the transmission of vibration to the hand-arm system. Another type of PPE that is widely used is

the back belt; however studies conducted by NIOSH and other organizations have not been able to substantiate their effectiveness to control whole-body vibration and remains a controversial means of protecting the back and spinal system against this type of hazard (even when used for manual lifting activities).

While OSHA has not adopted any workplace standard that assesses occupational vibration hazards or control measures, organizations such as the American Conference of Governmental Industrial Hygienists (ACGIH) have recognized exposure limits based on the task duration (in hours) and frequency (continuous, intermittent, impulse or impact). Measurement assessments are performed using vibration acceleration in meters per second squared (m/s^2). A typical vibration measurement system includes a device to sense the vibration (accelerometer), and an instrument to measure the level of vibration. The accelerometer produces an electrical signal. The size of this signal is proportional to the acceleration applied to it. The frequency-weighting network mimics the human sensitivity to vibration of different frequencies. Vibration exposure direction is also important and is measured in well-defined directions. How hard a person grips a tool affects the amount of vibrational energy entering the hands; therefore, hand-grip force is another important factor in the exposure assessment.

Ergonomically designed tools can be designed or mounted in ways that help reduce the vibration level. For example, using anti-vibration chain saws reduces acceleration levels by a factor of about 10. Some pneumatic tool companies manufacture anti-vibration tools such as anti-vibration pneumatic chipping hammers, pavement breakers and vibration-damped pneumatic riveting guns. Of course proper maintenance must be practiced.

While many companies provide anti-vibration gloves, made with a layer of viscoelastic material, actual measurements have shown that such gloves have limited effectiveness in absorbing *low-frequency* vibration - the major contributor to vibration-related disorders. Therefore, they offer little protection against developing vibration-induced white finger syndrome. Nevertheless, gloves do provide protection from typical industrial hazards (e.g., cuts, abrasions) and from cold temperatures that, in turn, may reduce the initial sensation of white finger attacks.

Along with using anti-vibration tools and gloves, workers can reduce the risk of hand-arm vibration syndrome (HAVS) by following work practices:

- Employ a minimum hand grip consistent with safe operation of the tool or process.
- Wear sufficient clothing, including gloves, to keep warm.
- Avoid continuous exposure by taking rest periods.
- Rest the tool on the work piece whenever practical.
- Refrain from using faulty tools.
- Maintain properly sharpened cutting tools.

Should you encounter a workplace activity that may represent an exposure to occupational vibration contact your ES&H professional for assistance. If you notice a workplace hazard, chances are the same hazard is affecting others.

Life isn't about finding yourself. Life is about creating yourself

George Bernard Shaw