

Beeping Hard Hat Designed to Prevent Construction Accidents

On behalf of Johnston, Moore & Thompson

- August 30, 2010

Every day in the U.S., five workers die in construction accidents. "A lot of construction equipment is dangerous and it's noisy, too," says Matt Reynolds, an assistant professor of electrical and computer engineering at Duke University. "Being a construction worker is one of the world's most dangerous occupations."

"The problem is, the operator of heavy equipment and the construction worker frequently don't have a good line of site," he explained in a recent interview with the Durham, North Carolina, Herald-Sun.

"The construction worker might have his back turned to the equipment and not hear it approach. Frequently they get into the path of a machine."

One strategy tried over the years to cut down on this kind of [construction accident](#) is the familiar beeping backup alarm on commercial vehicles.

The backup alarm is only partly effective, however. For one thing, most construction workers wear hearing protection, which can make the backup alarm seem quieter and farther away than it actually is. Ear protection devices can also interfere with directional hearing.

Another issue is that back alarms are everywhere -- particularly on construction sites. They indicate that a vehicle is backing up somewhere in the vicinity, but they don't tell you that it's right behind you -- and you're in the way.

Reynolds believes he has a new workplace safety device that could solve those problems and further reduce the incidence of dangerous and often fatal construction accidents. He calls the device, which he has been working on for two years with civil and environmental engineering professor Jochen Teizer of Georgia Tech, a SmartHat.

Technical Challenges Overcome to Get an Alarm So Audible 'It's Like It's Inside Your Head'

It seems like an obvious idea -- a hard hat that beeps when construction equipment is nearing that specific helmet's wearer. The reason no one has been able to make one before is simply that the battery technology wasn't available.

"Battery technology doesn't operate well in extreme temperatures," Reynolds explains. "When it's very cold or very hot, when it's under a lot of stress, it fails."

The SmartHat uses radio waves as a power source, which wasn't feasible until recent advancements in silicone technology made it possible to keep radio wave energy concentrated over longer distances.

In the SmartHat system, radio frequency identification (RFID) tags and antennas are mounted on equipment like backhoes and bulldozers. The tags transmit information about the vehicle's location -- and power for the SmartHat -- over radio waves.

On the receiving end, a microprocessor and wireless beeper are attached to the inside of the hard hat. As a vehicle approaches, the hat's beeper begins to sound, and then speeds up, giving location-specific information less likely to be ignored.

It also seems a lot louder.

"It's a very audible beeping sound that's inside your hat. In fact, it's very disconcerting -- it's like it's inside your head," says Reynolds. "It definitely makes you take notice of the situation. You can hear it even if you're wearing ear protection."

The SmartHat [construction safety](#) device isn't commercially available yet. Reynolds and Teizer say they're "in the very, very early stages" of development, having created a variety of prototypes and conducted field tests on construction sites in the Atlanta area.

Related Resource:

["Hard hat alerts workers to dangerous equipment"](#) (Durham Herald-Sun, August 23, 2010)