



## Just the Facts...

### Hand-Arm Vibration

“More Power!” - a common cry of people everywhere – both at home and at work. But, how often do we stop and think about the consequences of adding more power to that leaf blower or electric can opener?

In industry, “more power” can cause serious problems. If a process in an industrial setting is deemed to be highly repetitive, the solution is often automation or the addition of power tools. The addition of power tools may provide some answers to the problems that are currently plaguing engineers, such as productivity or bottlenecks, but the use of power tools can also introduce a variety of new problems. These problems can be detrimental to the health and well-being of the workers. One of the problems is vibration.

Two classifications of vibration affect the human body: whole-body vibration and hand-arm vibration.

Whole-body vibration can cause lower back problems or internal problems and usually is transmitted to the body via the feet or buttocks by ill-designed seats or floors. Hand-arm vibration is associated with such illnesses as carpal tunnel syndrome (CTS) or Raynaud’s phenomenon and is usually transmitted to the body through the power or pneumatic tool that a worker uses.



Carpal tunnel syndrome involves entrapment of the median nerve as it passes through the carpal tunnel located in the wrist. Compression of the nerve in the tunnel produces numbness, tingling and burning sensations in the little, ring, and middle fingers. Carpal tunnel syndrome is associated with fluid changes during pregnancy and occupations that require repeated forceful, awkward wrist postures and the use of power tools (e.g., assembly workers, meat processors, keyboard workers, and seamstresses).

In Raynaud’s phenomenon, the fingertips turn white and feel numb when exposed to cold. With increased vibration, this pallor extends to the base of the fingers. These attacks last several minutes to over an hour, and can be very painful. When diagnosing Raynaud’s phenomenon, health care practitioners need to remember that finger blanching may be symptomatic of other diseases or abnormalities. Exposure to hand-arm vibration over many years may cause decreased hand muscle strength, and may cause the numbness and cold sensitivity to persist between attacks.

Carpal tunnel syndrome and Raynaud’s phenomenon have been scientifically linked to extended use of vibrating handtools. There are several factors that will increase the risk of incurring these conditions: vibration frequency, vibration magnitude (acceleration), exposure time, temperature, awkward and static postures, and tool design. While vibration frequency and magnitude are the primary tool-related concerns, cold temperatures, static postures, high levels of force and poor tool design greatly decrease the amount of time a person can be exposed to the vibration before exhibiting symptoms of CTS or Raynaud’s phenomenon.

Taking preventive actions before the onset of symptoms will reduce the risk of developing CTS or Raynaud's phenomenon or reduce the progression of the condition if a person has already been diagnosed. The best method of prevention is to reduce the amount of time a person is exposed to the vibration source. You can accomplish this by providing additional breaks if necessary or implementing some type of worker- or job-rotation cycle.

Once proper measures have been taken to reduce the amount of time a person is exposed to vibration, steps need to be implemented to reduce the magnitude of vibration from handtools. Three preventive measures, used together, can reduce the magnitude of vibration:

- ? Properly maintain handtools.
- ? Use anti-vibration handtools.
- ? Use vibration-damping gloves.

Proper maintenance of handtools is essential. Follow the manufacturer's recommendations concerning preventive maintenance of handtools to keep the equipment in proper working order. In turn, the properly maintained equipment will keep the vibration levels to a minimum.

Several companies manufacture anti-vibration handtools for various applications. These tools are specially designed with vibration-damping materials and components that reduce the vibration emitted by the tools.

Vibration-damping gloves will reduce some of the vibration to the hands from the tools. Be sure to purchase gloves that have some type of gel in the palm. Full-fingered gloves offer better protection than do fingerless, or half-fingered gloves. Nevertheless, fingerless or half-fingered gloves will sometimes be needed for certain tasks and are, after all, better than nothing.

Besides vibration reduction, three other factors need to be considered to minimize the risk:

? Keep the hands warm and dry when working with vibrating tools. Several studies show a dramatic increase in the incidence of CTS and Raynaud's phenomenon when the climate becomes colder.

? Avoid using tobacco or stimulant drugs. The use of these drugs restricts blood flow to the skin by as much as 40 percent.

? Finally, maintain a neutral posture to reduce exposure to the unnecessary forces associated with non-neutral postures. For example, keeping the wrists and hands in line with the forearms reduces the muscle forces needed to grip the tools and lowers pressure in the carpal tunnel, thereby reducing muscle fatigue and increasing blood flow.

In a perfect world, handtools would not vibrate. But until then, we need to take precautions to keep our work force healthy, happy, and ready for the mission at hand.

For more information concerning exposure levels, consult scientific publications (e.g., American National Standards Institute, American Conference of Governmental Industrial Hygienists, or National Institute for Occupational Safety and Health), and keep the workers' exposure time to less than the recommended levels. For information pertaining to tools in the Federal Supply Service, consult the following website: <<http://www.GSA.gov>>.

