Wireless Solutions for Surface and Underground Mining

Improve Productivity and Help Ensure Safety in Challenging Environments
Comprehensive Wireless Solutions for Mining Applications

For more than 30 years, Cooper Bussmann has provided complete wireless monitoring, control, and networking solutions for the mining industry. Our products and solutions are used throughout the world in surface and underground mining for metal, mineral, and coal processes.

Our proven solutions increase worker safety, improve mine security and improve equipment maintenance to help increase productivity and efficiency and lower costs. We provide wire-free economics while delivering wire-like reliability for mining operations.

Industrial Wireless

The Cooper Bussmann ELPRO brand of products has helped companies in more than 80 countries improve the management of their assets and operations through more effective monitoring and control with our reliable and secure wireless solutions. ELPRO is a top industry leader, providing wireless mining solutions used to monitor and control remote machinery, collect critical process data from sensors, track physical and human assets, and monitor security and the environment.

We provide a comprehensive Wireless Solution for surface and underground mining operations. Industrial wireless mesh I/O radios, gateways, serial products, cellular routers, Ethernet modems and industrial grade Ethernet switches meet the demands of the rugged long-distance applications of the mining industry. Our network management system lets you manage your network complexities and the inter-operation of diverse wireless and LAN equipment from one location. Our System Solutions group can work with you to connect your diverse automation systems, instrumentation and controls and integrate your processes.

Mobile Machine Control

OMNEX Trusted Wireless™ mobile machine control transmitters, receivers, and expansion modules help provide safe, reliable control in harsh mining environments.

OMNEX is the industry pioneer and leader in developing rugged radio remote controls for heavy machinery and field operations. OMNEX remote control products are used to wirelessly control high value hydraulic machinery in harsh environments with utmost reliability, precision and durability. Our products are robust, easy to use, configurable and stand up under the most demanding industrial conditions.

Wireless Benefits

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Long Range</td>
<td>Current frequencies allow for 20-50km LOS between clients</td>
</tr>
<tr>
<td>High Speed</td>
<td>Up to 50Mbps bandwidth</td>
</tr>
<tr>
<td>Secure</td>
<td>Uses industry standard encryption</td>
</tr>
<tr>
<td>Rugged</td>
<td>Impact-resistant housing</td>
</tr>
<tr>
<td>Reliable</td>
<td>Meshing technology provides high availability; Never-fail Trusted Wireless</td>
</tr>
<tr>
<td>Easy to Relocate</td>
<td>Fast roaming allows equipment to be mobile with no disruptions to data</td>
</tr>
<tr>
<td>Low Powered</td>
<td>Can be powered using small solar/battery installations</td>
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Surface and Underground Mining Operations

Wireless networking infrastructure is the facilitator to provide increased safety and productivity in environmentally challenging and mobile applications.

Surface

- Remote control operation of excavators, trucks, conveyors, load/haul/dump, bull dozers, mobile drills
- Surface extraction
- Ore treatment plants and quarries
- Security video monitoring
- Access-control systems
- Power network monitoring
- PLC interconnection
- Fuel tank gauging, leakage detection
- Alarm monitoring of portable machinery
- Treatment plant monitoring
- Automated collection of mine slope wall data
- Emergency shower monitoring
- Water supply control systems

Underground

- Underground utility services
- Longwall mining
- Ventilation fan monitoring
- Conveyor monitoring and interlock
- Tunnel boring
- Detection of moving machinery
- Gas detection systems
- Remote control/alarm of emergency generators
- Compatible with leaky-feeder antenna systems

The Cooper Bussmann ELPRO 915U-2 Wireless Mesh Networking I/O and Gateway is the industry’s first 20-mile range self-seeking, self-healing mesh radio. It is ideal for monitoring multi-kilometer conveyor systems for operation and safety, providing alarm and status data from dragline excavators, level monitoring and pump control at tailing ponds and wastewater facilities, and even safety critical automated collection of mine slope wall data for storage and analysis.

