MOVUS

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WHITE PAPER

AI-Driven Predictive Maintenance for Crushers in Industrial Applications

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

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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.

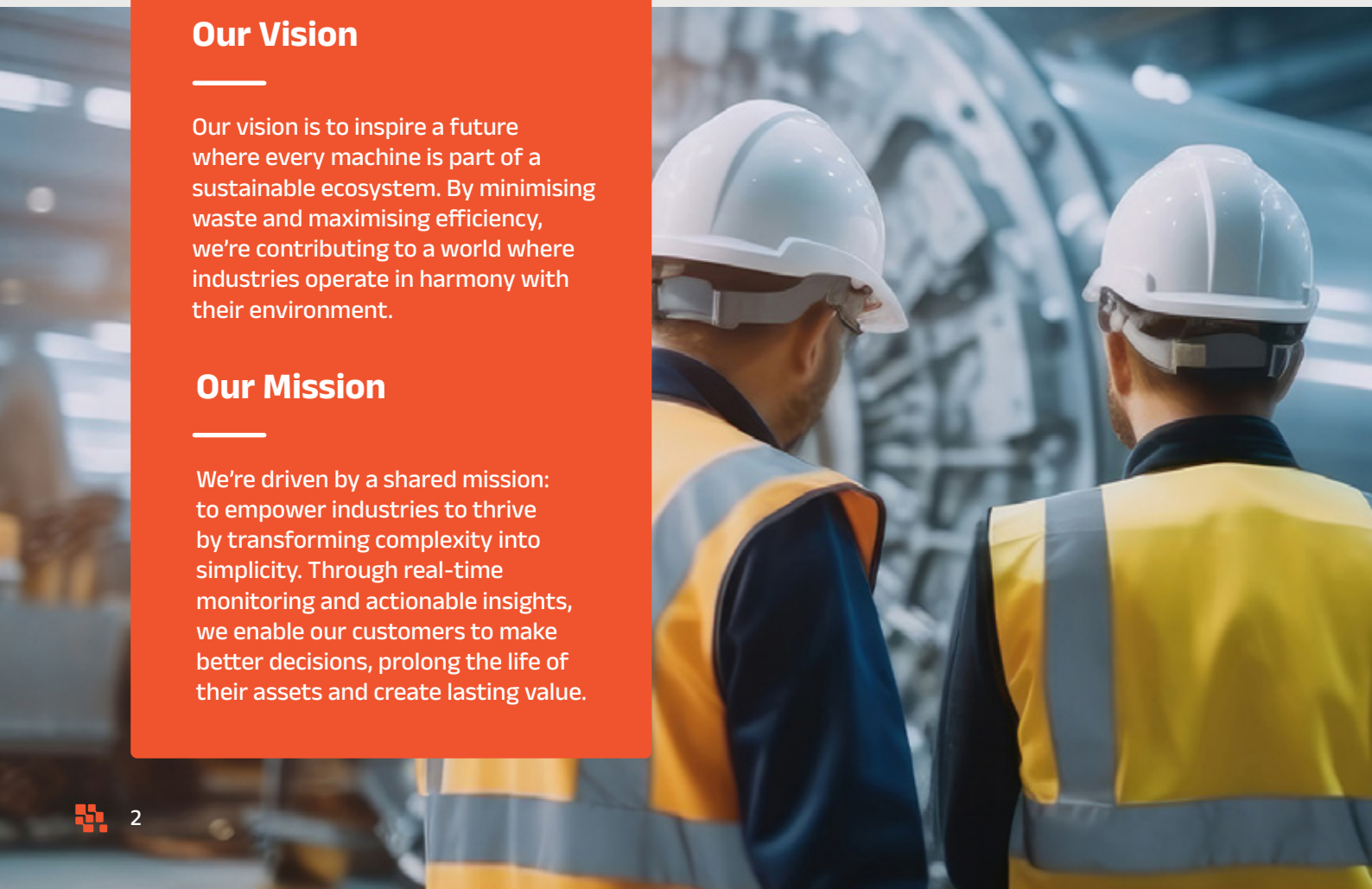
Today, MOVUS helps critical industries like mining, manufacturing, food processing and utilities unlock more efficient, and more sustainable operations, without the complexity.

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.

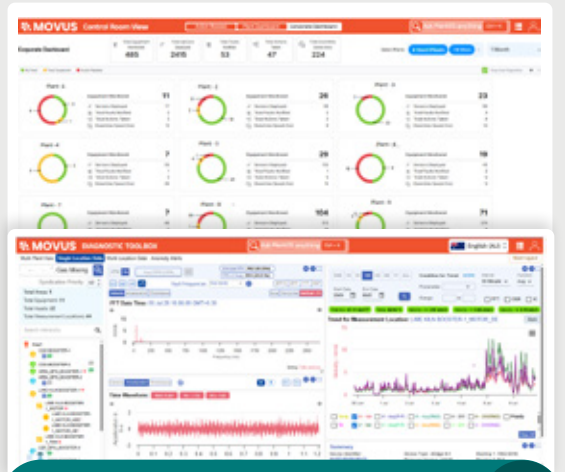
FitPower adds current monitoring to spot abnormal use, helping detect inefficiencies and emerging faults early. Together, they give a complete view of asset health, install easily via Wi-Fi/Bluetooth, and scale quickly across your site.

