

Reliability & Asset Management for Refining

Machinery Health Management | Field Device Management | AI/ML & Advanced Analytics



Keeping Critical Equipment Running in Complex Refining Environments

Refining is a demanding industry, involving hundreds to thousands of production and automation assets like **control valves, measurement instruments, compressors, turbines, pumps, heat exchangers** and many more. Managing this complexity—especially across aging units, hazardous environments, and remote locations—presents a constant challenge across safety, compliance, and resource availability.

Unplanned asset failures can cascade through the process, putting personnel and production at risk. Manual inspections aren't enough—especially in hard-to-reach or high-risk areas. Without continuous monitoring and early diagnostics, refiners often end up reacting too late. Today's reliability leaders are adopting predictive maintenance strategies that target top-quartile performance:



In refining, optimal asset health isn't optional—it's essential to stay competitive, compliant, and safe.

Proven Financial Impact for Refiners

The value of a predictive maintenance strategy is clear. According to a study published in *Hydrocarbon Processing*, a typical 100,000-barrel-per-day refinery implementing predictive maintenance as part of a broader asset management program can achieve annual savings exceeding **\$3.5 million:**



Considerable ROI Possible with a Proven Condition Monitoring Strategy



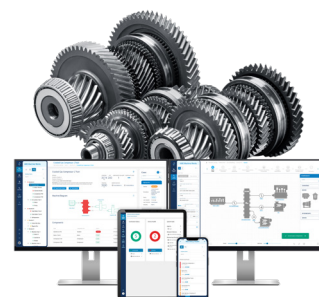
From Reactive to Predictive Maintenance

With Emerson's wide-ranging condition monitoring technology, maintenance becomes proactive and data-driven—not time-based. Early warning of developing issues empowers your team to act only when needed. In some cases, the ability to prevent a failure or confidently proceed with a major startup—such as a large compressor train—can pay for the entire system in a single event.



Advanced Protection-plus-Prediction

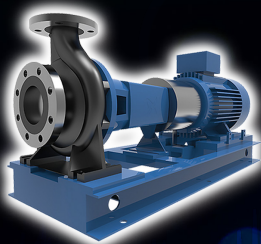
Protect your most critical rotating assets from catastrophic failure and costly downtime. Emerson's systems not only deliver continuous monitoring, but also offer a seamless path to upgrade legacy protection systems to full API 670-compliant solutions with embedded predictive diagnostics.



Mechanical Validation

Gain confidence during the most vulnerable period in a machine's lifecycle—immediately after maintenance. Emerson's solutions capture baseline vibration and performance data before and after servicing, ensuring machines are returned to optimal condition and enabling smarter, faster operational decisions.

Key Rotating Machinery



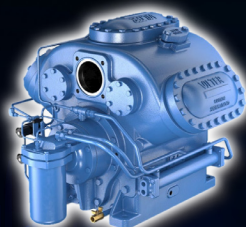
Pumps

- Most numerous rotating machinery
- Large refineries often have 1,000+ pumps
- Some facilities exceed 2,000 units



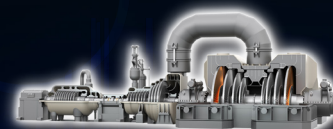
Electric Motors

- Drive pumps, fans, and compressors
- Range: several hundred to 1,000+ units



Compressors

- Centrifugal and reciprocating types
- Critical for gas compression and recovery
- Typically, number in the dozens per refinery



