

U.K. Construction Company Works to Reduce Risk From Damaging Vibes

Carillion is working with Lancaster University to test an RFID system designed to track employees' exposure to tool-related vibrations and, thus, help prevent injuries.

By Claire Swedberg

April 28, 2008—Researchers at [Lancaster University](#) are halfway through a four-year pilot with U.K. construction firm [Carillion](#) using RFID technology to gauge the safety of construction employees at risk for hand/arm vibration syndrome (HAVS), also known as "white finger," as a result of overexposure to heavily vibrating equipment.

Although construction companies strive to prevent workplace injuries and health hazards, they have few tools available to track the health risk to a specific employee. A group of researchers at Lancaster University is studying how RFID might offer a means to track the amount and length of a worker's exposure to vibrations from heavy equipment.

The project, known as Networked Embedded Models and Memories of Physical Work Activity (NEMO), involves both the technical and psychological aspects of tracking an individual's exposure to vibration—not only measuring whether it can be done accurately, but also investigating how that worker accepts the tracking technology.

"All industrial activities are very dangerous," says Gerd Kortuem, a professor in Lancaster University's computing department. Although employers attempt to reduce accidents by providing education and safety equipment, he adds, there is little awareness as to how effective such measures might be, especially in the case of long-term health dangers.

HAVS, caused by prolonged exposure to intense vibration from such tools as jackhammers, drills or grass cutters, results in a loss of sensation in the fingers and can be disabling. Strict guidelines dictate the maximum amount of exposure to vibration a person can sustain, but tracking that amount on an individual level can be difficult.

Lancaster University researchers have developed a system consisting of active RFID tags with built-in accelerometer sensors. The tags can be attached to tools to measure the level of vibration, as well as how long a particular tool is being operated. Compliant with the 802.14 IEEE Wi-Fi standard, the tag transmits the accelerometer's data to an RF interrogator in the employee's badge. The badge, about the size of a typical cell phone, contains a chip, battery and display, and can compute and store the time and level of vibration the wearer is exposed to. As it collects that information, the badge's screen displays how long the worker has been exposed to vibration, and how much more is allowable within a specific amount of time.

When the employee approaches a project truck on the worksite, a Wi-Fi access point installed in the vehicle wirelessly downloads the badge's data, including the individual's unique ID number and the amount and time

of vibration exposure, then transmits that information to a back-end server via a GPRS signal. Lancaster University developed the software for the server that collects data from each ID badge and interprets it for Carillion's staff in the office.

The system is intended not only to provide the company insight into its workers' vibration exposure, but also to encourage employees to become aware of their own risk so they can make informed decisions. At this point, Kortuem says, it is still too early to determine whether the system is reducing the number of vibration-related injuries, or if it provides a return on investment. "A large-scale trial is being planned for later this year," he states, "to answer some of these questions."

The project began at the end of 2005, and researchers have since gathered data about the use of the technology at job sites, regarding how well the technology worked and how well users received it. During that time, Kortuem says, the team has added the display screen to the employee badge to indicate the hours and vibration levels the wearer has been exposed to. "That was a major factor for acceptance," he says. "People are much more resistant to the technology without the display." Being able to see exactly what the system was tracking, he says, has made employees more comfortable using it.

"Our goal is to investigate the issues and understand the consequences," Kortuem says. How the technology is used affects how well workers accept it. He notes that it is up to an employer to use the technology for beneficial purposes, such as ensuring employee safety, rather than for efficiency purposes—measuring how many hours it could require of a worker on a specific tool, for instance.

RELATED_ARTICLES Currently, Kortuem says, about 10 badges are being used in field trials. The technology is performing well, though the research group continues working to make the badges smaller and more energy-efficient. "I think we have seen many more opportunities for this technology to measure health and safety risk," he says, including prolonged exposure to other types of work-related hazards, such as sound, light, chemicals or radiation. By the time the pilot ends, around December 2009, researchers hope to have data to evaluate whether use of the system resulted in reduced injuries, as well as how well it was received by construction workers, and whether it provided benefits for Carillion itself.

The project is being funded by the Engineering and Physical Sciences Research Council (EPSRC), a U.K. government agency that provides money for research and training in engineering and the physical sciences.

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