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

Crushers are mission-critical machines across mining, cement, metals, power, and other heavy industries.

They reduce large rocks, ores, and raw materials into smaller sizes essential for downstream processing.

However, crushers are exposed to high vibration, heavy shock loads, dust, and abrasive material, making them some of the toughest assets to maintain.

Unplanned breakdowns in crushers cause production stoppages, costly repairs, and safety risks.

By implementing AI-driven predictive maintenance across 142 crushers in five industries, results achieved include:

- >99.9% equipment availability
- Zero unplanned breakdowns over 12 months
- 20% reduction in Mean Time to Repair (MTTR)
- 537 early-stage faults detected
- 1,539 downtime hours avoided

The Importance of Crushers in industry

Crushers are essential machines in mining, cement, power, and other heavy industries, tasked with reducing large ore and rock to manageable sizes. However, they come with inherent operational challenges:

1. **High maintenance costs due to wear and tear on drive trains and critical components.**
2. **Exposure to harsh environments, making frequent inspections difficult.**
3. **Risk of catastrophic failure due to undetected faults.**
4. **Safety hazards from manual inspections in high-risk areas.**

These challenges make predictive maintenance, powered by AI and IoT, a transformative solution for the industry.

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

Challenges in Monitoring

Monitoring crushers is uniquely challenging because of:

Harsh environments: high vibration, dust, slurry, and moisture that damage conventional sensors.

Remote locations: difficult to conduct frequent inspections or transfer data.

Unstable loads: oversize rocks, uneven feed, and blockages create unpredictable stress.

Sensor durability: only SS-body ICP sensors with armored cables can withstand conditions.

AI-Driven Predictive Maintenance Approach

IoT Sensor Network

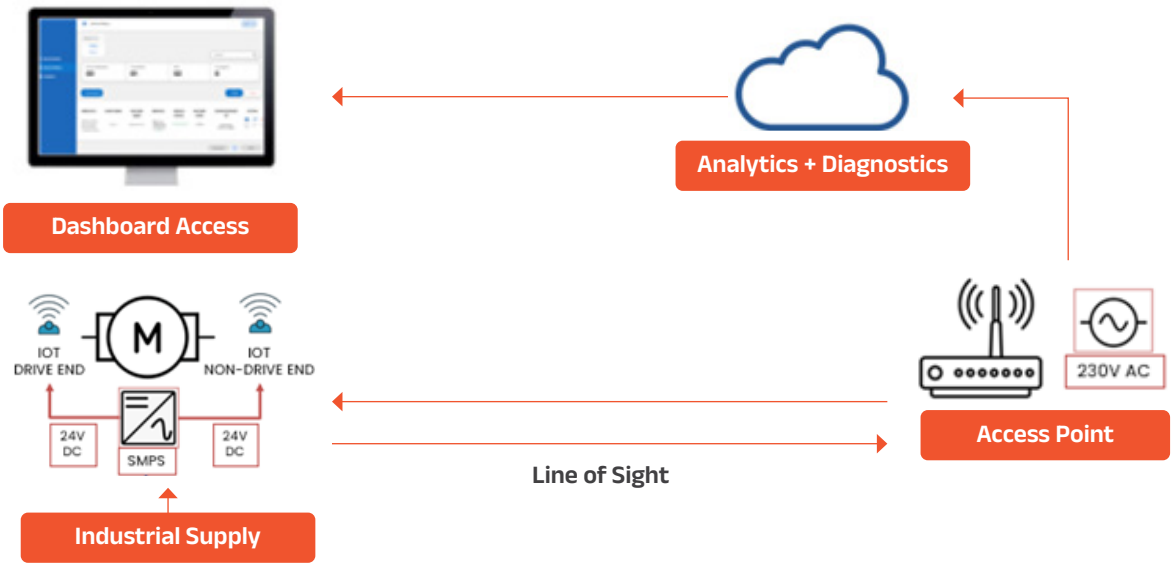
We deployed vibration, temperature, and operational sensors on critical crusher components. These sensors stream real-time data to an AI-powered analytics platform.

Machine Learning Fault Detection

PlantOS, the Industrial AI platform, transforms crusher monitoring through:

- Data ingestion: continuous capture of vibration, acoustic, and temperature signals.
- AI-driven analysis: 70+ engineered features identify early deviations.
- Fault classification: bearing clearance, lubrication failures, misalignment, gear issues, and blockages.
- Prescriptive recommendations: actionable guidance for maintenance teams.
- Continuous learning: adaptive models reduce false positives and align predictions with real-world outcomes.