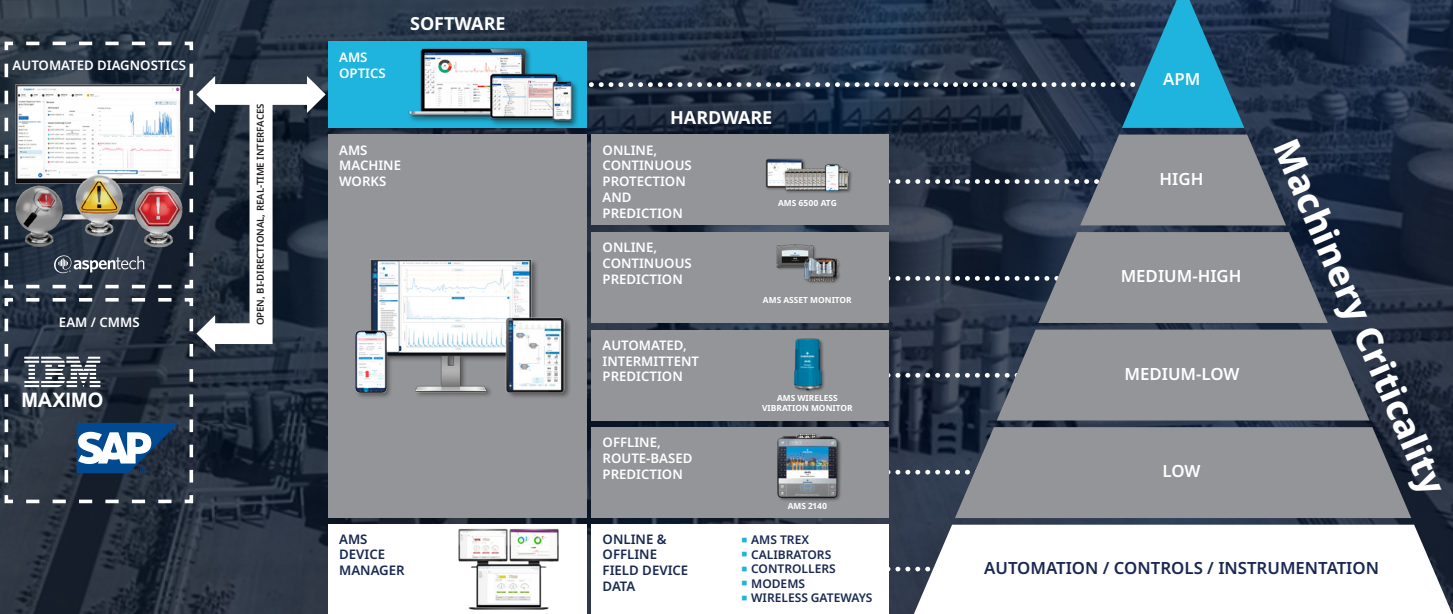
Turbines

- Includes expanders, drivers, recovery turbines
- Drive pumps, compressors, or generate power
- Commonly tens to hundreds per refinery

Key Refining Processing Units and Corresponding Machinery

In a modern refinery, not all assets carry the same level of risk to operations. While every pump, valve, and compressor plays an important role, certain assets—highlighted below in blue—represent the highest criticality. These include **hydrogen make-up compressors, gas and steam turbine generators, refrigeration compressors, recycle compressors**, and other large rotating equipment that are both capital-intensive and operationally vital.

An unexpected failure of one of these machines can bring an entire processing unit, or even the full refinery, to a halt. Industry studies have consistently shown that unplanned downtime in refineries can cost operators millions of dollars per day in lost production, increased maintenance costs, and safety or environmental risks.



[▶ Watch Video](#)



