

AXORA

METALS & MINING AX01192

IIoT sensor platform for monitoring the health of conveyor idlers

The technology marketplace for heavy industry

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View the solution on our marketplace

→ Open solution listing

IIOT PREDICTIVE MAINTENANCE SOLUTION FOR IDLERS THAT CUTS CONVEYOR BELT DOWNTIME

How it works

Primary sensor

An electronic module is housed within a mechanical conveyor roller. The conveyor roller monitors the temperature, vibration, and sound within the conveyor roller and communicates this data to the Gateway via a wireless network. It is powered directly from the rotation of the conveyor roller. Sub-components of the module are as follows:

- › **Rotor** – Internally coupled to the rotating conveyor roller bearing housing. The rotor is sized to follow the outside diameter dimensions of the bearings themselves.
- › **Stator** – Shaft-mounted component which contains the on-board data acquisition, analysis, and radio electronics.
- › **Antenna Cap** – Protective cover to ensure that the Smart-Idler® antenna is not damaged in the field.

Gateway

An electronic device that allows a Programmable Logic Controller (PLC) or cloud-based server to interface with the conveyor roller wireless network. The Gateway interfaces with the PLC via a Modbus interface over a Modbus-RTU protocol or to the cloud-based server via TCP/IP over 100 Base-T ethernet.

Hand-held barcode reader

A device which is capable of reading a barcode and establishing a list of scanned embedded conveyor rollers that can be uploaded to the cloud server to populate the network.

Server

The database which allows accumulated data from the embedded sensors to be stored, categorised, and presented. Information from the server can be pushed or pulled into third-party software systems and displayed in the dashboard.

Key facts

over

50%

ROI achieved in iron ore mine

360°

real time visibility of plant assets

GENERAL OVERVIEW

General

- › Real-time 24/7 autonomous monitoring of key conveyor roller conditions
- › Predicts and detects conveyor roller failure modes, including bearing failure and shell-wear
- › Completely wireless design requires no special conveyor wiring
- › Quick and easy installation within a conveyor roller
- › Seamless integration within the conveyor, requires only one Gateway per 5,000 rollers
- › Functional within steel and composite conveyor rollers
- › Low cost, high-performance design
- › Consumable/replaceable item (OPEX)
- › Remote firmware download capable (via network) facilitates future upgrades

Power

- › Energy harvesting, powered directly from conveyor roller rotation
- › Low power design results in smaller size and cost

Rotational velocity sensing

- › Measures conveyor roller rotational velocity
- › Automatic notification on erratic conveyor roller rotational

Vibration

- › Independent measurement of shaft longitudinal and rotational plane force vectors
- › Enveloped spectral analysis
- › Focused spectral analysis on key bearing frequency fundamentals
- › Automatic notification on exceeding vibration spectral analysis fault indicators

Mechanical

- › Easily adapts to various conveyor roller designs with minimal design and assembly process modifications
- › Requires only basic roller shaft milling to adapt within conveyor rollers
- › Robust design with no mechanical contact between rotating components
- › Completely sealed unit, encapsulated within overmould resin. 100% ingress protection

