WHITE PAPER

AI-Driven Predictive Maintenance for
Pumps in Industrial Applications

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

in **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

Pumps are indispensable in process industries, heavy industry, and mining & metals operations.

They move cooling water in power plants, transport abrasive slurries in mines, circulate fluids in chemical and fertilizer plants, and enable hygienic operations in food & beverage manufacturing. When a pump fails unexpectedly, entire processes can come to a halt, causing safety risks, lost production, and higher maintenance costs.

This paper explains why pumps matter, the challenges of monitoring them in real time, the importance of sensor selection, and how PlantOS, our Industrial AI platform, detects early-stage pump faults. We also present deployment results across 1,445 monitored pumps in six industries, with over 7,000 hours of downtime avoided.

The Importance of Pumps in Industry

Pumps are the beating heart of industrial processes:

- **Process Industries:** Circulating fluids, cooling water, and feedstock in continuous operations.
- **Heavy Industry & Mining:** Handling abrasive slurries, dewatering operations, and cooling heavy machinery.
- **Metals & Fertilizers:** Transporting corrosive or high-temperature fluids.
- **Food & Beverage:** Ensuring hygienic handling of liquids in regulated environments.

A pump breakdown is not a small event, it can disrupt entire plants, impact on worker safety, and trigger costly downtime.

Challenges in Real-Time Monitoring

Monitoring pumps in real operating conditions is far from simple:

Harsh environments: pumps are exposed to abrasion, corrosion, high heat, and vibration.	**Access issues: many pumps operate in confined, hazardous, or remote areas, limiting manual inspection.**	**Traditional inspection methods: rely on periodic manual checks, which miss early fault signatures and can't predict failures.**

These realities demand automated, always-on monitoring solutions capable of detecting small changes in vibration, temperature, or other behavior

Why Sensor Selection Matters

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

Electricity Powered Sensors (High-Frequency Capture)
- Capture vibration, temperature, and Flux, acoustic data etc. every 3–5 seconds.
- Ideal for critical pumps where early-stage fault detection is vital.
- Provide the richest datasets for AI fault models.

Wireless, Battery-Powered Sensors (Low-Frequency Capture)
- Capture data less frequently to conserve battery life.
- Best suited for auxiliary or less critical pumps where continuous monitoring is not essential

Piezoelectric Sensors (Crystal-Based with Stainless Steel Body)
- Highly sensitive to vibration, resistant to harsh industrial environments.
- Long lifespan and reliable performance in abrasive and corrosive settings such as mining or fertilizer plants.

Selecting the right sensor type for the right pump is crucial for b**alancing cost, data fidelity, and coverage**.

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:

- **Data Capture:** Streams raw vibration and temperature signals into the platform.
- **Feature Engineering:** Extracts 70+ engineered features from each dataset.
- **Adaptive AI Models:** Continuously learn normal vs. abnormal pump behavior.
- **Fault Classification:** Identifies failure modes such as bearing clearance, misalignment, lubrication faults, Flow Turbulence and Cavitation.
- **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 1,445 monitored pumps in cement, mining, metals, fertilizers, food & beverage, and power industries, PlantOS has delivered measurable outcomes:

- **Faults Detected:** 3,379 across categories including bearings, lubrication, misalignment.
- **Downtime Avoided:** 7,108 hours across deployments.

- **Availability:** >99.9 % with almost zero breakdowns across monitored pumps.
- **Maintenance Efficiency:** Mean Time to Repair (MTTR) reduced by 20%.
- **Safety:** Significant reduction in manual inspection in hazardous pump areas.

Data Visualisations
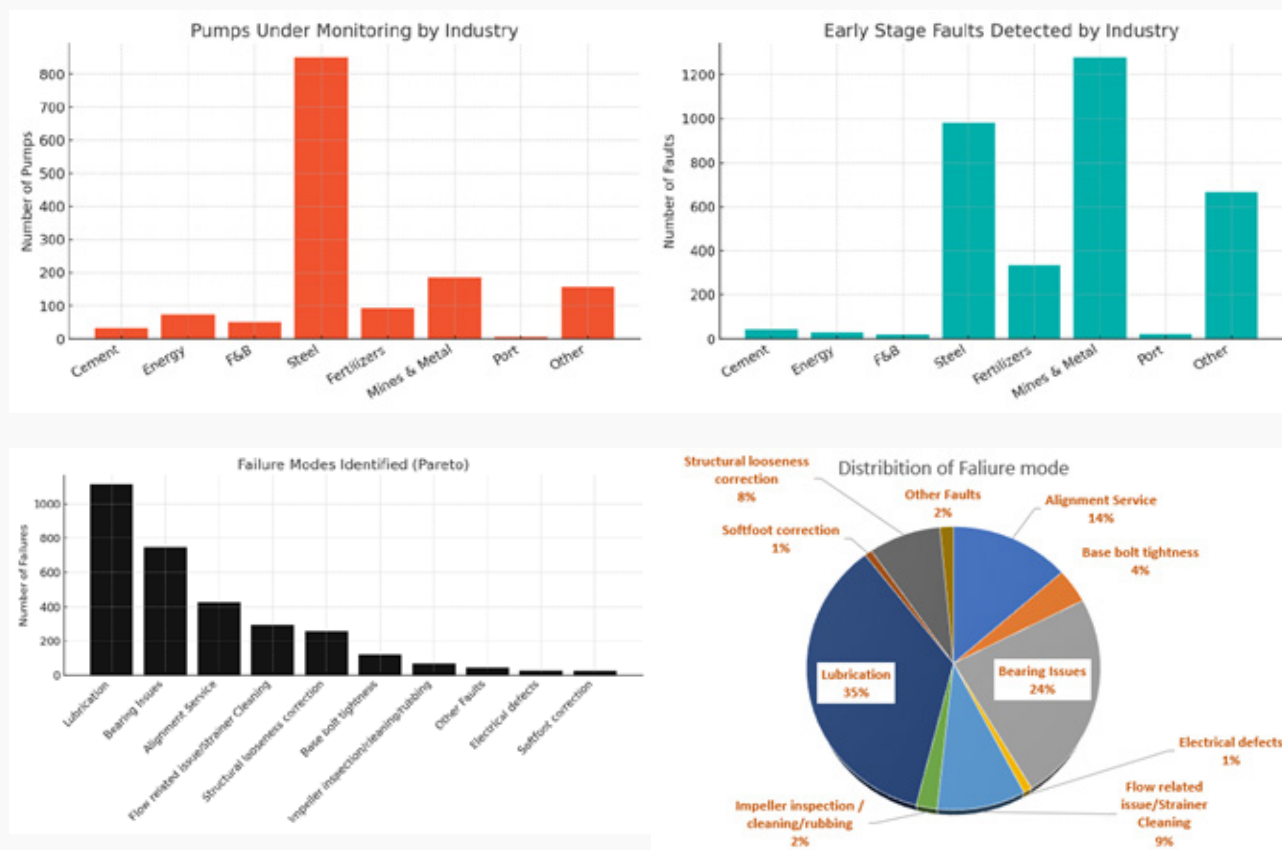
Conclusion

Pumps are mission-critical to industrial production, and predictive maintenance for pumps is no longer optional. With the right sensor strategy and an Industrial AI platform like PlantOS, industries can detect pump faults early, plan interventions, and protect plant uptime.

The results speak for themselves: higher reliability, lower costs, safer plants, and more productive teams. Pumps are only one example, AI-driven predictive maintenance is shaping the future of all industrial equipment.

Want to learn more?

Scan the QR Code to learn more about MOVUS or get in touch with our team today.

MOVUS
SMARTER MACHINE MONITORING