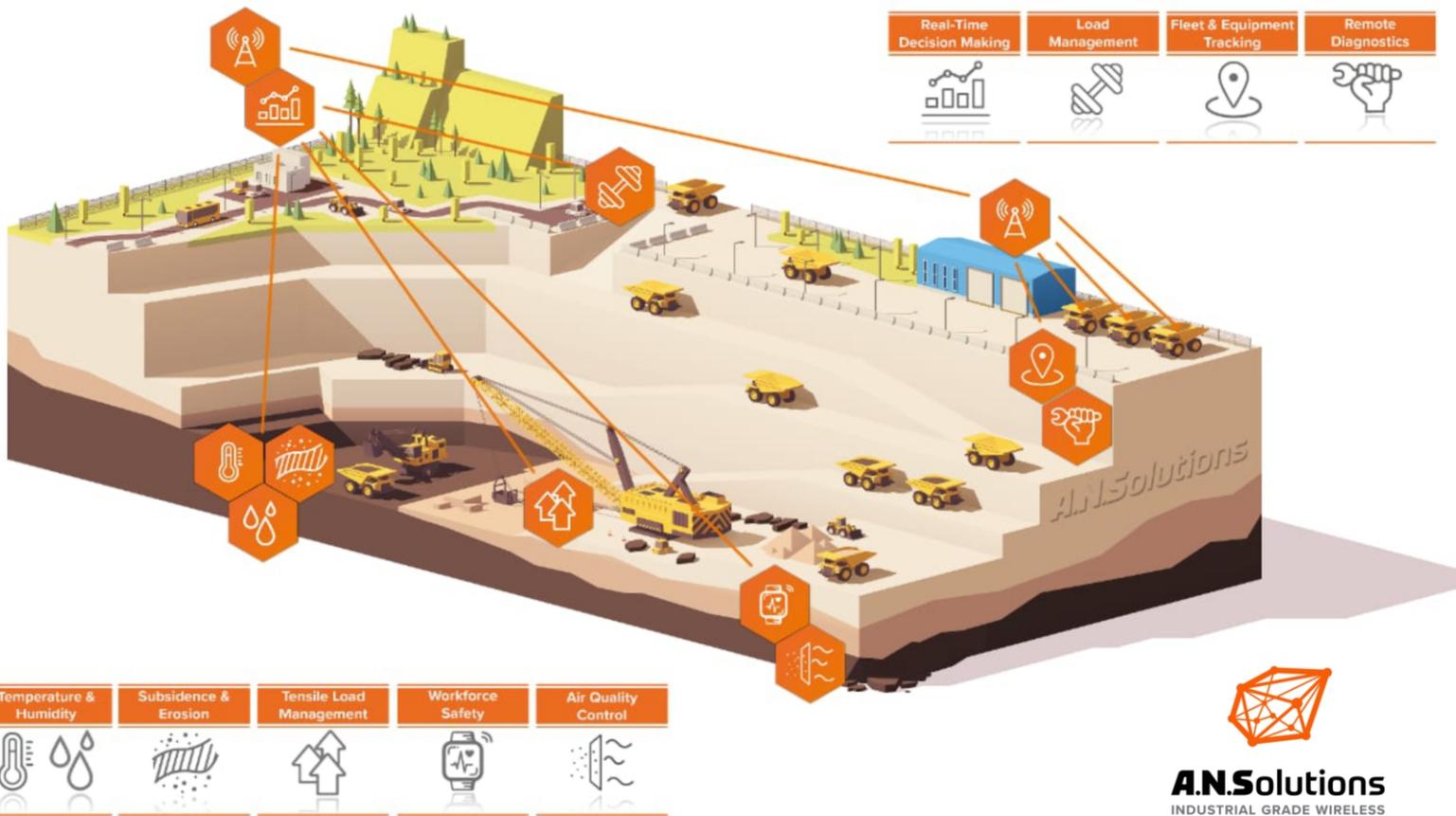


A.N. Solutions Enables Smart Mining Applications with Reliable Wireless Connectivity



Smart Sensors Improve Efficiency and Cut Costs

The mining industry has come a long way from pickaxes and shovels to sophisticated machines and tools. Yet another revolution is sweeping the industry. Powered by wireless sensor technology, the Internet of Things (IoT) brings connectivity to every piece of equipment in the field while offering significant benefits, from enhanced safety to cost reduction and increased efficiency. Whether it's an underground or a surface mine, the miners' safety is of paramount importance. Methane gas buildup may cause an explosion. Contaminated dust and volatile organic compounds (VOCs) are toxic and pose a significant health hazard. Machine operator's fatigue can cause an accident. By keeping a watchful eye on air quality and worker's vital signs, wireless sensor devices spring into action when critical conditions are detected. They help prevent accidents and

save lives 24/7.

