Real-time Ball Mill Monitoring: DataMind AI™ Identifies Gearbox Tooth Damage and Ensures Operational Continuity

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Overview

In mid-2024, DataMind AI™ was installed at an iron ore mining site in South Australia to monitor critical equipment, including the Ball Mill. Historically, the site's Ball Mill experienced gearbox-related issues, leading to hours of costly unplanned downtime and creating a potentially hazardous environment for the site's teams. Upon its installation, the DataMind AI™ system monitored the asset's health as it changed from alarm to critical, timely flagging the impending failure and identifying its root cause.

The system's insights prevented further damage, reduced safety risks, and ensured minimal interruption to production.

Uncovering the Exact Root Cause of the Impending Ball Mill

Failure

In August 2024, DataMind AI™ flagged the Ball Mill with an "Alarm" status due to increasing gearbox friction, recommending a borescope inspection (an optical device for inspecting hard-to-reach areas) to identify the location of the potential gear wear or damage and to assess lubrication quality.

The Value

8
Hours
downtime prevented

700
Tonnes
throughput/hour

**AUD 82,890**
per hour X 8 hours

~AUD 663,120
saved

+ Reduced Safety Incident Risks

The maintenance team, confident in DataMind AI™'s capabilities, chose to rely on its real-time monitoring to track the equipment's condition. They aimed to replace the gearbox as late as possible, planning to act only when the system escalated the status to "Critical," ensuring timely yet efficient maintenance.


