AssetWatch

From Rocky to Rock Solid: Maximizing Maintenance Reliability in Mining Operations

A Guide for Mining Professionals

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1. Introduction

Mining Operations Run on Reliability

The global economy depends on mining. From the copper that powers electric vehicles to the iron ore used in infrastructure and the rare earth elements critical for semiconductors, mining operations are the foundation of modern industry. The mining sector contributes approximately $1.9 trillion to the global economy each year, making it one of the most vital yet vulnerable industries on the planet.

Behind this massive economic engine lies an operational truth: if your equipment isn't running correctly, your mine is immediately losing revenue. Mechanical failures in critical assets like crushers, conveyors, and grinding mills don't just cause delays. They risk safety, regulatory compliance, and millions of dollars in lost productivity. Whether you're operating an open-pit mine or an underground site, a single unexpected failure can bring your entire operation to a halt.

Mining runs in harsh, high-load environments where wear is constant and failure is costly. In today's data-driven world, not every risk requires a reactive approach. Predictive maintenance is reshaping how mining operations think about uptime, safety, and long-term asset health. Start enabling your team with the tools to work smarter, prevent downtime, and operate with confidence.

Mining Impact on the U.S. and Global Economy

The U.S. mining industry supports over	Contributed to the global economy each year[2]
1 Million Jobs[1]	$1.9 Trillion

Sources: 1. ma.org 2. mining.arizona.edu

2. Why Downtime Carves Out Problems in Mining Operations

Equipment failure doesn't just stall production. Worker safety, environmental compliance, and your operation's reputation are all put at risk–all while dealing with razor-thin margins.

Unplanned Downtime Kickstarts Uncontained Losses

A single issue like structural looseness in a conveyor system, imbalance in a pump motor, or misalignment in a crusher can bring extraction, processing, or transport to a grinding halt. When one subsystem fails, the ripple effect is immediate and far-reaching.

Unplanned downtime in large-scale mining operations averages $180,000 per hour, and this cost quickly escalates when production targets are missed or contractual penalties are incurred. Whether it's an underground conveyor or a generator powering your operation, the cost of standing still isn't just high; it jeopardizes everything.

Worker and Site Safety Jeopardized

In mining operations, heavy equipment and hazardous environments leave little room for error. A single mechanical failure like a seized conveyor drive, a fan shutdown, or a faulty brake system can trigger rockfalls, fires, or toxic gas releases. These aren't just operational setbacks. They're life-threatening events.

Beyond the human toll, the financial consequences can be staggering. The Mine Safety and Health Administration (MSHA) enforces strict safety regulations, and flagrant violations now carry a maximum penalty of $332,376 per incident. Poor equipment reliability not only puts workers at risk but also exposes your entire operation to regulatory action and reputational damage.

Environmental Exposure and Reputation Risk

A ruptured tailings pipe, a leaky hydraulic line, or a faulty dust suppression system can trigger an avalanche of environmental harm. These incidents don't just impact the productivity of your mining operation; they also affect the safety and well-being of your employees. They put your entire sustainability profile at risk, drawing scrutiny from regulators, communities, and investors alike.

The financial penalties tied to environmental noncompliance can be steep, but the longer-lasting cost is reputational. A single spill can sideline projects, invite litigation, and damage long-standing community relationships.

3. How Predictive Maintenance Powers Mine Site Resilience

In mining failure is rarely silent, but problems can remain undetectable for months. Predictive maintenance provides operators with the visibility they need to identify issues early, mitigate risks, and maintain uninterrupted production–even in the harshest conditions.

Anticipate Breakdowns Before They Happen

Mining equipment typically shows warning signs before failure, but these signs are rarely apparent to human observers. Predictive maintenance systems utilize sensors to monitor key factors, including real-time vibration patterns, lubrication quality, and wear in critical assets. This data is continuously analyzed using advanced algorithms that identify patterns invisible to human senses, often giving advance notice of potential problems weeks before a failure occurs.

This foresight gives mining maintenance teams a crucial advantage. They have the opportunity to intervene before breakdowns impact production or safety.

IN THIS GUIDE, we'll explain how you can shift to predictive maintenance with confidence and start winning on day one.

Precision in Harsh Conditions

Mine sites push equipment to its limits. Dust, moisture, vibration, and remote locations make traditional inspections difficult and infrequent. Predictive systems are specifically designed for these harsh environments, offering round-the-clock insights into high-stress assets, including:

- **Crushers and SAG mills**
- **Conveyors and gearboxes**
- **Underground ventilation fans and hoists**

With enhanced visibility into asset health, your mining operation can optimize production demands without sacrificing machine longevity.

