



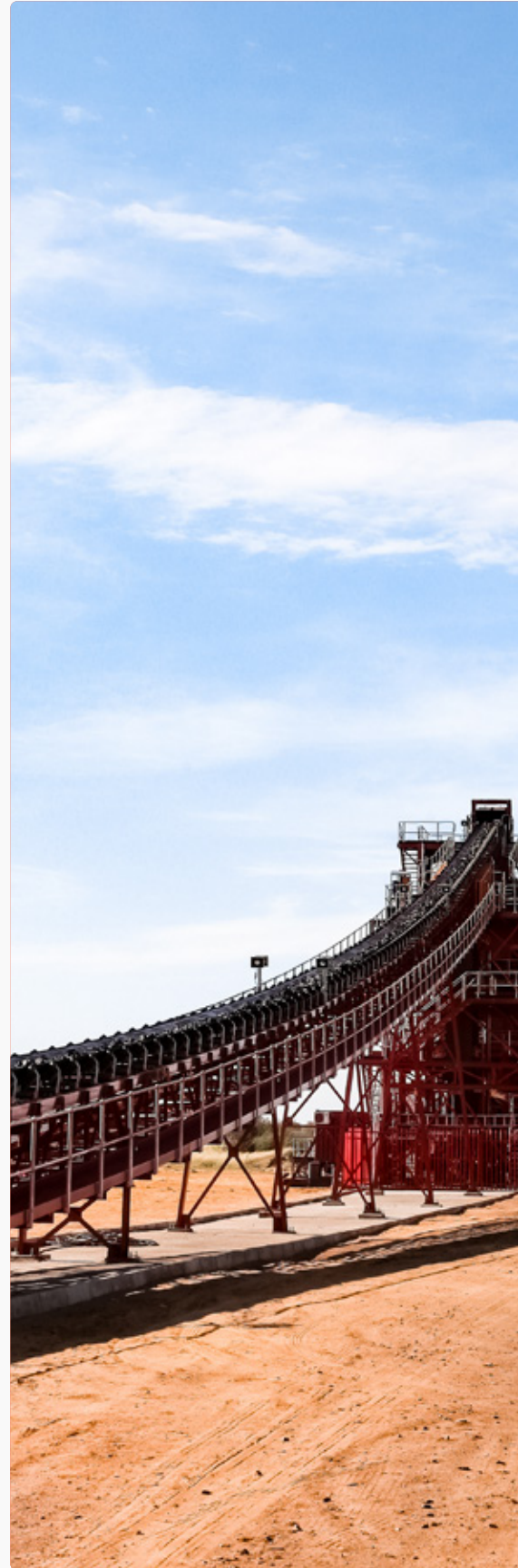
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WHITE PAPER

AI-Driven Predictive Maintenance for
Belt Conveyors

24/7 visibility, AI-driven insights, and expert support for
prescriptive maintenance of critical mining equipment.

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[MOVUS.COM.AU](https://www.movus.com.au)

About MOVUS

MOVUS is an Australian based company on a mission to extend the life of industrial assets, reduce unplanned downtime, and support more sustainable operations through smart, scalable monitoring solutions.

Founded in Brisbane, MOVUS combines AI-powered insights, continuous diagnostics, and hands-on support to help industries move from reactive to proactive maintenance. Our suite of wired and wireless sensors connects to a secure online dashboard that delivers real-time alerts, prescriptive diagnostic reports, and trends across your asset fleet. We don't just give you data. We provide clear, actionable insights so you can address issues early and avoid costly unplanned downtime.

As we've grown, we've reimagined what industrial condition monitoring can be, expanding our range, enhancing our analytics, and introducing 24/7 expert oversight to ensure nothing gets missed.

Today, MOVUS helps critical industries like mining, manufacturing, food processing and utilities unlock more efficient, and more sustainable operations, without the complexity.

Our Vision

Our vision is to inspire a future where every machine is part of a sustainable ecosystem. By minimising waste and maximising efficiency, we're contributing to a world where industries operate in harmony with their environment.

Our Mission

We're driven by a shared mission: to empower industries to thrive by transforming complexity into simplicity. Through real-time monitoring and actionable insights, we enable our customers to make better decisions, prolong the life of their assets and create lasting value.



Our Solutions



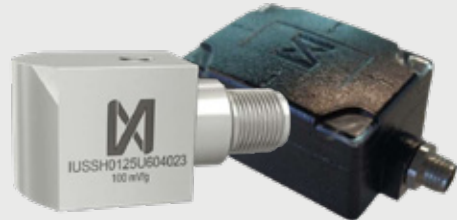
Wireless Sensors



Our wireless range delivers real-time vibration, temperature, run speed, and current monitoring, providing a complete view of asset health and performance.

FitMachine monitors vibration, temperature, and run speed in near real-time to detect shifts in asset behaviour before they escalate.

FitPower adds current monitoring to spot abnormal use, helping detect inefficiencies and emerging faults early. Together, they give a complete view of asset health, install easily via Wi-Fi/Bluetooth, and scale quickly across your site.



