MOVUS

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WHITE PAPER

AI-Driven Predictive Maintenance for Paper Plants

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.

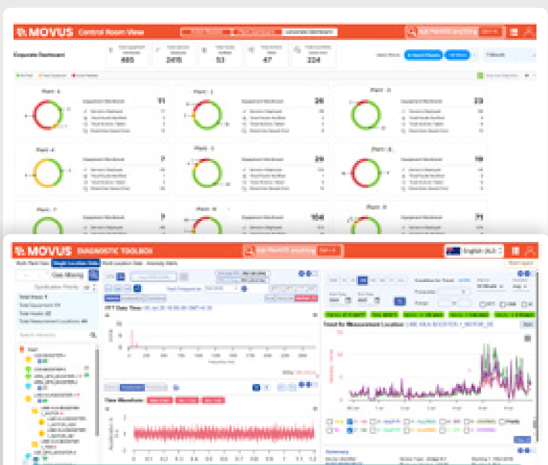
FitPower adds current monitoring to spot abnormal use, helping detect inefficiencies and emerging faults early. Together, they give a complete view of asset health, install easily via Wi-Fi/Bluetooth, and scale quickly across your site.

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 has a range of piezoelectric triaxial and uniaxial sensors to suit your application. They are suitable 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

Paper manufacturing is one of the most asset-intensive industrial processes, relying heavily on rotating machinery such as dryer cylinders, calender r olls, pumps, fans, mixers, and pulp screening systems.

These machines operate under high temperature, humidity, and load conditions, making them highly susceptible to early stage degradation and unexpected failures.

Across 25+ paper plants, our Industrial AI platform PlantOS continuously monitors 900+ critical assets, detects 1,500+ early-stage faults, and has already helped plants avoid more than 2,500 hours of unplanned downtime.

This has enabled a measurable improvement in plant reliability, including:

- >99% machine availability
- 25% improvement in maintenance planning effectiveness
- 20% reduction in Mean Time to Repair (MTTR)

This white paper outlines the challenges unique to paper mills, the role of correct sensor technology, and how Industrial AI shifts maintenance from reactive firefighting to precise, predictive and prescriptive decision-making.

Challenges in Paper Plant Monitoring

Paper mills operate in some of the harshest manufacturing environments. Core challenges include:

- High unplanned downtime
- Aging infrastructure
- High energy consumption
- Chronic lubrication, alignment, and contamination issues
- High temperature and humidity exposure
- Dryer sections operating at high temperatures
- Difficulty attracting and retaining experienced maintenance personnel
- High humidity accelerates corrosion and bearing failures

Together, these factors create conditions where failures occur frequently and often without warning.

Failure-Prone and Critical Equipment

Dryer Cylinders

Dryer cylinders are the heart of the paper machine, responsible for moisture removal, stabilise sheet quality, and influence production line speed. They operate under high surface temperatures, mechanical loading and continuous moisture exposure.

Major Failure Modes:

- Bearing damage from thermal expansion and lubrication breakdown
- Misalignment between cylinders
- Unbalance at high rotational speeds
- High vibration leading to structural and shaft damage.

Calender Rolls

Calender rolls refine paper surface characteristics such as smoothness and gloss, which is essential for high-quality printing, packaging, and specialty papers.

Major Failure Modes:

- Bearing wear from high pressure and lubrication issues
- Misalignment or unbalance causing vibration
- Heat-related damage
- Contamination contributing to premature bearing failure.

Why Sensor Selection in Paper Plants Matter

Paper mills combine high-criticality assets and harsh environmental conditions, making the correct sensor selection essential.

Piezoelectric Sensors (Powered, Continuous Monitoring):

Ideal for monitoring high-criticality rotating equipment such as dryer cylinders, calender rolls, high-speed fans, blowers, and main drives. These sensors tolerate harsh conditions and deliver continuous vibration and temperature data for early-stage fault detection.

MEMS-Based Wireless Sensors (Battery Powered):

Suitable for less critical or hard-to-access equipment where wiring is impractical. These sensors perform intermittent monitoring, offering periodic condition checks where continuous data is not required.