Smarter Maintenance, Safer Teams

An unplanned repair invites a wealth of production challenges, often prompted by rushed decisions and uncertain conditions.–These slowdowns can create high-risk interventions when your maintenance team is forced to make repairs in confined spaces or high-temperature zones.

Predictive maintenance removes uncertainty from a maintenance schedule, allowing your team to schedule repairs during planned shutdowns. Reducing emergency callouts and unplanned downtime also limits exposure to hazardous by-products while conveniently maintaining regulatory compliance and MSHA standards.

THE RESULT? A safer site, a more efficient team, and a culture that values prevention over reaction.

4. Real-World Wins for Mining and Aggregate Operations

Cement Plant Prevents $120K in Losses with Proactive Fan Maintenance

At a flagship cement plant, a high-value separator fan began showing signs of imbalance. AssetWatch's dedicated condition monitoring engineer (CME) detected elevated vibration at the turning speed of the fan in both horizontal and axial directions, along with non-synchronous vibration at the motor's drive-end bearing.

The CME alerted the site team, recommending an inspection for material buildup and an evaluation of the fan bearing for possible damage. After cleaning the fan, vibration levels dropped significantly. Even more critically, the early warning gave the plant months of lead time to plan a controlled bearing replacement, avoiding sudden failure during production.

By acting early, the plant prevented $120,000 in repair and production losses. Over the first six months of service, AssetWatch helped save over $1.1 million and 160 hours of unplanned downtime. Read the full save.

RESULTS:	ROI Delivered:	Downtime Prevented	Avoided cost:
	$1.1M	160 hrs	$120,000

Mining Site Saves $240K by Addressing Crusher Vibration Early

At a mining facility, elevated vibration was detected on a cone crusher motor, specifically at the machine's operating speed. AssetWatch's CME flagged the issue and advised checking for possible sheave misalignment or incorrect belt tension.

Following the recommendation, the site team inspected and ultimately replaced the motor, belts, and sheaves. The proactive intervention avoided 24 hours of downtime and saved $240,000 in repair and lost productivity costs. Read the full save.

RESULTS:	ROI Delivered:	Downtime Prevented
	$240,000	24 hrs

5. Breaking Down Barriers to Successful Predictive Maintenance in Mining

Transitioning to predictive maintenance isn't just a technology upgrade–it represents a fundamental change in mindset. Any operational shift typically comes with understandable hesitations.

Here's how mining and aggregates leaders are addressing the most common objections and demonstrating the value of predictive maintenance, even in the toughest environments.

Perception:

"We're too remote for real-time monitoring"

Reality:

AssetWatch is built for hard-to-reach places. Whether you're deep underground or miles from the nearest network hub, **AssetWatch's wireless, cloud-enabled monitoring system works reliably with minimal IT overhead.** The technology is designed to thrive in remote and rugged environments. No fiber or heavy integration? No problem.

Perception:

"Our equipment is already old—why bother?"

Reality:

Aging equipment benefits most from predictive insights. Older crushers, conveyors, and fans may not be digitally native, but they're far from beyond saving. In fact, **predictive maintenance is often more effective on aging assets where mechanical wear is common** and the consequences of failure are high. Early alerts help you prioritize repairs, stretch lifecycle value, and avoid catastrophic downtime.

Perception:

