



REN SERIES APPLICATIONS: UNLOCKING POSSIBILITIES IN THE **MINING** INDUSTRY

The mining industry demands rugged, high-performance technology capable of withstanding harsh conditions while potentially enhancing operational efficiency and safety. The REN Series, with its versatile and resilient design, could offer solutions tailored for both current and forward-thinking mining applications. With its adaptability to various use cases, the REN Series might help modernise mining operations, support safety measures and facilitate data-driven insights on site.

Enhancing Safety and Operational Efficiency

1. On-Site Data Processing for Drilling Operations

In modern mining scenarios, quick, data-based decisions are essential. Deploying REN units, such as the REN 19-14 Standard, on drilling platforms could enable on-site analysis of key performance metrics. The robust design of REN boxes might allow them to withstand extreme temperatures, high dust levels and constant vibrations. This localised data processing could lead to faster response times for drilling teams, enabling them to adjust operations to maximise efficiency and minimise risks without relying on remote data processing.

2. Remote Equipment Health Monitoring

The downtime of heavy machinery can severely impact productivity. REN systems might be integrated into maintenance frameworks, potentially functioning as local processing nodes that track equipment health using data from IoT sensors. The inclusion of the latest Intel hardware could also allow REN systems to run advanced CYBER protection software at the NODE, safeguarding sensitive operational data from cyber threats. These features could enhance predictive maintenance strategies, reducing unexpected failures and optimising machine performance. This edge-processing capability could provide mining engineers with predictive maintenance alerts, reducing unexpected failures and optimising machine performance. The removable I/O plates and adaptable connectivity of REN boxes might make them easy to integrate into various types of equipment, offering compatibility with both legacy and modern machinery.

Intelligent Autonomous Systems

3. Coordination of Autonomous Vehicles and Drones

As automation progresses, more mines are incorporating autonomous vehicles and drone fleets for tasks such as ore transport, surveying and safety checks. The REN 19-14 VPX, equipped with powerful VPX cards, might handle the computational demands of managing these systems, including the real-time processing of data from sensors and cameras. This capability could enable smooth and coordinated operations, where vehicles communicate effectively to avoid collisions and ensure optimal task execution. By deploying REN units, operators might retain the flexibility needed to adapt to changing site conditions and requirements.

4. Surveillance and Environmental Compliance

Meeting environmental regulations is a critical aspect of mining operations. REN units could assist by collecting and processing data from air, soil and water quality sensors. This real-time monitoring might help companies stay compliant and respond proactively to potential environmental issues. With the ability to manage large data sets through integrated EPU or ESUs, REN systems could provide a reliable backbone for continuous environmental assessments, allowing engineers to mitigate risks while maintaining operational efficiency.

Hypothetical Scenario: Smart Mining Operations with REN

Imagine a modern mining site equipped with an interconnected network of REN boxes positioned both underground and on the surface. These units could serve as the digital core of the operation, managing everything from drilling efficiency to workforce safety. Equipped with real-time communication capabilities, REN systems might enable seamless information flow between monitoring stations, control rooms, and field teams. In this smart mine, predictive analytics processed by REN units could forewarn operators of potential structural weaknesses or equipment wear, preventing accidents before they happen.

Optimising Extraction Techniques

By analysing geological data at the edge, REN systems might help mining engineers fine-tune extraction techniques for maximum yield. Real-time processing of seismic data, rock density, and mineral composition could enable immediate decisions on blasting and drilling strategies. This might optimise resource use and reduce operational waste.

Resource Allocation and Energy Management

Efficient use of energy is essential, especially in remote mining operations where power resources are limited. REN boxes, integrated as part of an energy management system, might track consumption patterns and redistribute power where it's most needed. This smart allocation could lower energy costs significantly and improve overall sustainability by balancing load demands and integrating renewable sources like solar panels or wind turbines into the mine's energy matrix.

Advancing Safety Protocols and Workforce Protection

5. Worker Tracking and Safety Monitoring

The unpredictable nature of underground mining necessitates advanced safety measures. REN units might track worker locations through wearable devices and process this data in real-time to ensure safety compliance and fast responses in emergency situations. The REN's processing power could enable quick analysis of environmental sensors monitoring for gas leaks, temperature spikes, or vibrations that might indicate potential cave-ins, with alerts sent instantly to the control room and workers' devices.

6. Emergency Response and Disaster Management

In the event of a mine collapse or other emergencies, REN systems could play a pivotal role in coordinating response efforts. The REN Mini, housed in a rugged transit case, might be deployed as a mobile command unit with plug-and-play capabilities. This setup could allow it to rapidly process and relay information from various sensors, cameras and communication devices on the scene. The comprehensive, real-time situational analysis it provides might ensure rescue teams have the critical data needed for well-coordinated, timely interventions, thereby enhancing safety and operational efficiency during high-risk scenarios.

Enhanced Communication Infrastructure

Deep underground, conventional communication systems often struggle. REN units might support mesh networking solutions that extend communication lines to hard-to-reach areas, ensuring that teams stay connected even when working in the most challenging parts of the mine. This improved communication network could enhance coordination between surface and underground teams, increasing operational effectiveness and safety.



Paving the Way for Future-Ready Mining Solutions

7. Sustainable Mining Operations

As the industry shifts towards more sustainable practices, the REN Series could play a pivotal role. REN boxes might integrate renewable energy sources into daily operations, acting as intelligent controllers for hybrid power systems that combine traditional and renewable energy inputs. This could help reduce the carbon footprint and promote cleaner, more sustainable mining practices.

8. Integration with Next-Generation Mining Technology

The future of mining will likely include advancements such as AI-powered decision-making and advanced robotics. The REN Series, with its modular and scalable architecture, could support these future technologies. Engineers might develop and deploy AI models directly onto REN platforms to enable smarter, automated processes that adapt to the ever-changing landscape of mining operations.



Disclaimer:

The scenarios and applications described in this document are hypothetical in nature and intended solely for informational and illustrative purposes. Actual deployment, performance and results of the REN Series in mining applications may vary depending on specific configurations, environmental conditions and integration with other systems. The REN Series is provided as a customisable edge processing platform, not as a finished product; therefore, end users may need to modify, configure and integrate REN components to meet their specific requirements. All users should perform thorough testing and consult with qualified engineers to determine suitability for their intended use. Unitronix disclaims any liability for direct, indirect or consequential damages arising from the use or reliance on this document or the products described herein.



About Us

Unitronix are an innovative engineering-capable distributor and manufacturer of rugged, embedded computing solutions for military, aerospace and high-end industrial applications. Our own innovative Rugged Embedded Nodes - REN are reusable, reconfigurable, recyclable, cutting carbon footprint and saving cost.

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