Rotational count sensing

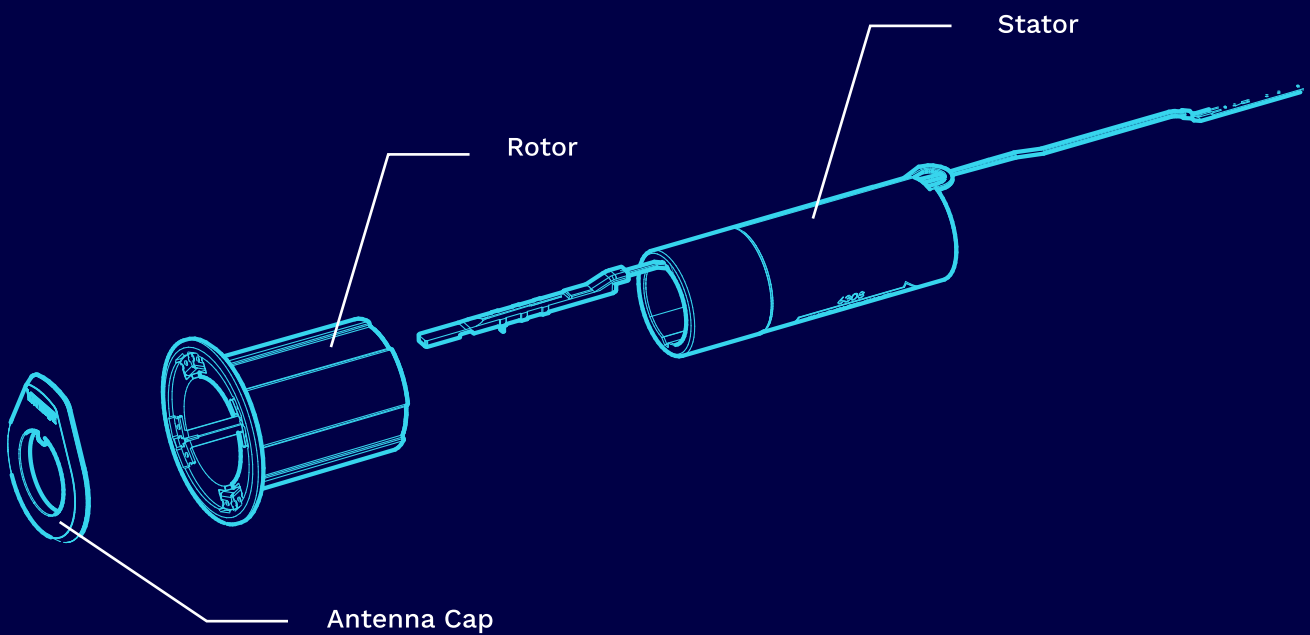
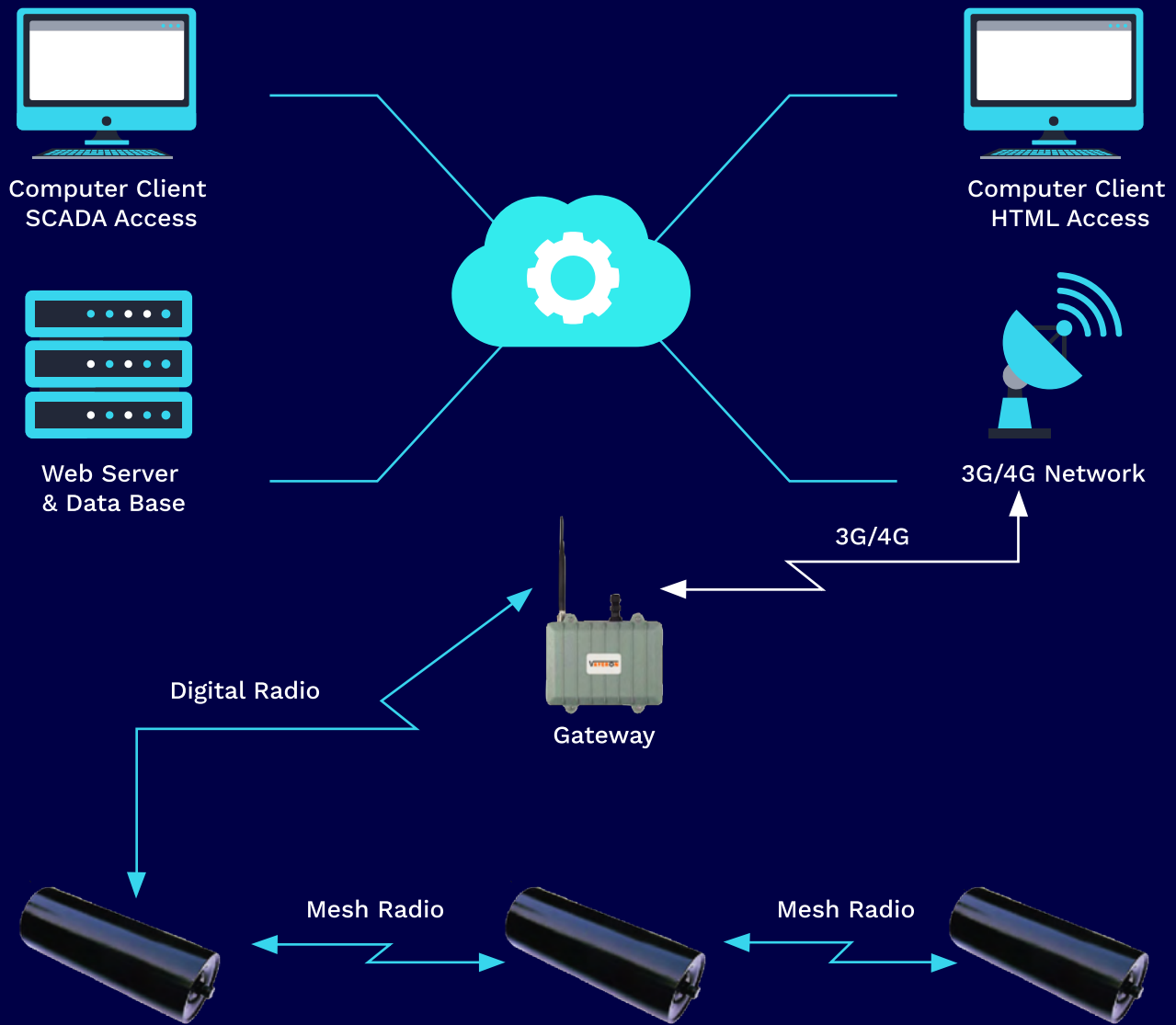
- › Counts rotations to exactly determine mileage
- › Automatic notification on exceeding programmable rotational count thresholds