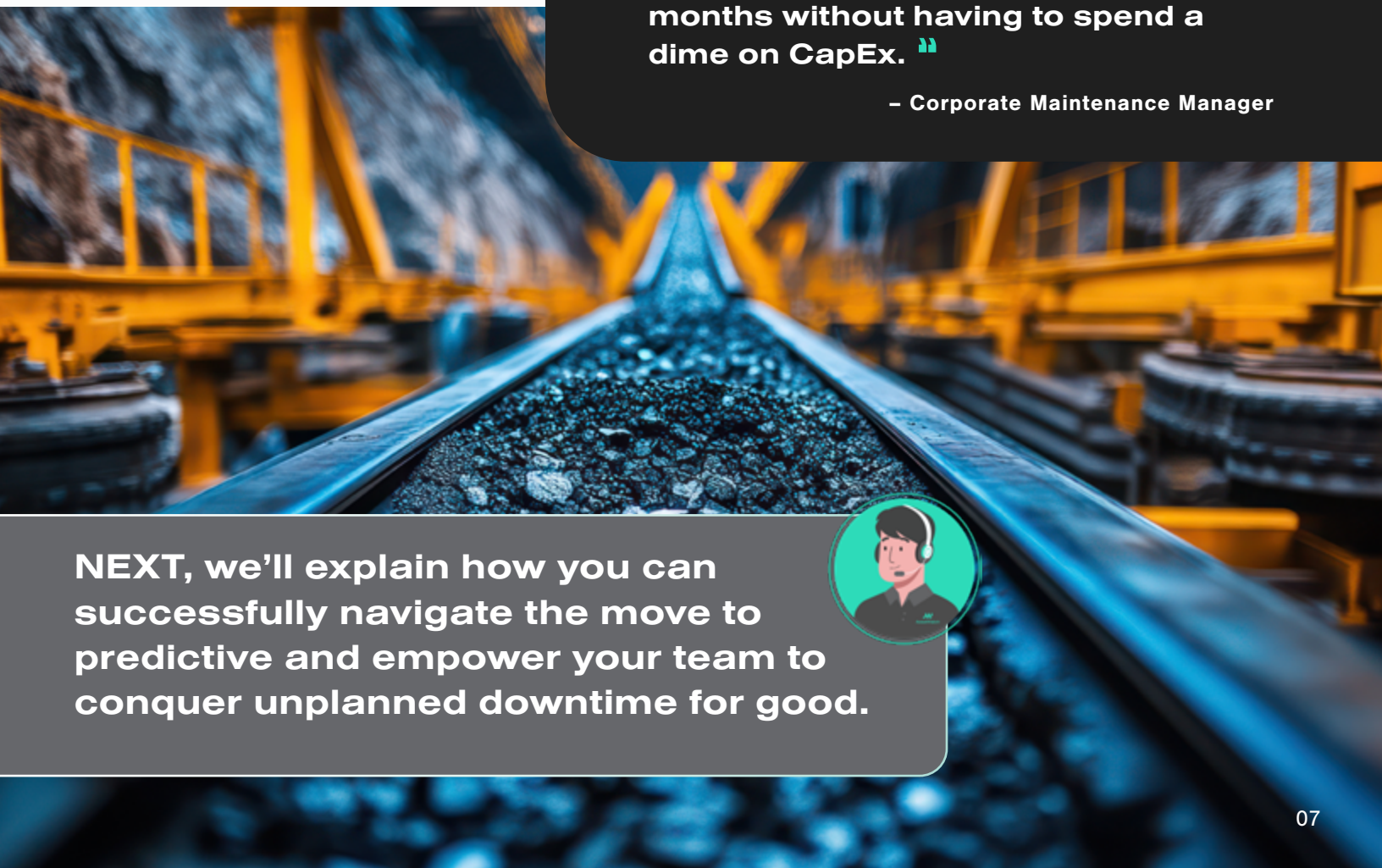
"We don't have a reliability engineer"

Reality:

You don't need one. With AssetWatch, you get more than just data. You get a dedicated condition monitoring engineer (CME) who monitors your equipment, interprets sensor data, and delivers clear, confident recommendations—so your team knows exactly what action to take and when to take it. **No in-house data science team is required.**

In short, modern mines are under pressure to do more with fewer people, tighter margins, and rising regulatory expectations. Predictive maintenance helps bridge these gaps with **smarter insights, fewer surprises, and greater control over your assets.**

> **"AssetWatch's world-class service and expert machine health insights saved us more than $1.1M in just six months without having to spend a dime on CapEx."**
>
> **– Corporate Maintenance Manager**



NEXT, we'll explain how you can successfully navigate the move to predictive and empower your team to conquer unplanned downtime for good.

6. Building a High-Impact Maintenance Strategy for Mining Sites

Predictive maintenance in mining isn't just about uptime. It's about operational resilience in some of the harshest, most remote conditions in the world. A high-impact strategy starts with a focused rollout, empowers your people, and scales smoothly across sites, systems, and teams.

If you're ready to move from reactive firefighting to proactive care, here's how to get started.

Start with Your Bottlenecks

Not all machines are created equal. When launching your predictive maintenance program, focus on one to three assets that cause the most downtime, cost the most in repairs, or are most critical to throughput.

Preventing just one major failure can offset the entire cost of your predictive maintenance program and generate a powerful momentum for broader adoption.

Strategy for Quick Wins:

- Start with bottleneck assets tied to production or safety
- Measure early results to secure operational buy-in
- Use success stories to expand site-wide

Enable Your Maintenance Teams

Technicians shouldn't be overloaded with data and alerts. They need the right data at the right time. That's why AssetWatch goes beyond dashboards to deliver clear, prioritized alerts with actionable next steps.

