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WVU mining engineering professor's device seeks and saves trapped coal miners

October 28th, 2011

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Farmington. Sago. Upper Big Branch.

In West Virginia, those words draw mountains of sorrow and reflection from the state's deep-seated coal mining family.

Collectively, those three high-profile disasters snatched the lives of 117 miners. In a utopian world, the availability of adequate technology and equipment could have precisely pinpointed the location of those trapped miners and enabled a swift rescue.

A [mining engineering](#) professor at [West Virginia University](#) is working on making that utopian world a reality for coal miners across the state, country and world.

[Keith Heasley](#) recently earned a \$110,511 grant from the U.S. Department of Health and Human Services Centers for Disease Control and Prevention to develop a seismic system for locating trapped miners. The system is portable and can be set up within minutes of arriving at the accident site.

Click to hear WVU mining engineering professor Keith Heasley discuss how technology he's developing could have aided in the rescue efforts of the Sago and Chilean mine disasters.

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It's a project that stems from one of the previously mentioned mine disasters – Sago, in which an explosion trapped 13 miners for nearly two days in January 2006 in Upshur County, W.Va. Only one of the miners, Randal McCloy, survived.

"At Sago, they didn't know if anyone was alive or where they were," Heasley said.

The 13 men were trapped two miles inside the mine at about 280 feet below the ground. McCloy later recounted how he and his fellow miners took turns pounding at the mine bolts and plates underground with a sledgehammer, in hopes that rescuers above ground would hear those pleas for help.

"No one heard them," Heasley said. "It's all hindsight and conjecture, but if they had a system like the one we're developing, there may have been a quicker effort getting to them. It would've changed the dynamic of the situation."

Several factors inhibited responders' ability to locate and rescue the trapped miners. Traditional seismic systems used to locate trapped miners are limited in depth, Heasley explained. Most systems can't locate miners more than 400 feet underground. Although the Sago miners were trapped within 280 feet, background noise interfered with the signals from the seismic system.

Heasley said background noise, which can be anything from the wind, chatter or trees rustling, can interfere with the signals that determine a miner's exact location.

"You can have rain, road traffic, rescuers drilling ? there's a number of things that can impede the signals," he said.

But this system in development filters out the background noise. Last year, Heasley began collaborating with SureWave Technology, a United Kingdom-based company, to further develop this seismic system.

Since then, they've conducted field tests at two mine sites: The 4 West Mine in Greene County, Pa. and the Federal No. 2 Mine in Fairview, W.Va.

MEDIA



27920s001xx — Keith Heasley, a mining engineering professor, recently landed a \$110,000 grant to develop a system to locate trapped miners. Here Heasley poses for a picture with some of the engineering department's historic rescue and mine safety gear. (WVU Photo by Mark Brown.)

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Old methane detector — Keith Heasley, a mining engineering professor landed a \$100,000 grant to develop a system to locate trapped coal miners. Here, Heasley holds a historic methane indicator. (WVU Photo by Mark Brown.)

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Current equipment — Keith Heasley, a mining engineering professor landed a \$100,000 grant to develop a system to locate trapped coal miners. Here, Heasley is picture next to some of the department's state of the art testing equipment. (WVU Photo by Mark Brown.)

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Geophone — During a test at a local coal mine, Keith Heasley and graduate students used a geophone to detect pounding underground. (Photo courtesy Keith Heasley)

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Heasley system — Don't let the mess fool you. This bundle of cables and equipment is the next wave of technology to help save trapped coal miners. (Photo courtesy Keith Heasley.)

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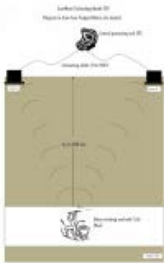


Diagram — A diagram of Keith Heasley's system. (Photo courtesy of SureWave)

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With the aid of his graduate students and other mining engineering faculty, Heasley and SureWave successfully detected the location of individuals pounding with sledgehammers 800 feet below ground.

“We’re proposing to test this system up to 2,000 feet below ground, which would take care of 99 percent of mines in this country,” Heasley said.

The system consists of sensitive microphones called geophones that are placed onto the ground. Geophones can identify underground sounds, such as pounding. These devices are attached to a computer that uses an algorithm to filter out background noise and determine a precise location of the underground sound.

The rescue response team should know within hours whether or not there are survivors from the accident and, crucially, where they are located. This is an unprecedented advance in mine safety technology, according to SureWave.

Given the dangers of coal mining, why doesn’t this technology already exist?

“Unfortunately, there’s not a big market for this type of mining rescue equipment,” Heasley said. “Each state might buy one, so that’s less than 100 units. In this case, it needs the support of federal funding for the health and safety of miners.”

Heasley and SureWave will continue to test this system at mines over the next 15 months – the duration of the grant. They hope to test it at a deep mine out in the West, as well as a site with background noise in West Virginia.

David Manning, director of business development in North America for SureWave, said the company’s managing director, Philip Shaw, has worked on this technology for 15 years. SureWave found out about Heasley when they discovered a report on him testing his system at a West Virginia mine.

The tool could also be used for military and Homeland Security purposes, Manning said. Illegal immigrants, terrorists or drug traffickers crossing the U.S. border from Mexico via underground tunnels could be caught with this technology, he said.

Click to hear Keith Heasley describe his students' experiences in helping him test a system that locates trapped miners.

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The tests have also given mining engineering graduate students an opportunity to participate in hands-on research and experiments in the field.

“We had one student underground doing the pounding,” Heasley said. “There were several on the surface helping out – digging holes, running wires and of course, analyzing the data. They enjoy that.”

But the purpose of the research bounces back to providing a safe environment for one of the grittiest jobs in the country.

Once Heasley’s technology is in place, West Virginia may no longer be known for these unfortunate disasters. It may be known, instead, for helping save miners all across the globe.

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-WVU-

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