Industrial Wireless
for Cranes and Heavy Industry

Success Stories
Reliable and Real-time WLAN Connections for Underground Mines

Overview
Underground mining operations require efficient and reliable mine-wide communication systems to maintain smooth operations and safeguard the safety of miners. Traditional wired networks are poorly suited for reaching all the corridors of an intricate, multilayered mine network. Wireless LAN offers wide-range mobility, freedom from cables, and plenty of bandwidth to create mining operations that run smoothly and can quickly recover from emergencies.

Application Requirements
- Reliable WLAN connection with full coverage of mine operations from the underground mine to the surface control center in real time
- 4.9 GHz band operations to avoid interferences
- Up to 1 km long range data transfer to surface control room
- Video data transfer rate of 15 Mbps
- Designed for arduous underground mine conditions

System Description
An industrial WLAN system makes it possible to track miners and mobile equipment throughout a mine system, and also monitor different environmental conditions such as toxic gas, humidity, and fallen rocks using sensors.

The system uses several AWK-6222 units with outdoor dual RF design that are installed as access points along the underground line and are connected to each other using Ethernet cables. One AWK-6222 is set up as an AP to communicate to the above-ground control room located one kilometer away from the mine entrance.

Mining operations include mobile machinery, such as mine wagons, large wheel loaders, and off-highway mining trucks. To wirelessly monitor and track this array of vehicles and equipment, each vehicle is installed with one AWK-6222 configured as a client, which in turn connects to an EDS-205A switch that itself is connected to PLCs, GPS equipment, and video cameras via Ethernet cables.

Moxa WLAN wireless products empower the mine system with exceptional wireless performance. Fast roaming allows seamless handovers from one access point to another over wide-ranging areas. The AWK-6222 also features dual RF modules to provide the security of redundant wireless links, and the 4.9 GHz operation prevents possible radio interference.

Video surveillance is important due to the many possible blind spots at a complex mine site, and a video data rate of up to 15 Mbps is required to guarantee that video data is transferred to the control center in real time.
Moxa’s Solutions
- IEEE 802.11a/b/g access point and client in one device
- High availability and WLAN redundancy with two RF modules
- Roaming for seamless mobility
- Level 3 for high EMS
- Tailor-made RF band service
- -40 to 75°C, IP68, and up to 10 km data transfer
- Integrated wireless and unmanaged wired network

Product Offerings
- **IEEE 802.11a/b/g access point and client in one device**
- **High availability and WLAN redundancy with two RF modules**
- **Roaming for seamless mobility**
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- **Tailor-made RF band service**
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- **Integrated wireless and unmanaged wired network**
Overview
The steel industry remains an indispensable part of the economy of many countries, including China and the United States. Modern steel plants must operate extremely precisely in order to produce consistent, high quality output. Reliable wireless communication and tracking systems are key components of steel production operations to reduce maintenance workload, increase efficiency, and reduce the risk of accidents. For example, the ladle transfer cars that transport molten steel have the potential to cause serious accidents, such as breakouts, which can lead to production interruptions, injuries, and even loss of life. Proper wireless monitoring and control of the ladle transfer cars would mitigate these risks.

Application Requirements
- Save cable maintenance cost
- Prevent data loss to maintain quality of production
- Provide wireless roaming for seamless handover
- Widely distributed network with seamless connectivity
- Up to 15 Mbps for stable throughput
- Level 3 EMS (Electro-Magnetic Susceptibility)

System Description
For this system, a reliable wireless remote control system can be used to telemetrically connect ladle transfer cars to a central control center. This wireless communication system can maintain real-time data access without compromising car mobility. AWK-5222 units are placed every 100 m to form bridge networks along the car tracks in order to create wireless network coverage across the entire plant. Thanks to dual RF channels, the AWK-5222 can easily create redundant two-way cascade links and form a bridge network by running the same device in both master and slave mode. This optimizes the reliability and cost-effectiveness of each wireless unit while maintaining a throughput of up to 25 Mbps. The AWK-5222 nearest the control room links the wireless backbone to Ethernet via an unmanaged EDS-208A switch.

AWK-6222 units are installed as redundant clients in the ladle transfer cars and connect to PLCs that remotely control and monitor a number of factors, including car location, environmental conditions, and furnace operating conditions. To connect the ladle transfer cars to the wireless backbone, the AWK-6222 units are configured as redundant APs and are linked to AWK-5222 units using an Ethernet cable. The two independent RF modules form a redundant wireless connection between the AP and client to ensure no data loss and safe operations. Fast roaming between APs ensures uninterrupted performance across the entire wireless coverage area.