Ball Mill flagged as "Alarm"
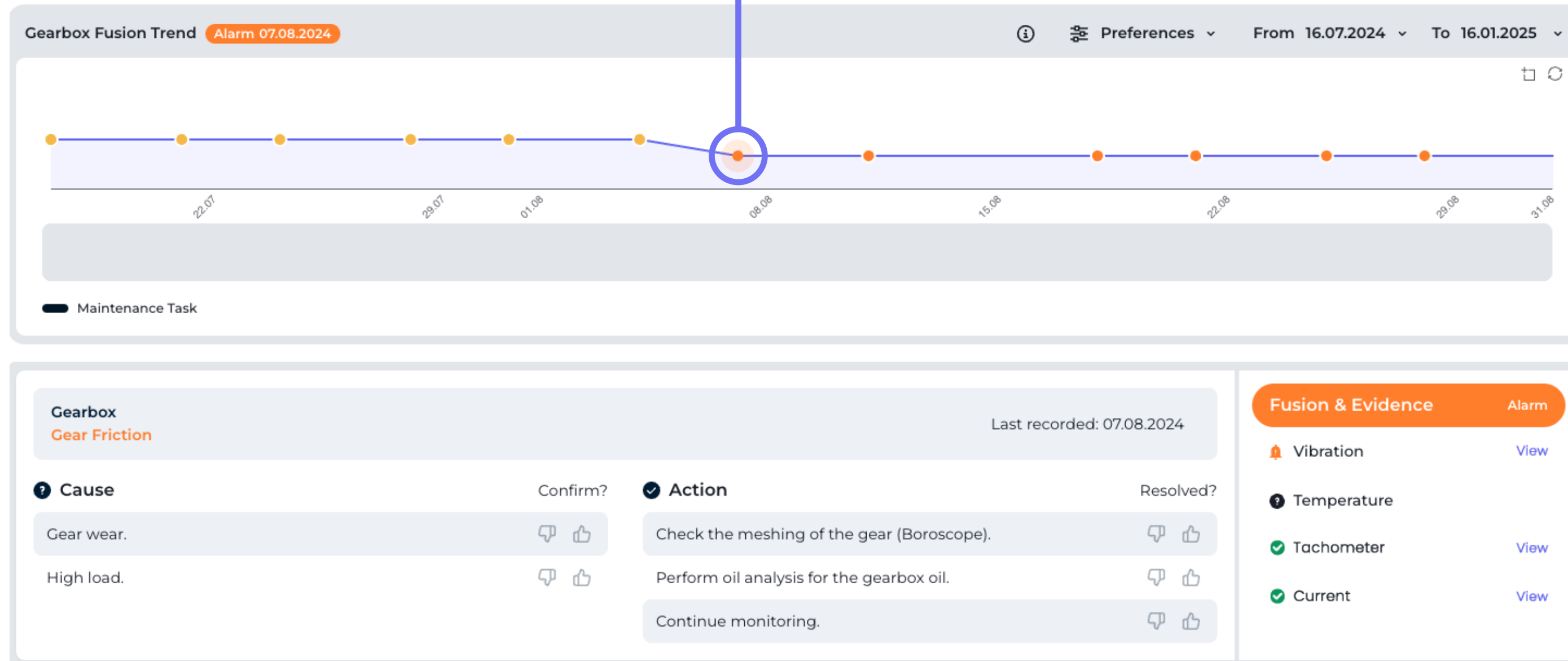
At the beginning of January 2025, DataMind AI™ escalated the status to "Critical," signalling that the issue had progressed as anticipated. The diagnosis indicated a broken tooth in the output shaft gear. The maintenance team promptly followed the system's recommendation and replaced the gearbox. Upon inspection, the predicted tooth damage was confirmed, validating the system's accuracy and the team's strategy to intervene at the optimal time.
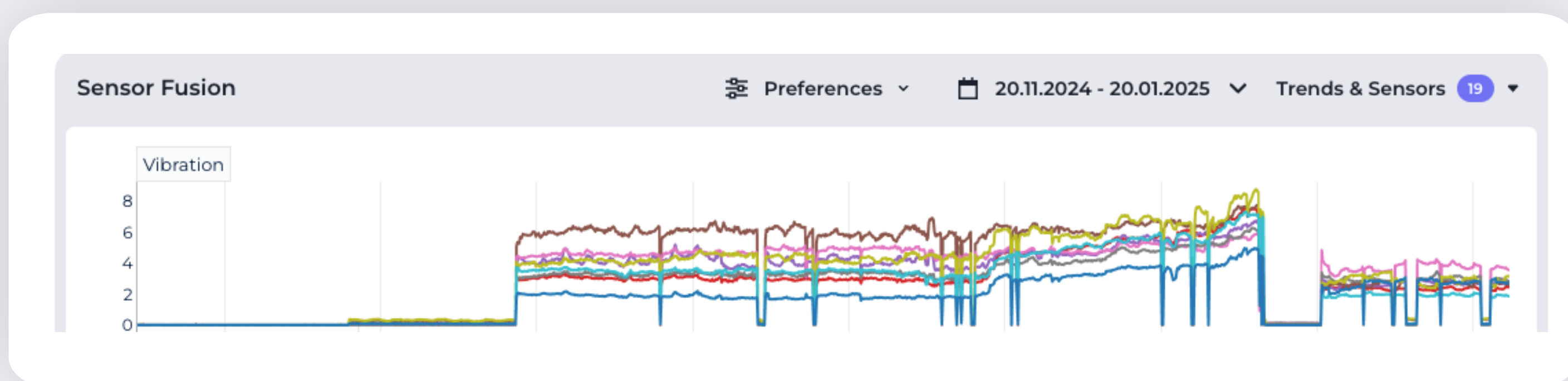

