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Submarines to underground coal

USING technology originally developed by the US Navy for its submarine fleet, new underground coal supplier InSet Systems plans to introduce inertial navigation technology to track and locate underground coal miners in real time.

Inertial devices have historically been used for the navigation of submarines, guided missiles, military aircraft, and space vehicles, but the technology has been miniaturized to the point where it is now small enough to be worn as a personal tracking unit.

InSet COO Jay Breeding told *Coal USA* InSet was established in April 2006 to bring the Inertial Sensor Tracking system to the underground coal market. The catalyst was the Sago mine accident early in 2006 and the ensuing MINER Act which requires operators to have wireless communication and tracking systems installed by June 15, 2009.

InSet has already built a working prototype of the system and tested underground the communication relay links and the inertial tracking devices in front of observers from the Mine Safety and Health Administration, a mine rescue team leader in the Sago Mine rescue effort, and the National Institute for Occupational Safety and Health.

In July last year the company successfully demonstrated its device at Murray Energy's Century Mine in Ohio.

The device is accurate to within 3m and can track miners or equipment in real time showing continuous movement, instead of just at certain points in a mine.

InSet says it is also possible that voice communications will be incorporated into the device.

The method of communication is wireless, with fiber optic back-up. The location data is relayed by transceivers to a base computer outside the mine where the location data is displayed on the mine dispatcher's tracking monitor.

Transceivers are installed in Lexan housings bolted to a mine roof or wall. The transceivers must be supplied with electric power to keep the batteries charged but run on the batteries when the power is shut off.

The number of transceivers required varies from mine to mine, depending on the mine's configuration, the height of the coal seam, the amount of undulation in the tunnels and more.

"We expect to be able to have a solid network with transceivers located every 500 to 1500 feet (150-500 meters). The transceivers will be arranged so that if communication with some are lost due to roof falls or explosions, the network will still be able to transmit data through other nodes in the mesh network. The radios in the sensor units worn by the miners

can also act as relay transmitters," Breeding said.

The sensor device fits onto a miner's belt, weighing less than half a pound and is about the size of a TV remote control.

"We do not expect that the sensor will replace any of the other gear a miner now wears unless he is now wearing a walkie-talkie. The data flow is two-way both to and from the miner's device, which would still be the case with the incorporation of voice communications."

Besides its safety attributes, the inertial device has the added advantage of being able to track equipment underground, map the mine, measure and record mine face progress shift by shift, and improve mine operational efficiency.

The company said its system can provide mines with accurate equipment location data which will save numerous man hours.

A patent for the device has been filed and InSet expects protection as the only company to be able to use the inertial devices to track underground personnel and equipment and use geodetic monuments for calibration of the devices.

InSet will apply for intrinsic safety approval from MSHA once a production unit is available. It expects the system to be available by this summer.