CUSTOMER STORY

Major Southwestern U.S. Refinery Sets the Standard for Predictive Reliability

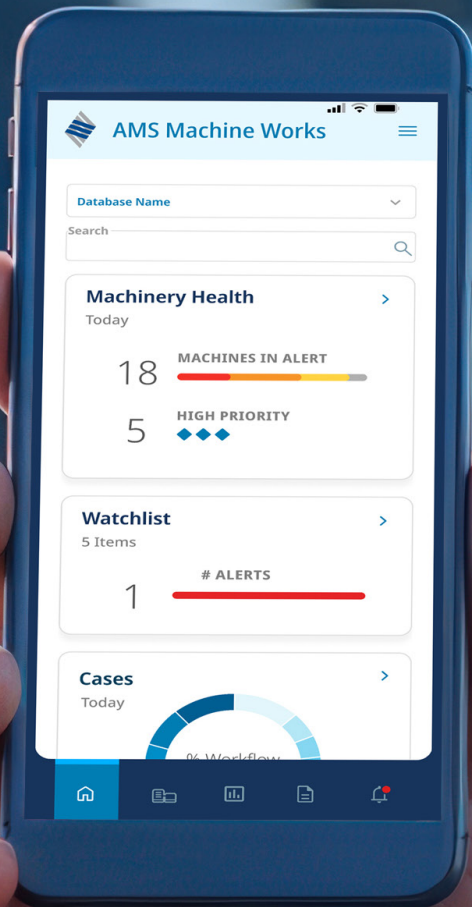
Location: North America

Capacity: 100,000 bpd

Assets Covered: Motors, Pumps, Fans and Compressors

A leading U.S. refining site faced recurring failures across pumps, fans, and compressors that disrupted production. Partnering with Emerson, the team deployed 2,100 AMS Wireless Vibration Monitors integrated with the plant historian and AMS Machine Works software, delivering daily health updates on 250+ motors/pumps, 4 fans, and 2 compressors.

To complement this coverage, AMS 2140 Machinery Health Analyzers are used in the field for advanced troubleshooting and detailed diagnostics, enabling teams to confirm issues and prevent costly downtime. Another 900 wireless monitors are planned for implementation. This site pioneered the program, which has since expanded across the refiner's U.S. and Canadian operations—becoming an enterprise-wide standard for asset health and reliability.



CUSTOMER STORY

One of the World's Largest Oil & Gas Producers Strengthens Reliability with Continuous Vibration Monitoring

Location: North America

Capacity (two sites): 250,000 bpd; 100,000 bpd

Assets Covered: Reciprocating Compressors, Knock-Out Drums, Burner Assemblies, and others.

One of the world's leading oil and gas companies sought to improve reliability across critical rotating and static equipment at multiple refinery sites.

Emerson implemented a predictive maintenance program using AMS Wireless Vibration Monitors and AMS Machine Works to continuously monitor and analyze equipment health at specified points of interest.

Reciprocating compressor valves, knockout drums, and burner nozzles were experiencing recurring vibration and fatigue issues that occasionally led to unplanned downtime. Manual checks made it difficult to detect developing faults early enough to prevent failures.

Vibration trends uncovered gradual valve deterioration and high-frequency swings linked to coupling imbalance and mechanical fatigue—problems that could now be identified and addressed before escalation.

With more than 4,000 wireless vibration monitors deployed, the customer gained plantwide visibility into asset conditions, enabling faster root-cause analysis, optimized maintenance planning, and greater overall reliability across its refining operations.



CUSTOMER STORY

Major Gulf Coast Refinery Strengthens Reliability, Scaling Across 15 Sites

Location: North America

Capacity: 630,000 bpd

Assets Covered: Tank Mixers

A leading U.S. refiner with 15 sites faced persistent failures across critical assets, limiting visibility into asset health and impacting production. Known “bad actors” were not consistently monitored.

At one Gulf Coast facility (630,000 bpd), Emerson deployed 133 AMS Wireless Vibration Monitors integrated with AMS Machine Works, covering assets in a Crude unit. This built on prior installations of 78 Emerson vibration sensors in other units. Nearly 400 additional sensors are planned for implementation.

The program has since scaled enterprise-wide, with 15 U.S. sites now using AMS technologies to standardize asset monitoring, improve uptime, and strengthen reliability.