Mining operations require a lot of sophisticated tools and equipment. Open-pit mining requires a fleet of dump trucks and earth-moving equipment. Every mechanical failure results in costly downtime and may affect many other links in the production chain, snowballing the losses. Smart connectivity allows a company to diagnose each vehicle's health remotely, and schedule maintenance proactively. Vehicle usage can be optimized by tracking and analyzing its performance.

Ground subsidence and erosion are extremely dangerous while being ever-present in open-cast mining. By detecting minute shifts, tilt sensors monitor ground subsidence and provide advance warning. It is also important that the dump trucks do not get overloaded. Wheel load scales help ensure that the truck load is within the acceptable range. Fitted with radio

transmitters, they relay real-time data to the operations control center.

How Sensor Network Operates

Mines use a wide variety of sensors that measure all kinds of parameters, from temperature and humidity to tilt and acceleration. However, all this valuable sensor data needs to be harvested and transmitted, often in real-time, so that it can be analyzed and visualized, and actions can be taken in a timely manner. Wireless technologies hold the key to solving this challenge.

Each sensor node is equipped with a tiny radio transceiver and antenna. An embedded microcontroller is its "brains." Software determines the mode of operation of a sensor node and the frequency of data transmission. A sensor node can serve as a pure monitoring device or when equipped by an actuator, will perform a control function.

Battery-powered sensor nodes can operate autonomously for years and are easily fitted even into the most hard-to-reach locations. They offer the ultimate flexibility in the network configuration.

Wireless Solutions that Work Reliably

A.N. Solutions specializes in developing reliable and rugged wireless sensing solutions that work in the environments that are most “unfriendly” to a radio signal, from trains to industrial equipment to mines. A.N. Solutions has been building ATEX compliant solutions and designs capable of operating in the -85°C to 145°C temperature range, which far exceeds IP67 requirements. With a large portfolio of reference designs from different industries, A.N. Solutions can create a future-proof system quickly and cost-effectively. The recent proliferation of wireless standards makes it difficult to select the one that best fits the application. A.N. Solutions will help you select the wireless protocols and components spanning 169MHz up to 5.2GHz radio spectrum to achieve an optimum range vs. signal strength, battery life, and important characteristics, according to your requirements. Software fine-tuning is important for a secure and efficient sensor data acquisition and storage process, as well as battery life. Antenna design is a critical factor for reliable data transmission. Long battery life is the key to smooth operations,

and A.N. Solutions has mastered different battery technologies, including industrial-grade rechargeable cells, and more. Many mines have wired or wireless legacy systems in place. Replacing them completely is prohibitively expensive. A.N. Solutions' experts will be able to seamlessly integrate a new wireless network with the legacy system, and combine the data collected. A.N. Solutions offers comprehensive expert services for every stage of wireless product development - from a thorough review of the current architecture and the need assessment to mapping out a migration plan and creating a proof of concept. Combining in-depth knowledge of wireless protocols, such as IEEE 802.15.4/Zigbee, 6LowPAN, and LoRa, and their compatibility, with all aspects of connectivity and device management, network security, and sensor data acquisition, A.N. Solutions experts will provide step-by-step guidance.

The advantages of working with A.N. Solutions are many:

- In-depth expertise in all facets of IoT design;
- Its own product line of rugged IoT components;
- Rapid prototyping using 3D modeling;
- Safety and compliance certification assistance;

- Extensive partner ecosystem of industry leading vendors and service providers, incl. Bosch Sensortec, Microchip, Nordic, Qorvo, Sensirion, and more;
- Flexible engagement options and support packages;
- Uncompromising “Made in Germany” quality.

Explore our IoT solutions and contact our engineers at www.an-solutions.de.

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Building Reliable Wireless Solutions for Smart Mining

- ✓ Air quality and condition monitoring
- ✓ Subsidence and erosion surveillance
- ✓ Workforce safety monitoring
- ✓ Automated load management
- ✓ Proactive fleet management
- ✓ Remote diagnostics and preventive maintenance
- ✓ Real-time decision making and operation control