A steel plant is a harsh operating environment that includes dust, smoke, vibration, EMI/noise, and extremely high temperatures. The AWK-6222 overcomes these hazards with an IP68 rating, -40 to 75 °C operating temperature range, and level 3 EMS rating.
**Product Offerings**

- **EDS-208A Series**
  - 8-port Rugged Unmanaged Ethernet Switches
  - Configurable 100Base-TX and 100Base-FX
  - -40 to 75°C operating temperature
  - Dual redundant 12/24/48 VDC and 18 to 30 VAC inputs
  - C1D2/ATEX Zone 2 and DNV/GL ratings
  - Slim IP30 aluminum housing

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**Moxa’s Solutions**

- Wireless and wired networking
- Redundant wireless technology
- Turbo Roaming for seamless mobility
- Cascade links to form a bridge network with stable throughput
- -40 to 75°C, IP68, and Level 3 EMS

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**AWK-6222**

Outdoor Dual RF AP/Bridge/Client

- WLAN standards: IEEE 802.11a/b/g
- Fully redundant solutions:
  - Wireless/Ethernet/power redundancy
- Fast roaming for seamless handover
- Smooth network traffic:
  - QoS (WMM), VLAN, and up to 25 Mbps throughput
- Interference-free solution:
  - 2.4 and/or 5 GHz RF bands
  - Level 3 EMS
  - Robust metal housing
- Industrially hardened design:
  - IP68, -40 to 75°C, and up to 10 km data transfer
- Mounting flexibility: Pole, DIN-Rail, and wall mounting

**AWK-5222**

Indoor Dual RF AP/Bridge/Client

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  - Wireless/Ethernet/power redundancy
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Overview

Boom bucket wheel stacker-reclaimers are used for bulk material handling in the coal, cement, gravel, and steel industries. Though these machines were once entirely manually operated, modern industry is increasingly using automation to increase operations efficiency, safety, and cost-effectiveness. In order to remotely operate a stacker-reclaimer, the control room needs to monitor and exchange PLC/IO signals with the machine. This way, one operator can manage an entire operation from the control room. However, boom bucket wheel stacker-reclaimers are among the world’s largest terrestrial vehicles, with boom lengths that can exceed 60 meters. The sheer scale of the vehicle presents obvious networking obstacles which make cabling both expensive and unreliable. WLAN technology has emerged as an alternative that not only eliminates cabling hassles and increase future expandability, but also provide a means for remote control and monitoring.

Application Requirements

- Eliminate the expensive and time-consuming task of cable installation
- Transmit real-time signals from material handling PLC to operator’s cab via wireless LAN
- Avoid PLC I/O signal loss since material handling PLC is on a moving platform
- Provide wireless reliability and redundancy for uninterrupted connectivity
- Dustproof, waterproof, and wide temp. support for harsh mine environments
- Provide at least level 3 EMS (Electro-Magnetic Susceptibility)

System Description

Stacker-reclaimer automation reduces the operating costs of the mine plant in this example. The stacker and reclaimer are constantly moving, so the material handling PLC needs to communicate with the operator’s cab using WLAN. Moxa’s industrial 3-in-1 wireless AP/Bridge/Client products are ideal for this type of application. One AWK-6222 is installed as a client on the belt conveyor to link the material handling PLC and IP camera via its dual Ethernet ports, for video monitoring and data collection of digging conditions and the bucket wheel’s operation. One AWK-5222 is installed in the operator’s cab to connect to the PLC controller. Both products feature dual RF modules that can set up two independent wireless links to guarantee zero data loss. All of the data from on-site material handling PLCs can be collected and transmitted to the AWK-5222 in the operator’s cab in both the 2.4 and 5 GHz bands. This allows operators to monitor and control machine speed and position reliably and safely.

This stockyard is located in a mining mill where equipment is exposed to harsh conditions such as dirt, humidity, vibration, and extreme temperatures. Moxa’s wireless products are IP68 rated and verified to operate over a large temperature range to ensure continuous operations despite environmental challenges.
Moxa’s Solutions

- Dual RF design for WLAN redundancy
- IP68 rated for dustproof and waterproof
- -40 to 75°C operating temperature
- Level 3 EMS
- Wi-Fi Multimedia (WMM) QoS to prioritize time-sensitive traffic

Product Offerings

**AWK-6222**
Outdoor Dual RF AP/Bridge/Client

- WLAN standards: IEEE 802.11a/b/g
- Fully redundant solutions:
  - Wireless redundancy using two independent RF modules
  - Ethernet redundancy via RSTP and Moxa Turbo Ring
  - Power redundancy with Redundant power inputs and PoE
- Fast roaming for seamless handover
- Smooth network traffic
  - QoS (WMM) to prioritize delay-sensitive traffic
  - VLAN for network segments
  - Up to 25 Mbps throughput
- Interference-free solution:
  - 2.4 and/or 5 GHz RF bands
  - Level 3 EMS
  - Robust metal housing
- Industrially hardened design:
  - IP68 rated for dustproof and waterproof
  - Operating temperature from -40 to 75°C
  - Long-range communication of up to 10 km
- Mounting flexibility: Pole, DIN-Rail, wall mounting

**AWK-5222**
Indoor Dual RF AP/Bridge/Client
Moxa’s Commitment to Trust

A Trusted Single Source
• A single source for wireless and wired LAN solutions
• Long-term, sustained value from upgradable, standards-based solutions

A Trusted Partnership
• 23 years of proven experience in Industrial Networking
• Client references: Caterpillar, Siemens, Tenova, Yokogawa, TianQiao

Trusted Quality
• 5-year warranty
• Strict 24-hour dynamic burn-in policy
• Certifications: C1D2/ATEX Zone 2, DNV, EN60950, UL508, IEC 61850, EN50155, e/E mark

Trusted Service
• Tailor-made RF band service
• Technical experts who understand unique customer needs
• Branch offices and distributors in over 60 countries

Absolutely Reliable Wireless LAN Connectivity