The Cooper Bussmann OMNEX TD3200 2-Way Remote Control with Color LCD Display is a robust, next generation radio remote control designed for smooth operation and precise control of industrial machinery. The multi-function radio remote incorporates state-of-the-art design, industry-leading ergonomics and integral two-way communications into a robust and lightweight portable control unit. The TD3200 features a 3.5” transflective color LCD display that provides extensive status monitoring, diagnostic information and controls capability.
Problems Solved

Achieving improved productivity, reduced costs, and increased safety with wireless.

Water Monitoring and Control
The monitoring and control of water resources on a mine often spans vast distances, making cabling impractical. Mine water balancing and water meters as well as borehole/reservoir monitoring and control are typical applications where wireless is used. ELPRO’s long-range 105U radio telemetry systems provide a reliable radio alternative to cabling.

Ventilation Fan Monitoring
Ventilation fan malfunction consequences are serious, especially in mines of great depth. Fans are often situated far away from the control room making constant monitoring difficult via cabling. An ELPRO radio link indicates when a fan has tripped. Data such as bearing temperatures and vibration readings is fed over the radio link into a SCADA, PLC or controller that will handle the alarm conditions.

Security and Surveillance
Video surveillance on mines is being used for detecting process and security problems before they occur—preventing costly operational shutdowns and delays. ELPRO’s 245U-E wireless Ethernet modem range specifically targets high-throughput applications such as plant-based video surveillance. Military-grade encryption, WDS multihop repeating and serial server functionality (RS232/45) are some of the standard features within the range.

Mobile Machinery and Stacker-Reclaimer Communication
It is essential to have a reliable communications connection between the control room and the moving piece of equipment. Problems easily arise with cables and slip rings and communication cables to stackers or reclaimers. An ELPRO wireless modem (Ethernet/RS232/RS485) between a PLC on the stacker or reclaimer and the control room proves an ideal solution.

Networking Fire Detection and Access Control Panels
During fire conditions, cables are prone to interruptions. Linking wireless is a safer option. ELPRO modems are used extensively to facilitate secure communications. The radio modems feature encryption as standard to ensure information security. Error checking over the air further ensures data integrity and reliability. All modems have a license-free option and can be easily configured by the contractor or client directly to ensure fast installations with minimal delays.

Mobile Machine Control of Hydraulic Machinery
OMNEX remote control transmitters and receivers are used in mines to operate excavators, load/haul/dump trucks, conveyors, and bulldozers. Also, mobile drills, inside very large tunnel boring machines to erect the segments (lining for the tunnel walls) while tunnel boring is occurring.

Solutions Delivered

Solving the simple to complex problems in surface and underground mining operations.

Conveyor System Monitoring Iron Ore Plant
A mining company transports its ore via a 17km long conveyor. ELPRO industrial wireless units were fitted to each section of the conveyor to measure roller bearing temperature. Overheating bearing alarms are transmitted back down the conveyor to the mine as an early-warning to allow planned maintenance of the conveyor. The ELPRO wireless units are battery powered. The wireless system also acts as an independent backup for conveyor safety trip and sectional interlocking.

Excavator Alarm Data Surface Coal Mine
A moving dragline excavator in a surface coal mine uses ELPRO wireless units to transmit alarm status and operational data from the dragline boom to the operator’s cabin, and also to the nearby maintenance depot. The wireless units replaced flexible cable connections which had poor reliability performance causing frequent machine outages.

Video Monitoring at Ore Dump Points
ELPRO wireless Ethernet units are used to connect video cameras at ore dump points to monitors in the cabins of large ore-carriers. The wireless video connection allows the carrier drivers to monitor the area during the ore transfer process for potentially unsafe situations.