CUSTOMER STORY

Calumet Upgrades Critical Machinery with AMS 6500 ATG in a Pinch

Location: Shreveport, Louisiana, United States

Capacity: 60,000 bpd

Assets Covered: Critical Compressors

At a major U.S. Gulf Coast refinery, a highly critical piece of machinery faced recurring reliability challenges that had direct implications for production and costs. During routine site assessments, Emerson identified a legacy Bentley Nevada 3500 rack as needing an upgrade. They provided a proposal for comparison and budgeting, highlighting how predictive monitoring could help the plant anticipate potential failures before they caused unplanned downtime.

Within months, the facility experienced an **unplanned outage** when the BN 3500 stopped communicating with the DCS and several cards failed. With no spare parts readily available, support from the previous supplier proved ineffective. Emerson's team stepped in, recommending the **AMS 6500 ATG system**, which offered:

- **Predictive protection** to detect developing issues before failure
- **Universal modules** compatible with a wide range of sensors, ensuring replacement flexibility
- **Proactive support** and pre-installation planning to identify additional at-risk equipment

Emerson completed the **installation and startup in just three days**, identifying several faulty sensors that posed risks to other critical machinery. The result is a **simpler, cost-effective, and reliable vibration monitoring process**, improving uptime and safeguarding production.

This project has given the refinery confidence in deploying **AMS 6500 ATG** for other highly critical machines across its operations, establishing a scalable approach to predictive maintenance.

We are very pleased with the system and everything is working better than our other system. We now have a simple and cost-effective process, which is as important as the reliability of our compressor. We would highly recommend Emerson's AMS 6500 ATG as the vibration prediction/protection system for other highly critical machines throughout our company.

Timothy Johnson

Control Systems Technician
Calumet Specialty
Shreveport, LA USA



CUSTOMER STORY

European Tank Terminal Enhances Pump Reliability with Integrated Predictive Monitoring

Location: Europe

Capacity: 40,000 bpd

Assets Covered: Booster Pumps

A major European tank terminal sought to improve availability and reliability of its booster pumps while operating with limited maintenance resources. Continuous manual monitoring was impractical, and the customer needed an automated solution to alert operations and maintenance teams—via DCS integration—of any changes in pump health.

Emerson deployed AMS Asset Monitors on four vertically oriented booster pumps. The system applied edge analytics and predictive monitoring to detect early signs of performance degradation. Installed in an ATEX Zone 0 environment, the solution included wall-mounted junction boxes with barriers for intrinsic safety.

Through OPC integration, pump RPM data, raw vibration signals, and prescriptive analytics were delivered directly into DeltaV, enabling operators to live-monitor motor and pump conditions. This seamless connection between asset health and process control empowers the terminal to optimize performance in real time, prioritize maintenance based on data-driven insights, and sustain reliable operations across its refining network.



CUSTOMER STORY

Chevron El Segundo Refinery Cuts Valve Maintenance Costs with Continuous Monitoring

Location: North America

Capacity: 276,000 bpd

Assets Covered: Control Valves

Chevron's El Segundo Refinery faced high costs and delays from manual valve troubleshooting. Each evaluation could take up to 10 hours and involve eight people, with two investigations weekly totaling about \$57,000 annually. Valves were sometimes removed unnecessarily, further increasing costs.

Emerson implemented AMS Device Manager software to continuously monitor and report on the health of 103 control valves with digital valve controllers. Real-time diagnostics now let maintenance teams identify issues quickly and make informed repair decisions without disrupting operations.







The program achieved major results: \$45,600 saved in troubleshooting labor, \$136,800 from avoided maintenance, \$90,800 by improving a key steam control valve, and \$100,000 through surplus valve recovery. The solution reduced downtime, cut costs, and improved overall reliability.



AMS Reliability Portfolio

Emerson's AMS portfolio helps the world's leading refiners enhance asset visibility, reduce maintenance costs, increase equipment uptime, and improve overall operational efficiency. AMS technologies enable a transition from reactive to proactive asset management strategies, empowering businesses to make data-driven decisions and optimize asset performance.

