The Wireless Touch: Contactless Monitoring

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The machine roars, vibrates, and fills the air with dust. For decades, maintenance was an almost desperate act of physical contact: attaching cables, bolting on accelerometers, and hoping they would not come loose. Deep underground, that is a losing battle. Heat and noise eventually sever any connection. And if the obsession with touching the steel to feel its failure belonged to the old school, today the paradigm shift is to understand that operational robustness can arise from the subtlety of an invisible wave.

The 2025 Nobel Prize in Economics recognized a truth that can be uncomfortable at an industrial site: innovation requires patience. It is a learning process. Unlike other investments, it does not deliver results overnight; it involves trial, error, and the ability to adapt to the hostility of real-world conditions. A plant's competitiveness is built on the technical conviction of those who understand that data is the only solid ground.

The Physics of Certainty

STGI Mining has installed wireless vibration and temperature sensors in large mining operations, studying these variables in hydrocyclones, for example, and combining these signals with images to detect the Roping phenomenon (or cyclone roping). This ecosystem

does not operate through the sensor alone; our integrated systems use edge computing (Edge AI), meaning that the brain is installed directly on the machine so the algorithm can make decisions on site, without losing time sending data to the surface.

Another technology we are testing at the plant is millimeter-wave radar (mmWave), which is designed to detect the invisible: metal objects covered by ore on a conveyor belt, known in mining as uncrushables. The system processes vibrations across a range covering the audible spectrum - from 10 Hz to 16 kHz - with a physics of certainty that enables a relative error margin of just 0.5 percent.

While optical methods can be blinded by airborne dust and ambient noise can confuse microphones, radar provides a direct and localized measurement. It achieves a balance between sensitive capture and the robustness of IP68-protected hardware.

Data as a Lifeline

Automation is no longer a technological luxury; it is the lever that ensures the viability of the mining business. Faced with phenomena that the human eye cannot anticipate, such as rock slab falls or rockbursts, contactless monitoring is becoming the standard for survival.

As stated in the Strategic Return on Investment Analysis (2025-2026), which integrates official data from Sernageomin, Cochilco, and Codelco, remote monitoring is now the only real means of removing personnel from high-exposure areas. With statistics warning of a 60 percent increase in fatalities, withdrawing personnel from the working face is where ethics and profitability converge.

STGI Mining designs an ecosystem that extends from the algorithm and the sensor in the dust to the dashboard in the control room. We do not deliver isolated hardware; we orchestrate integrated solutions at critical points such as chutes, hoppers, feeders, and bucket-wheel reclaimer discharge areas, where early anomaly detection is vital to the plant.

We transform the subtlest vibration into a competitive advantage. Ultimately, technology is the invisible touch that protects what matters most: operational continuity and the lives of those who make it possible.

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