Truck Loading Processing Taconite Pellet Plant
A taconite pellet manufacturing plant needed a reliable, easy to maintain radio control system to ensure product was safely and efficiently loaded into trucks for transport. An OMNEX Trusted Wireless™ FHSS remote radio control system was used to add more functionality and prevent multiple transmitter interference, and a set of video monitors to increase visibility. The solution revolutionized the plant’s loading process, creating a safe, reliable method of control. The OMNEX rugged, foolproof wireless remote, combined with supplemental control equipment, ensured reliable, precise control in a coarse, hazardous environment. Workers were safer, productivity was kept at a maximum and upkeep was a breeze.

“Our ELPRO wireless telemetry system provides communications from the difficult-to-reach irrigation stations in our sulphide leaching process. The critical process variables of flow, pressure and temperature, as well as pump control, are seamlessly transmitted to the PLC to ensure proper operation.”
Jose Miranda Romero, Chief Control and Communication Process Xstrata Lomas Bayas Mining Company, Antofagasta, Chile
Achieving Increased Safety and Productivity Through Automated Slope Monitoring System

Movement of open cast mine walls poses a major safety issue. Personnel and expensive equipment are at risk. Manual data collection is error prone and dangerous. Changes to a mine require occasional relocation of equipment. Instrumentation is an issue due to physical changes in mine environment. Cabling can be prohibitive and often not an option. A low-powered remote solution is required. The higher the slope angle, the more efficient a mine can be.

Slope Monitoring Solution

Our automated slope monitoring solution utilizes automated survey equipment that measures angle and distance to target prisms located around mine wall. A wireless network provides the means for automated collection of slope wall data for storage and analysis.

Fully Integrated Solution

- Seamless integration of instrument and alarm data to existing control networks
- Wireless network provides reliable way to integrate key measurement instruments
- Database of mine wall information provides long-term trending
- Analysis provides near real-time notification of mine wall issues, both in the office and in the pit
- Provides integration of additional measurement technologies (weather)

Wireless Product Portfolio

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<td>Control System</td>
<td>Asset Management System</td>
<td>Network Management System</td>
<td>Automated Survey Equipment</td>
<td>Control Room</td>
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<tr>
<td>Gateway 400/869/900MHz</td>
<td>Mesh 869/900MHz</td>
<td>Modern 2.4/5.8GHz</td>
<td>Gateway Modern 900MHz</td>
<td>2.4GHz/900MHz</td>
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<tr>
<td>Ethernet Products</td>
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<td>Unmanaged Switch</td>
<td>Cellular Modern Quad Band</td>
<td>Hand-held Proportional 2.4GHz/900MHz</td>
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<tr>
<td>Mesh 869/900MHz</td>
<td>Modern 2.4/5.8GHz</td>
<td>Modern 900MHz</td>
<td>Managed Switch</td>
<td>CAN Controller 2.4GHz</td>
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<tr>
<td>Serial Products</td>
<td>Managed Switch</td>
<td>Expand</td>
<td>CANbus 2.4GHz/900MHz</td>
<td>Expansion Modules</td>
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</table>
| Ethernet Products | Gateway 2.4GHz | Data Concentrator 2.4/5.8GHz | Expansion Modules | **Can Use These Images:**
| Cellular Modern Quad Band | Gateway Modern 900MHz | **Automated Survey Equipment** | **Repeater** | **Prism** | **Control Room** |
For more information:
Please visit our website for further details or contact your local representative.

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The Cooper Bussmann Wireless Business Unit is headquartered in the San Francisco Bay Area, with offices in North America, Asia, Australia and Europe. For more than 30 years, we have provided complete wireless monitoring and control solutions to the industrial market with our two brands, ELPRO Technologies and OMNEX Control Systems. We are the industry leader in the design and manufacture of industrial wireless products, and offer an extensive product portfolio of wireless transmitters, receivers, gateways, I/O, modems and more. Our wireless monitoring, control and networking solutions are designed to meet the challenges of a broad range of industrial applications.

www.cooperbussmann.com/wireless

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