Ball Mill flagged as "Critical"
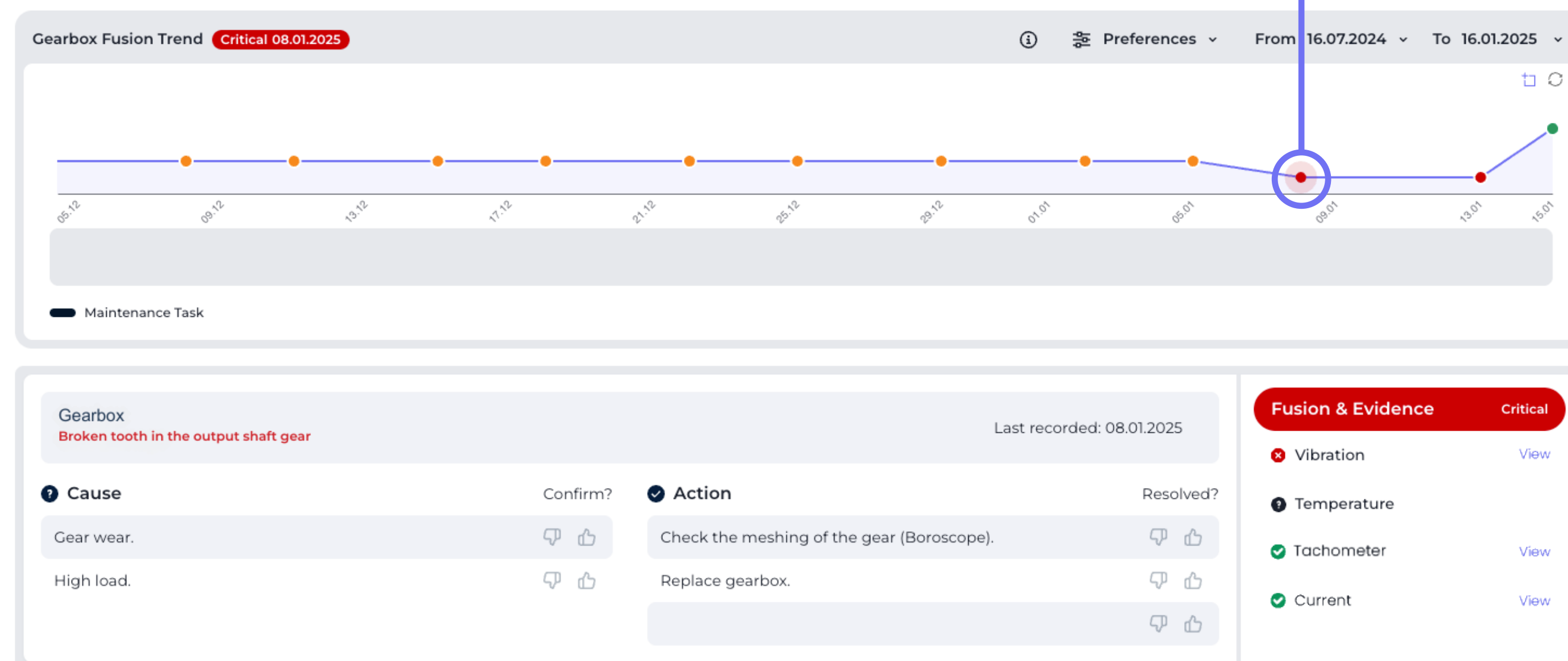
Evidence

Analysing the sensor data, DataMind AI™ identified the gearbox's deteriorating condition.
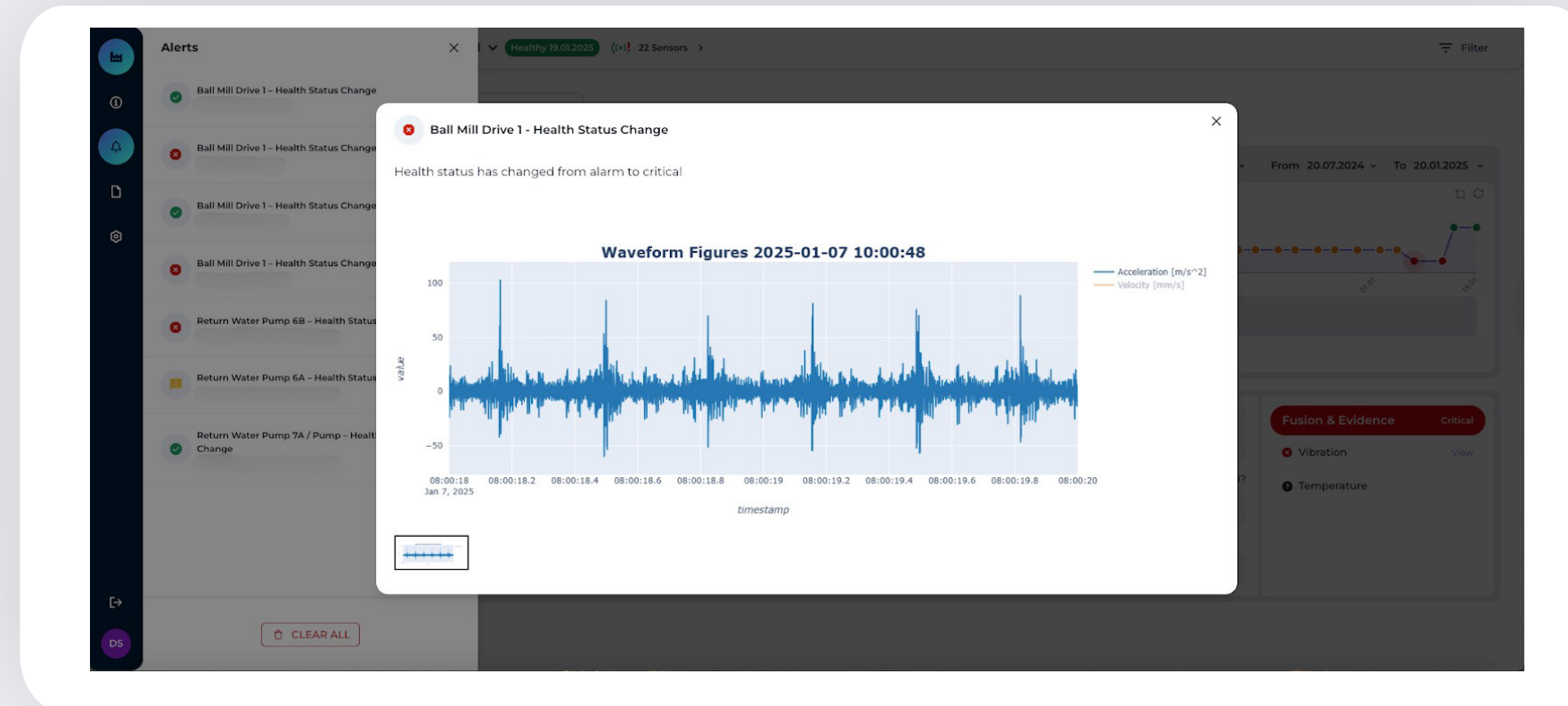
Vibration Data: Impacts in the 3Hz interval suggested tooth damage in the output shaft gear.