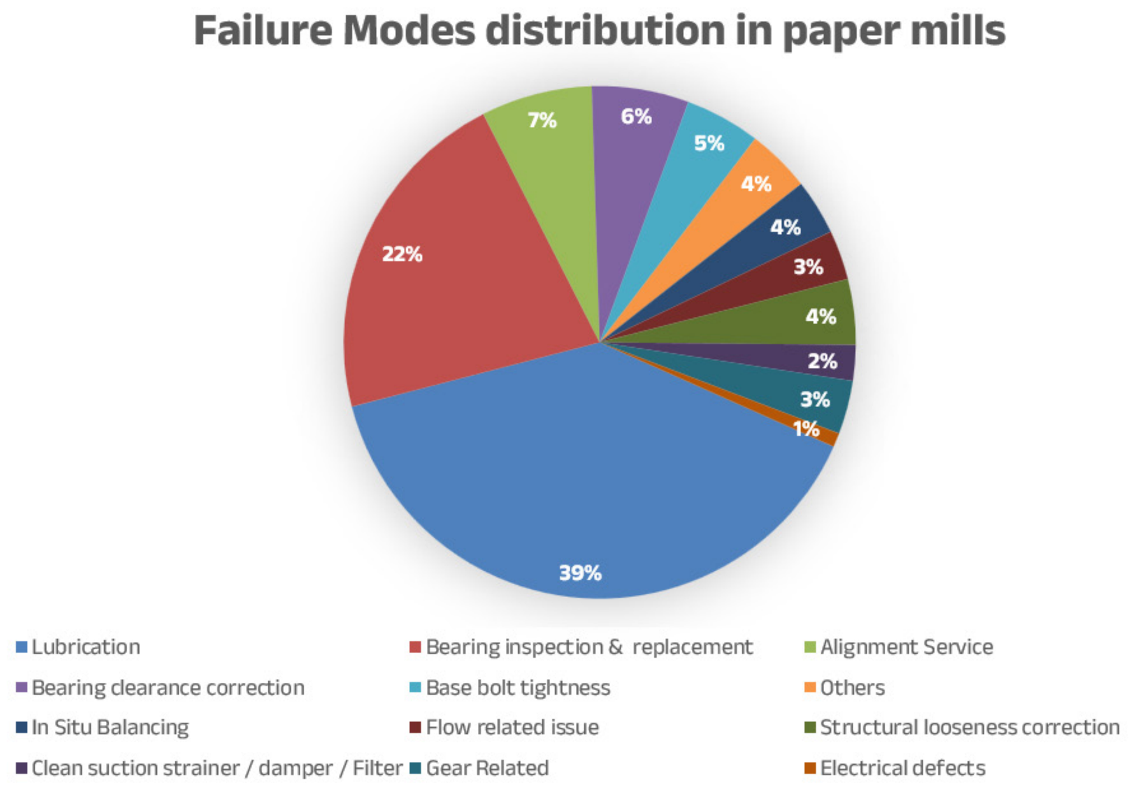
How PlantOS Identifies Early-Stage Faults

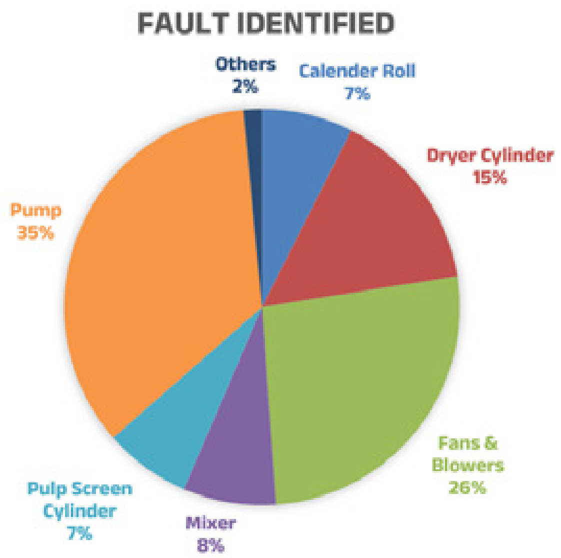
PlantOS ingests high-frequency sensor data and applies advanced analytics to detect faults at their earliest stages:

- **Data Capture:** Vibration, temperature, acoustic, and torque signals.
- **Feature Engineering:** 70+ engineered signal and statistical features.
- **Adaptive AI Models:** Learn normal vs. abnormal patterns under varying loads.
- **Fault Classification:** Detects issues such as bearing clearance changes, misalignment, lubrication faults, gear/pinion defects, and shell or liner wear.
- **Prescriptive Insights:** Provides the most likely root cause and recommended intervention.

This **closed-loop approach** reduces false alarms and builds trust by aligning predictions with real-world site feedback.

Data Visualisations





Conclusion

Paper plants operate high-temperature, high-humidity, and mechanically demanding assets such as dryer cylinders and calender rolls. Traditional inspection-based maintenance cannot reliably detect early wear or degradation under these conditions.

AI-driven predictive maintenance, enabled by continuous monitoring and prescriptive diagnostics, is now essential for achieving higher reliability and reduced downtime. PlantOS provides the insights needed to detect faults early, plan interventions, and extend asset life.

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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