Wired Sensors



Our wired sensors are IP68-rated and deliver continuous, high-fidelity diagnostics where wireless isn't practical.

vEdge combines MEMS-based vibration monitoring with ultrasonic sensing and a magnetometer for speed detection, enabling early-stage fault identification. Compact and ideal for assets like pumps and gearboxes.

vSense is a piezoelectric triaxial sensor for critical rotating machinery in extreme environments, providing detailed vibration and temperature insights.



PlantOS



PlantOS is MOVUS's intelligence platform, designed to unify monitoring, diagnostics, and decision-making in one digital hub.

It delivers real-time machine health insights across your entire plant, backed by AI-driven diagnostics and 24/7 expert oversight. With specialised dashboards, you can view asset status at plant, line, or machine level receive fault identification and prescriptive maintenance actions, and track ROI over time.

PlantOS transforms raw sensor data into clear, prioritised actions, helping you reduce unplanned breakdowns, improve maintenance planning accuracy, and extend asset life, all while supporting more sustainable, efficient operations.

Executive Summary

Conveyors are the arteries of bulk material handling in mining & metals, cement, power, fertilizer, and port industries.

They transport ore, concentrate, raw materials, and finished goods across vast operations. A single conveyor failure can halt production, cause safety risks, and lead to significant financial losses.

In mining and metals especially, conveyors replace fleets of trucks, carrying thousands of tons per hour in harsh and abrasive environments. Unplanned breakdowns here are costly and dangerous.

This paper explains the challenges of monitoring them in real time, the importance of sensor selection, and how PlantOS, our Industrial AI platform, detects early-stage faults. We also present deployment results across 1215 conveyors in five industries, cement, Mines & metals, paper, Port and power, we achieved over 99% equipment availability, avoided 4,917 hours of downtime, reduced mean time to repair by 20%, and enhanced workforce safety.

The Importance of Conveyors in industry

1. **Conveyors replace fleets of trucks, reducing costs and emissions.**
2. **They transport raw ore, concentrate, and waste efficiently across vast mine sites.**
3. **In metals processing plants, conveyors feed crushers, mills, and smelters—any failure stalls critical production lines.**
4. **Manual inspections in mining conveyor tunnels or transfer points expose workers to hazardous conditions.**

For the mining and metals sector, reliable conveyor operations are directly linked to productivity, cost efficiency, and workforce safety.

Challenges in Monitoring

Conveyors are subject to constant stress from load, friction, and environmental exposure.

Key operational challenges include:

High maintenance costs from wear on motors, gearboxes, pulleys, and belts.

Harsh operating environments that hinder frequent inspections.

Safety hazards from manual inspection in confined or high-risk areas

Unplanned downtime leads to major production losses.

In addition to these operational challenges, conveyor monitoring presents specific technical hurdles:

1. **Monitoring at slower belt speeds**, where vibration patterns are subtler and harder to analyze.
2. **Inconsistent operational loads** that distort vibration signatures and complicate fault detection.
3. **Network connectivity issues** caused by vast distances between monitoring points, especially in mining and port operations.
4. **Sensor durability and positioning challenges** in high-dust, high-moisture, or high-temperature environments.

These factors make conveyor monitoring one of the most demanding use cases for predictive maintenance technology, requiring rugged sensors, reliable connectivity, and advanced AI analytics to extract meaningful insights.

Why Sensor Selection Matters

The effectiveness of predictive maintenance depends heavily on the sensors used to collect conveyor health data.

- **Powered sensors (3–5s capture):** Provide continuous, high-resolution data for mission-critical drives and pulleys in mines.
- **Wireless, battery-powered sensors:** Suitable for less critical conveyors in remote areas where wiring is impractical.
- **Piezoelectric sensors (SS body):** Resistant to dust, slurry, and vibration, which are ideal for abrasive mining environments.

Assets Monitored:

- Motor
- Gearbox
- Head Pulley
- Snub Pulley
- Bend Pulley
- Tail Pulley

Mining operations demand **rugged, high-frequency monitoring** to prevent costly shutdowns.

How PlantOS Identifies Early-Stage Faults

PlantOS, the Industrial AI platform, ingests high-frequency sensor data and applies advanced analytics to detect faults at their earliest stages:

- Extracts 70+ engineered features to detect weak fault signatures in low-speed belts.
- AI models identify early-stage faults such as bearings, lubrication, misalignment, and many more.
- Adaptive learning reduces false alarms, building confidence with the operators.
- Prescriptive Insights: Goes beyond detection—PlantOS recommends the most likely cause and the intervention required.

This **closed-loop AI system** reduces false alarms and builds trust with plant teams by aligning predictions with real-world outcomes.

Deployment and Results

Across 1215 Conveyors monitored in Mining & Metals , Steel , power, fertilizer, cement and ports predictive maintenance have delivered measurable results:

- **Faults Detected:** 1257 across categories including bearings, lubrication, misalignment.
- **Downtime Avoided:** 4,917 hours across deployments.
- **Availability:** >99.9 % with almost no breakdown.
- **Maintenance Efficiency:** Mean Time to Repair (MTTR) reduced by 20%.
- **Safety:** Significant reduction in manual inspection in hazardous pump areas.