Temperature

- › Direct contact sensing of the bearings
- › Independent left- and right-bearing temperature monitoring
- › Automatic notification on exceeding programmable temperature thresholds

Barcode

- › Compatible with Android devices
- › Barcode is used to identify the Smart Roller and assign it to the network
- › Programmable user parameters, such as install date, installer name, conveyor ID, location details, etc.
- › Barcode data consolidated with network data to provide a detailed view of each conveyor roller



TOP BUSINESS BENEFITS

There are three main business benefits at a high level:

- › Reduction of downtime
- › Reduction of damage
- › Improved safety

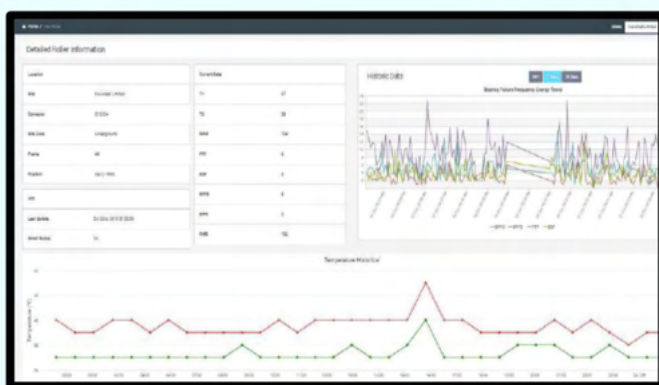
This is all enabled through detailed data and information on the real-time condition of the conveyor rollers.

Conveyor roller-related downtime is in the top three causes of unscheduled conveyor production stoppages, and, of course, the cost of production stoppages, LTIs, and disruptions is extremely high. By eliminating the associated costs of manual inspection, the total cost of ownership (TCO) of the conveyor can be reduced significantly, and personnel can be assigned to more critical tasks. Ultimately, every roller will fail, it's just a matter of when and how.