Instead of spending time decoding alarms or chasing false positives, your team receives guidance on what to inspect, what to replace, and when to take action.

Why it Works

- Less guesswork, more confidence
- Proactive repairs reduce high-risk emergency work
- Frees up time for higher-value maintenance planning

Scale with Seamless Integration

Your existing systems shouldn't hold back progress. AssetWatch integrates seamlessly with CMMS and ERP, allowing your asset health data to flow directly into the tools your team already uses.

Deployment is fast, with no significant IT involvement required. That means your mining operation can start seeing real value in days—not months.

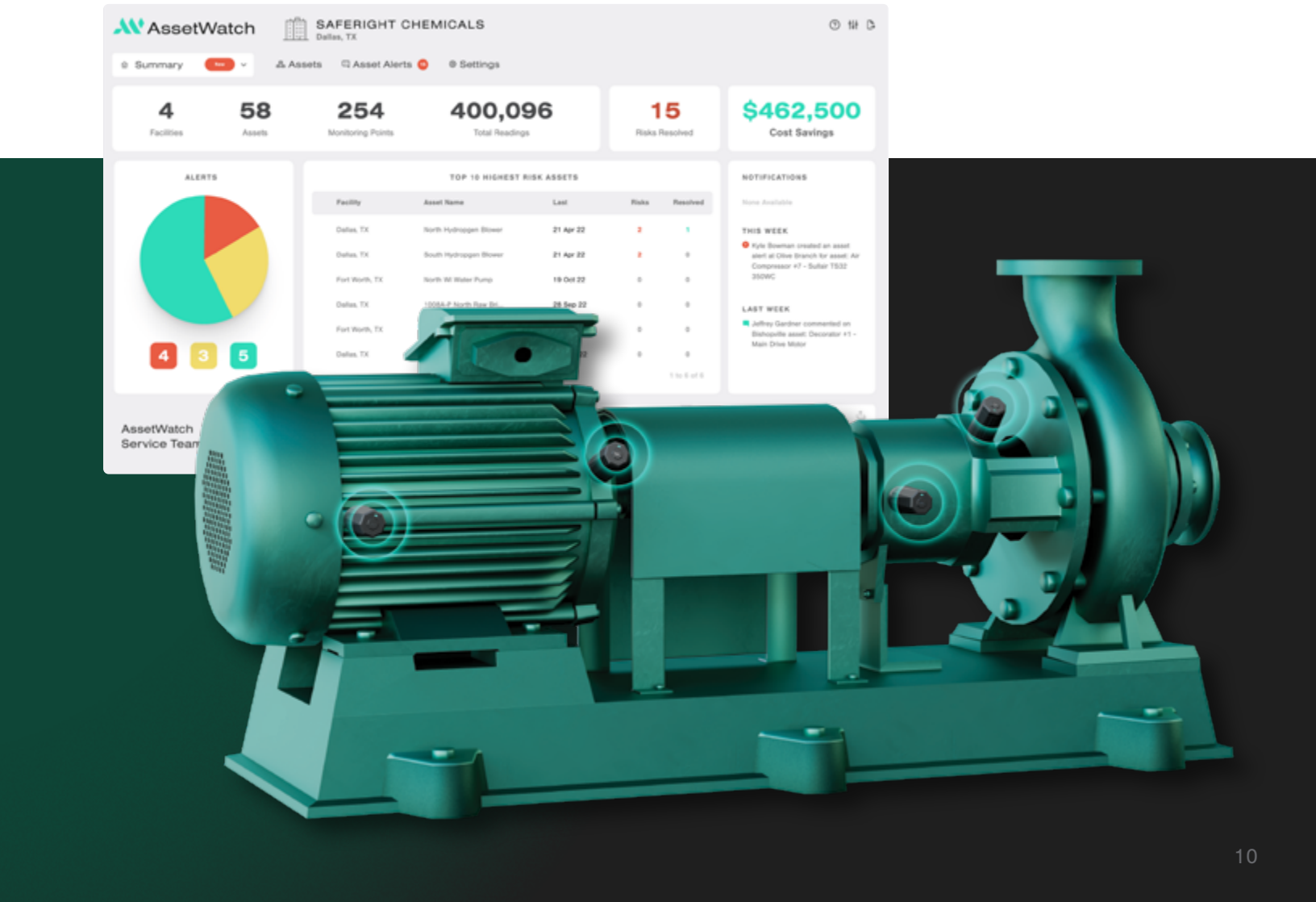
System Compatibility:

- Plug-and-play sensor installation
- No disruption to daily operations
- Aligns with digital transformation and automation goals

Track the KPIs that Matter Most

To truly build a resilient maintenance program, you need to monitor the metrics that impact safety, efficiency, and profitability. AssetWatch helps you track the KPIs that matter most to mine operators, maintenance leaders, and compliance teams.