ROI and Industry Adoption

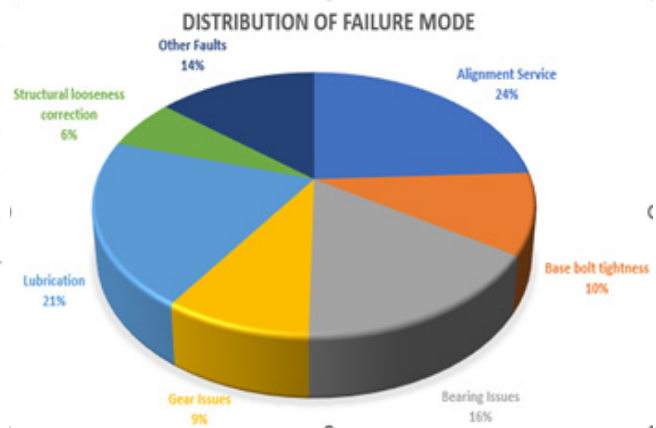
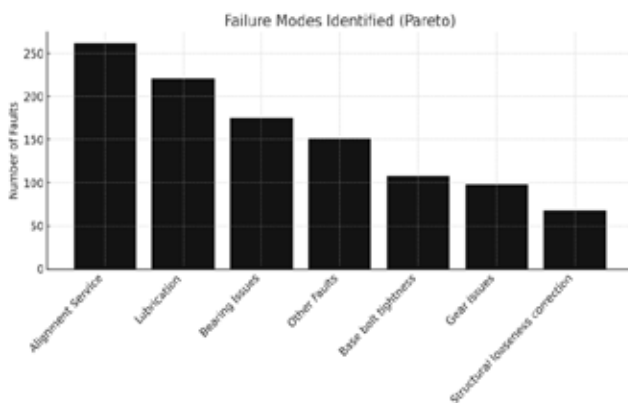
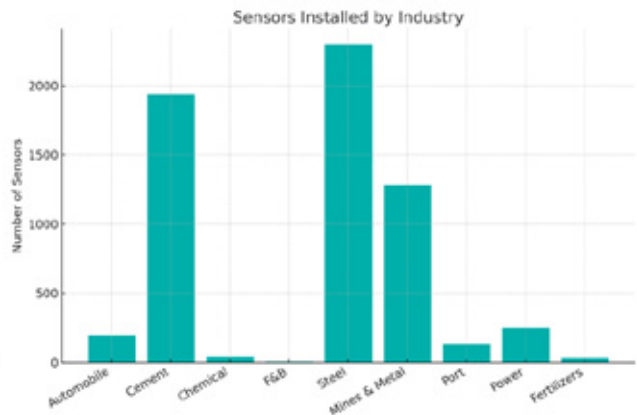
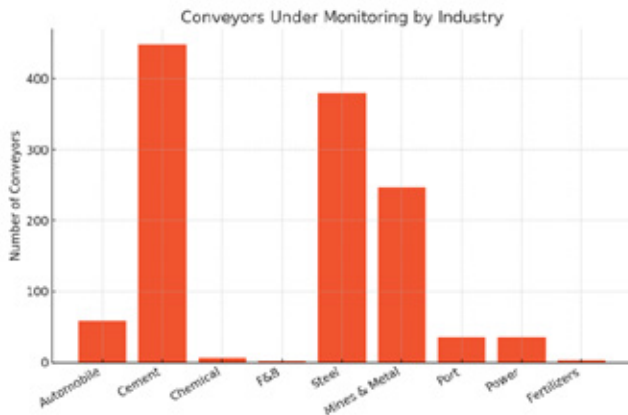
For mining and metals companies, ROI is clear:

- **Operational:** greater than 99% uptime, fewer stoppages.
- **Financial:** millions saved in avoided downtime; optimized spares inventory.
- **Safety:** reduced manual inspections in hazardous zones (transfer points, crusher feed conveyors).

Beyond mining, adoption spans cement, fertilizers, power, and ports—with cross-industry learnings enriching PlantOS models.



Data Visualisations



Conclusion

Conveyors are mission-critical assets across industries — from mining and metals to cement, steel, fertilizers, ports, power, and manufacturing. Unplanned failures can disrupt entire operations, create safety risks, and drive up costs. AI-driven predictive maintenance, enabled by PlantOS, offers a proven path to maximize uptime, extend equipment life, reduce maintenance costs, and protect worker safety.

Please Note: The technical data presented in this document is based on an actual case or on as designed parameters and therefore should not be relied upon for any specific application and does not constitute a performance guarantee for any projects. Actual results are dependent on variable conditions. Accordingly, Movus does not make representations, warranties, or assurances as to the accuracy, currency or completeness of the content contained herein. If requested, we will provide specific technical data or specifications with respect to any customer's particular applications. Our company is constantly involved in engineering and development. For that reason, we reserve the right to modify, at any time, the technology and product specifications contained herein.



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movus.com.au
info@movus.com.au

MOVUS Australia Pty Ltd
107 Milton Road,
Milton QLD 4064



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