This solution provides a unique safety net, allowing you to get the most life out of your roller before it fails and causes damage, which in turn can save millions per annum for some operations. In one calculated iron ore mine scenario, the technology payback occurred in the first 15 minutes of saved downtime.

Top benefits

- › Reduction of downtime
- › Reduction of damage
- › Improved safety



Screenshot of solution dashboard

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CUSTOMER SUCCESS STORIES

Coal mining company

Challenge

This underground coal miner uses conveyor systems to transport to the surface. There were major issues with fires, roller failures, limited availability, and high inspection costs.

Solution

The smart roller sensor solution was adopted, and helped immediately avoid employing inspection personnel every two weeks. After installation and commissioning, the customer was able to predict roller failures before they happened, only replace damaged rollers, reduce operational downtime, and reduce overall costs by 60%. All rollers are now monitored 24/7 with the system, predicting failure before it happens.

Benefits

Even ignoring the improved production output, there was a payback of approximately 3x (cost of deployment \$54K year 1, inspection personnel reduction \$156K p.a.).

Iron ore processing company

Challenge

This ore processing facility has a conveyor shuttle that feeds multiple bins. The rollers are not accessible without shutting down the conveyor and removing the guards. They had several additional challenges: roller failure causing belt damage, ineffective maintenance practices, change out method was for all 112 rollers (somewhat unnecessarily), and high costs associated with the change out.

Solution

The smart roller sensor deployment helped the customer avoid the full change out. As a result, they could predict roller failures, only replace damaged ones, reduce their downtime, and reduce yearly inspection and maintenance costs by over 50%.

Benefits

Return on investment was nearly 2x in the first year alone, with \$26K of first year costs and over \$44K saved, a first year ROI of 59%.

FAQ

Who is responsible for installation of the sensors in the rollers?

Approved conveyor roller manufacturers are responsible for the installation of the sensor in the rollers. Our solution provider provides 24/7 technical support to ensure successful installation.

What is a typical system architecture?

The Gateway aggregates all information from the network of modules. Each Gateway communicates with up to 5,000 roller sensors using 433MHz radio. The roller sensors mesh network data down the conveyor to the Gateway.

What is the operating lifespan of the sensor module?

The conveyor roller sensor is designed to last 10+ years, which is well beyond the average life expectancy of a conveyor roller (approx. three to five years).

Does every roller require a sensor module?

The solution provider recommends every roller has a smart sensor module as the network will be more robust with multiple paths of redundancy. It also means every roller is being monitored, ensuring all deterioration will be detected. However, the system can still operate successfully when implemented in localised areas.

How early does the solution detect failures?

The analysis system has been proven to detect a roller bearing defect at stage two of a four-stage failure progression. This provides months of warning before catastrophic failure, so that conveyor roller maintenance can be arranged during a scheduled downtime period. The solution detects roller bearing failure by sensing acoustics and temperature. This means that all modes of conveyor roller bearing failure can be detected and tracked as the condition worsens. The severity of the failure can be escalated in the reporting software for urgent attention.

Can any type of conveyor roller brand be fitted with the smart sensor?

Yes. The system is designed to be integrated with a universal range of conveyor rollers during manufacture. If an integration is particularly difficult, the solution provider's team is always available help make it happen.

About Axora

Axora is the global technology **marketplace** for heavy industry. We source the best innovative solutions, to solve the biggest industrial problems.

Our service helps industrial companies to discover, evaluate, procure and deploy technology from all over the world.

Entrusted globally by 100s of industrial leaders and innovative solution providers, we help companies take action to hit their safety and sustainability goals.

Your next steps

→ [Email us](#)

About the solution provider

The award-winning solution provider is based in Australia, founded in 2014 and developed into an OEM technology company for mining. The company has a focussed set of IOT products for mining conveyors, which are sold all over the world.

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