Communication Architecture



Maintenance Optimisation

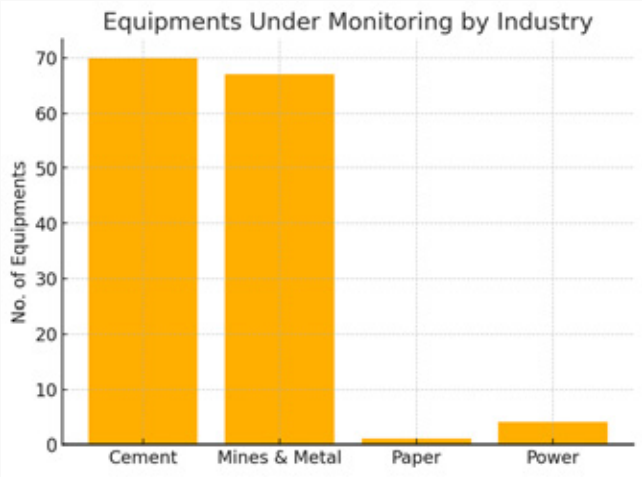
The system not only flags faults but also provides fault-type classification, from bearing clearance issues to lubrication faults, allowing targeted repairs.
This reduces:

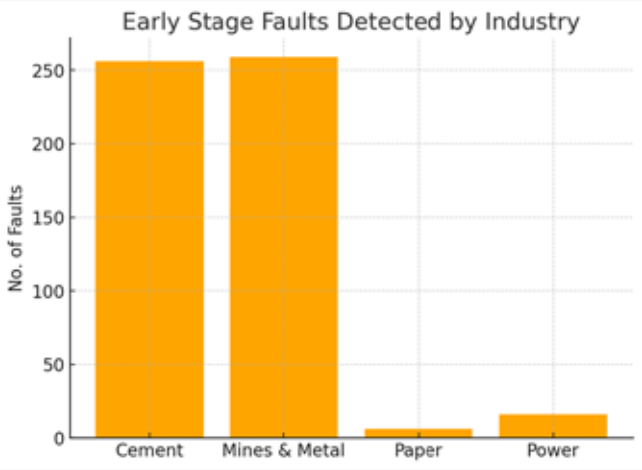
- Mean Time to Repair (MTTR)
- Unnecessary part replacements
- Maintenance crew exposure to hazardous zones

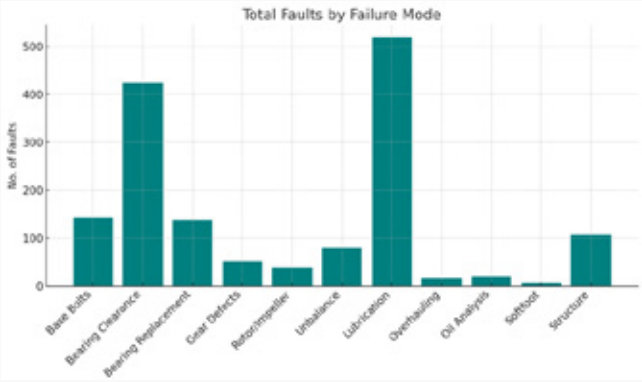
Deployment & Results

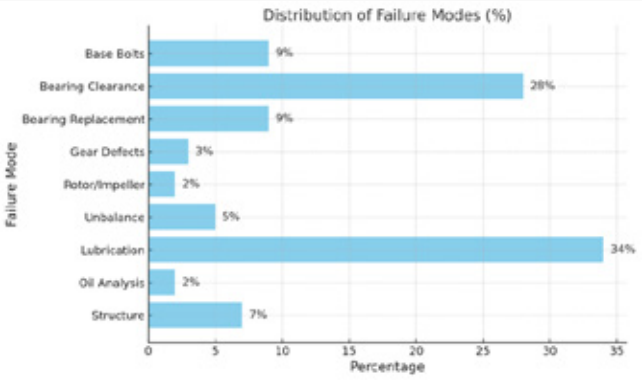
- Industries Covered: Cement, Metal, Mining, Paper, Power
- Total Crushers Monitored: 142
- Total Fault Reports Generated: 537
- Total Downtime Avoided: 1,539 hours

Data Visualisations









Conclusion

Crushers are among the most demanding industrial assets, but also among the most critical. Failures lead to disproportionate impacts on productivity, costs, and safety.

AI-driven predictive maintenance, powered by PlantOS, has proven to deliver higher availability, reduced maintenance costs, safer operations, and measurable ROI.

The success of predictive maintenance in crushers demonstrates how rugged IoT sensors and AI analytics can be applied across industries, not just for crushers, but for all mission-critical assets where uptime and reliability matter most.

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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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