With Predictive Maintenance, INTECH Helped a Port Operator Reduce Equipment Downtime by 85%

Summary

A global terminal operator struggled with unexpected equipment breakdowns and rising maintenance costs. They partnered with INTECH to shift from last-minute fixes to predictive maintenance using AI. By building an AI-powered maintenance system using real-time sensor data and smart analytics, INTECH helped reduce unexpected downtime by 85%, improve equipment availability, and extend asset lifespan.

About the Client

The client operates one of the world's largest port and terminal networks and handles millions of containers across continents. Their ports serve as critical gateways for global trade, relying on heavy-duty equipment like Ship to Shore cranes, Rubber Tyred Gantry cranes, and automated guided vehicles to move cargo with precision and speed.

With round-the-clock operations, any disruption in equipment functionality leads to more than just technical delays. It risks breaching service agreements with shipping lines, disrupting vessel schedules, and triggering a chain reaction across logistics partners.

Client Challenges: Routine Maintenance Was Not Enough

The client's engineering and operations teams found it difficult to keep every piece of equipment running at peak efficiency. For this, they needed a solution that could do more than routine maintenance.

The client relied on a fixed-schedule maintenance model, supplemented by reactive repairs. They maintained equipment on fixed schedules or waited until it broke down. This led to unnecessary servicing, unexpected failures, and higher costs.

Soon, these challenges started showing up:

Increased Operational Downtime
Unplanned equipment failures frequently halted berthing operations. Vessel turnaround times slipped, and container offloading was delayed, damaging both profit margins and customer trust.

High Maintenance Cost
Labor hours and spare part expenses steadily increased. Because of reactive maintenance, these investments delivered minimal returns. This led to growing frustration across operations and finance teams.

Growing Safety Risks
Aging machines, operating under pressure, started showing intermittent issues. It raised the risk of critical failures that could harm onsite personnel.

Teams Were Stretched Thin
Skilled technicians were overwhelmed, often jumping between emergency repairs and routine checklists without clear priorities and predictive visibility.

No Real-Time Insight, Only Guesswork
Decisions relied heavily on spreadsheets, operator instincts, and paper logs. Critical decisions relied on instinct rather than insight, which slowed down response times and led to costly errors.

The client needed an intelligent system that could deal with all the challenges they faced.
That's why they partnered with INTECH.

INTECH's Solution: AI-Powered Predictive Maintenance System

Working alongside the client's engineering and IT teams, INTECH designed and deployed an AI-powered Predictive Maintenance System that could learn and act before breakdowns occurred.

Every decision was driven by live equipment data. Every alert reflected intelligent insights. Every maintenance task became timely, targeted, and effective.

Here are the key features:

Smart Sensor Deployment Across Critical Equipment

- INTECH began by auditing the client's high-risk machinery, focusing on Ship to Shore cranes, RTGs, and AGVs. Each asset was fitted with industrial-grade IoT sensors to continuously capture real-time data points like vibration, temperature, oil pressure, motor load, and brake wear. These sensors acted as digital sentinels, detecting early signs of wear that the human eye might miss.

Unified Data Infrastructure for Real-Time Visibility

- All sensor streams were funneled into a central computing layer for real-time processing. INTECH's engineers built a robust integration layer to unify this live data with historical maintenance logs, enabling more accurate modeling of future failures. The system also connected with the client's existing CMMS (Computerized Maintenance Management System) to ensure alerts, work orders, and scheduling could happen within familiar tools.

Predictive Models Trained on Real-World Events

- INTECH developed machine learning models using actual sensor data from daily operations. These models analyzed how specific changes, including increased vibration or shifting temperatures, often came before equipment failure. Over time, the

This innovative solution brought immense clarity for the client's engineering team.

Clarity that reduced risk without slowing down yard operations. Clarity that made every maintenance decision proactive, informed, and intentional.

Implementation Process

INTECH knew that installing a predictive maintenance system inside a busy port & terminal environment couldn't afford trial and error. Equipment was constantly in use, operations ran 24/7, and downtime came at a high cost.

That's why implementation became a joint transformation journey. This journey built trust, delivered quick wins, and ensured long-term sustainability without disrupting existing workflows.

Here's how the implementation process unfolded:

1. **Equipment Prioritization and Sensor Calibration**
   The process began with a hands-on equipment audit. INTECH worked shoulder to shoulder with the client's mechanical team to identify failure-prone components across high-impact machines. Rather than covering every asset with sensors, INTECH focused on precision, targeting the motors, gearboxes, brakes, and hydraulic systems most likely to fail.

   We calibrated each sensor based on asset history and environmental conditions. We also paid attention to baseline performance values to distinguish normal operating behavior from early failure signals.

2. **Seamless Data Integration and Model Training**
   Once sensors went live, INTECH set up a secure data pipeline between the edge processing units and the client's cloud infrastructure. From here, the data gets cleaned, labeled, and prepared for AI modeling.

   INTECH engineers built predictive models tailored to each machine category, using supervised learning on historical failure cases to identify patterns. We tested each model rigorously before being released into live mode.

3. **Shadow Mode Testing and Operator Validation**
   For the first 30 days, the system ran in "shadow mode." It generated predictions without triggering any real maintenance action. During this time, INTECH collected operator feedback, fine-tuned sensitivity thresholds, and validated the model's alerts against actual machine behavior.

   Maintenance leads used this period to cross-verify AI predictions with their assessments, building confidence in the system's accuracy.

4. **Live Rollout with Training and Support**
   After successful shadow testing, INTECH rolled out the system across all terminals. We trained technicians through on-site workshops and mobile walkthroughs. We also created Custom playbooks for interpreting alerts, initiating repairs, and logging follow-ups. Additionally, we launched a dedicated support channel for daily feedback, system tuning, and escalation.

Once the predictive models went live, the impact on operational efficiency was both immediate and measurable.

Key Outcomes

Within weeks of full deployment, the impact of INTECH's predictive maintenance system became visible across the terminal.

Here's how operations transformed:

85% Reduction in Unplanned Downtime: The system flags potential failures weeks in advance, giving technicians the lead time to plan maintenance before issues escalate. This proactive approach eliminates last-minute scrambles, keeps vessel schedules on track, and minimizes demurrage charges.

40% Increase in Equipment Availability: Fewer breakdowns and faster service cycles keep cranes and AGVs running longer. Planners gain more flexibility to allocate assets during peak berthing windows, allowing the terminal to move more containers without adding equipment or straining teams.

30% Extension in Asset Lifespan: Technicians replace parts only when necessary, avoiding premature wear from over-servicing or reactive repairs. Equipment runs closer to its design limits without stress, reducing long-term damage and delaying the need for costly replacements.

But beyond these numbers, the system delivered something far more valuable: Control. Control over asset health and operational risks.

Tools and Technologies Used

INTECH carefully selected every tool and technology component to balance real-time performance with long-term scalability.

Here's what powers the predictive maintenance system:

- **IoT Sensors:** Capture real-time data on temperature, vibration, pressure, and motor performance across all high-risk equipment components.
- **Edge Computing Units:** Process data instantly at the source to enable faster decision-making without relying on cloud latency.
- **Machine Learning Models:** Analyze historical and real-time equipment behavior to predict failures with high accuracy and minimal false alerts.
- **Cloud Infrastructure:** Centralizes all data streams for long-term storage, model retraining, and seamless access across teams and terminals.
- **Mobile Alert System:** Delivers prioritized maintenance notifications to technicians and supervisors with recommended actions and response timelines.