Sensor Fusion Trends: Real-time monitoring of the relevant frequency range indicated increasing friction levels over time, highlighting the urgency for immediate action to prevent further deterioration.

Resolution

Following DataMind AI™'s recommendations, the site's maintenance team:

→ Replaced the gearbox during a shutdown, preventing catastrophic failure.

→ Avoided unplanned downtime and emergency repairs.

→ Prevented safety risks associated with unexpected Ball Mill failure.

The Ball Mill was fixed and returned to optimal operation.

Ball Mill returns to optimal operations
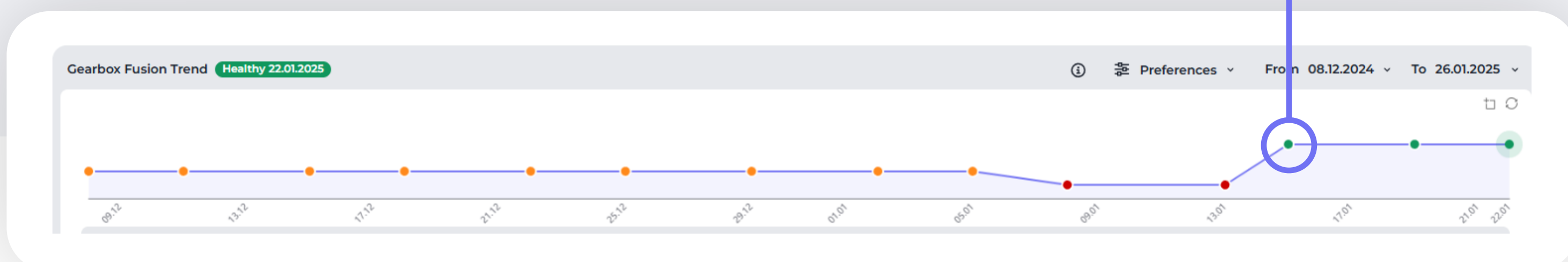
Conclusion

DataMind AI™ improved Ball Mill maintenance by detecting early gearbox failure signs that traditional methods had missed. Its real-time insights prevented **8 hours of downtime**, saving approximately **AUD 663,120** (at a rate of **AUD 82,890 per hour**) and helping to prevent a potential safety incident. This case demonstrates how AI-driven solutions ensure efficient operations and enhance industrial reliability.