- **Uptime** % – Measure asset availability across shifts
- **Mean Time to Repair (MTTR)** – See how quickly teams respond
- **Equipment Reliability Index** – Quantify asset stability over time
- **Maintenance Cost Per Ton** – Link asset care to production value
- **Energy Efficiency Metrics** – Track how maintenance affects power use
- **Near Misses Avoided** – Highlight predictive safety wins
- **Compliance Incident Rate** – Support MSHA and EPA reporting



Calculating the Value of PdM Over Time: Key Metrics

Cost Savings & ROI	☐ Return on Investment (ROI) - (Total Savings - Cost of Implementation) / Cost of Implementation ☐ Total Cost of Maintenance (TCM) - Preventive + Corrective + Predictive Maintenance Costs ☐ Cost per Failure Event - (Downtime Cost + Repair Cost + Labor Cost) / Total Failures ☐ Reduction in Emergency Maintenance Costs - Baseline vs. Post-Implementation ☐ Reduction in Overtime Labor Costs = Overtime Hours Saved x Hourly Rate
Equipment Performance & Reliability	☐ Mean Time Between Failures (MTBF) - Total Operating Time / Number of Failures ☐ Mean Time to Repair (MTTR) = Total Downtime / Number of Repairs ☐ Asset Uptime (%) - (Total Operating Time / Total Available Time) × 100 ☐ Failure Rate (%) - (Number of Failures / Total Assets) × 100 ☐ Reduction in Unplanned Downtime - Downtime Before vs. After Predictive Maintenance
Production & Operational Efficiency	☐ Overall Equipment Effectiveness (OEE) - Availability × Performance × Quality ☐ Planned vs. Unplanned Maintenance Ratio - Planned Maintenance Hours / Total Maintenance Hours ☐ Capacity Utilization (%) - (Actual Output / Maximum Possible Output) × 100 ☐ Throughput Increase (%) - (New Throughput - Baseline Throughput) / Baseline × 100 ☐ Reduction in Maintenance-Related Production Delays
Safety & Compliance Metrics	☐ Reduction in Safety Incidents = Incident Count Before vs. After Implementation ☐ Reduction in Regulatory Non-Compliance Events ☐ Audit Pass Rate (%) = Number of Passed Audits / Total Audits × 100
Inventory & Spare Parts Management	☐ Reduction in Spare Parts Inventory Holding Cost ☐ Reduction in Urgent Spare Part Orders ☐ Inventory Turnover Rate - Cost of Goods Sold / Average Inventory Value
Environmental & Energy Efficiency Metrics	☐ Reduction in Energy Consumption per Asset ☐ Reduction in Carbon Footprint (CO_2 Emissions Saved) ☐ Waste Reduction from Equipment
Predictive Maintenance Effectiveness Metrics	☐ Accuracy of Failure Predictions (%) = Correct Predictions / Total Predictions x 100 ☐ Reduction in False Positives & False Negatives ☐ Reduction in Unnecessary Maintenance Interventions

Conclusion: Reliability that digs deeper

Mining operations face pressure from every direction: production quotas, worker safety, environmental responsibility, and cost control. Predictive maintenance is no longer a luxury; it's a must-have tool for any mining operation that is serious about uptime and long-term profitability.

- **Detect issues early before they become costly failures**
- **Reduce unplanned downtime that disrupts production**
- **Cut maintenance costs through smarter, data-driven decisions**
- **Keep teams safe, compliant, and focused on priority tasks**

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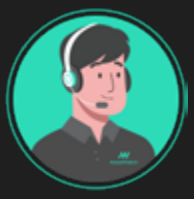

Reach out to us today!

Take that first step.

Ready to transform your maintenance program and protect your operation's future? AssetWatch makes it easy to get started, with a low-cost, no-risk 30-day trial. We'll help you identify your most critical assets and get you up and running in no time. We'll also provide expert support, dedicated to your facility, every step of the way.

Start Your Risk-Free 30-Day Trial

Schedule a Demo

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