

Deploying wireless connectivity in subterranean

—by Ed Sullivan

Providing reliable voice and data communication that is flexible and durable enough for underground mining operations has been a labyrinth of issues—until now. Advanced connection technology today makes it simple and economical to couple fiber optic networking with an integral power source for truly flexible wireless access.

Advanced and reliable network communications will be required by law in underground mines within the next few years, according to the Mine Improvement and New Emergency Response Act of 2006. The question is, will meeting this technological challenge result in consternation, disruptions and ongoing pricey investments—or will you use this occasion as an opportunity to improve both safety and productivity?

“Not later than three years after the date of enactment, a plan (to be approved) shall provide for post-accident communication between underground and surface personnel via a wireless two-way medium, and provide for an electronic tracking system permitting surface personnel to determine the location of any persons trapped underground or set forth within the plan the reasons such provisions can not be adopted,” states the Act.

“The underground mining industry could benefit in a huge way in what we take for granted with typical surface-based wireless communications technologies,” says Will Gove, General Manager for Canadian Operations of Mine Site Technologies (MST). Headquartered in Sydney, Australia, MST is a global specialist in communications technologies for underground soft- and hard-rock mining applications.

Like most above-ground applications, subterranean mining operations not only face a profusion of network communications issues, but also exceptional economic ones. There is the inherently harsh environment, the need to frequently relocate communications access points, and potential for soaring maintenance costs—in addition to the critical need of providing unbroken communications and tracking capabilities for mobile people and equipment, especially within a very rugged environment.



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Partnering for a solution

Pursuing a far-reaching underground wireless solution, MST developed its ImPact Technology Suite, a network communications platform product line that extends a mine’s Ethernet topology into the underground workings. While the product line includes both wired LAN and wireless LAN platforms, it is the wireless connectivity that promises to address many of the “infrastructures” and “data communication” challenges that are typical of subterranean mining environments.

The optimum solution would be hybrid connector-cable carrying both fiber-optic communications as well as power [pictured above]. “Researching a provider of that technology led us to Applied Optical Systems (Plano, TX)” says Gove. “Applied Optical Systems (AOS) designs and manufactures fiber optic connectors and terminals for harsh and rugged environments.”

While AOS products include “tactical” fiber optic connectors conforming to U.S. military specifications, MST was particularly interested in the “F-Link™” series connector family which derives the “best in class” attributes from military-grade cylindrical connectors at a commercially viable price and includes versions designed for hybrid applications capable of supporting port counts from 2 through 34 channels across 4 shell sizes of product.

“AOS was able to produce a connector that works well with our ImPact system,” Gove explains. “As a result, we can place wireless access points anywhere needed throughout an underground installation.” MST began working with AOS to develop the specifications, including some unique features for a heavy-duty (“mine-hardened”) version of the F-Link. The outcome was a very robust ImPact System that provided mine operators with a very effective “plug & play” connector that’s easy to install within the mine.

The challenges to overcome

Gove’s team knew that MST wanted to integrate a technology that would allow the ImPact System to carry two-way voice and data



over a wireless network. Having served the mining industry for many years, they also knew that mining environments were exceptionally challenging. "In traditional wireless networking you need to power up every single device with 110-Volt AC power," Gove explains. "With our system and the F-Link Inter-connect System we are able to carry the power down the same cable that also carries voice and data. That means you only need to power every fifth or sixth device. Also, the composite fiber cable can be easily connected to other devices in the network with the F-Link's "three turn twist action." Many mine operators deploy Category 5 (or 5e) twisted pair cable in their networks, however, this cable can only be run in maximum lengths of 300 ft., whereas with the ImPact/F-Link system the cable can be run for up to two kilometers.

Another problem associated with Category 5 copper cables in underground mining is that interference from magnetic forces can cause corrupt data and sporadic performance. The fiber optic solution has no such problems.

"The underground mining environment is usually either wet or dusty," Gove says. "And often you have equipment running into or over cables and connectors. All of that spells 'maintenance,' which you don't have with the F-Link. It's water- and dust-proof and very durable. And it doesn't take a specialist to install it or move it, which could add up to major savings."

Complete connectivity

The F-Link makes the ImPact system highly adaptable for the mining environment. By providing independent channels, gender selectable plug or receptacles, and total environmental sealing of connector system, the F-Link is ideal for almost any application, be it a military, commercial, or industrial application.

"As long as the devices are 802.11 certified, they are able to communicate through the network," Gove says. "That includes personal devices such as PDAs, laptops, VOIP devices, and cell phones. Our users have complete flexibility to talk to each other, talk to mine operations on the surface, or make calls outside the system."

Productivity is an anticipated by-product of the wireless communication system's flexibility. The F-Link/ImPact System allows for automated collection of data, for example. This can incorporate digital (paperless) forms on laptops or PDAs, so that when an equipment operator needs to submit a daily maintenance form, it can be quickly completed via a PDA or laptop and then sent wirelessly to the central data collection for review and storage.

"The F-Link, the first hybrid connector system adds considerable communications power," Gove says, "which could also be extended to collecting sensor-based data such as temperature, humidity, airflow and gas."

[For more information, contact Applied Optical Systems, Inc., 1700 Capital Avenue, Plano, TX 75074 Phone: (877)-509-1500, (972)-509-1500; Fax: (972)-509-9009; Email: <sales@appliedopticalsystems.com> or visit the web site: www.appliedopticalsystems.com.]

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ANNOUNCEMENT

2008 ACSM/LSAW CONFERENCE

When: March 4-8, 2008

Where: Spokane Convention Center Spokane, WA

Note: The conference will take place from Tuesday March 4 to Saturday March 8. This schedule is different from the typical Friday-to-Wednesday schedule of ACSM conferences. As a result there is a possibility that the ACSM Congress meeting will be held on Sunday March 9, but logistics planning is still in progress.