Machinery Health Management

AMS 2140 Machinery Health Analyzer	AMS Wireless Vibration Monitor	AMS Asset Monitor
 <ul style="list-style-type: none"> ■ Portable analyzer combining data collection, vibration analysis, balancing, and motor diagnostics in one unit. ■ Monitors a wide range of machinery: variable-speed equipment, gearboxes, high-speed compressors, and sleeve-bearing turbomachinery. ■ PeakVue™ and PeakVue™ Plus™ deliver early, simple bearing fault detection with severity assessment. ■ 4-channel plus tachometer inputs support simultaneous multi-channel diagnostics. ■ Advanced tools: FFTs, waveforms, phase, order tracking, resonance, and modal testing. ■ Dynamic balancing (up to 4 planes) and motor/electrical diagnostics for full coverage. ■ Integrates with AMS Machine Works for advanced analysis and route management. <p style="text-align: center;">VIEW ONLINE</p>	 <ul style="list-style-type: none"> ■ AI-driven analytics with prescriptive insights to detect and diagnose asset faults. ■ Pairs with AMS Machine Works as its native application. ■ Wireless monitoring via triaxial accelerometer with temperature, PeakVue™ and PeakVue™ Plus, and Z-axis coverage up to 20 kHz. ■ Up to 13 key parameters with integration to SCADA, DCS, historians, and AI/ML platforms. ■ Remote alerts delivered over WirelessHART® connectivity. ■ Hazardous area certified (Class I, Div 1, IP66 / NEMA 4X enclosure, ATEX Zone 0). ■ Easy installation and upkeep with simple mounting, alignment, and 3–5 year replaceable battery. <p style="text-align: center;">VIEW ONLINE</p>	 <ul style="list-style-type: none"> ■ Non-API 670 compliant shutdown logic. ■ AI-powered edge analytics and automated monitoring. ■ IIoT-ready – installed at the industrial edge near the asset. ■ Versatile, continuous monitoring with configurable shutdown logic. ■ Provides condition reports on imbalance, misalignment, bearing defects, and seven other common machine issues. ■ Easy and inexpensive to deploy and configure (install and configure in less than 1 hour); eliminates project complexity. ■ Use native software, or integrate with AMS Machine Works for advanced analysis ■ Hazardous area approvals: Class I, Div 2 / ATEX Zone 2. <p style="text-align: center;">VIEW ONLINE</p>
AMS 6500 Machinery Health Monitor	AMS 6500 ATG Online Protection-Plus-Prediction System	AMS Machine Works Asset Management Software
 <ul style="list-style-type: none"> ■ For assets that might require quick response to sudden changes during transient conditions, online condition monitoring provides tailorable frequency and the types of data necessary. ■ The versatile, scalable system delivers online condition monitoring as needed. <p style="text-align: center;">VIEW ONLINE</p>	 <ul style="list-style-type: none"> ■ API 670 Compliant TSI Machinery Protection. ■ World class Predictive Maintenance tools in a single rack. ■ Powerful embedded Machine Studio application. ■ Integration with AMS Machine Works for advanced analysis. ■ Modernization solution for legacy protection systems like BN 3500. <p style="text-align: center;">VIEW ONLINE</p>	 <ul style="list-style-type: none"> ■ Integrates data from various data-collection methods into a single database — including information from thermographic and lubrication programs. ■ Teams view data and trends to improve the reliability of rotating equipment. ■ Persona-specific alerts help teams understand potential faults and give site-wide visibility to asset health. <p style="text-align: center;">VIEW ONLINE</p>

Intelligent Field Device Management

AMS Device Manager



- Predictive diagnostics & alerts prevent failures early.
- One app for config & calibration (online/offline).
- Browser access to health & calibration via AMS Device View.
- Auto-sync field changes from AMS Trex (USB/Wi-Fi).
- Centralized Audit Trail & calibration history.
- Faster commissioning with templates & bulk config.
- Broad protocol support: HART, FOUNDATION Fieldbus, PROFIBUS, WirelessHART, PROFINET.
- Role-based security with traceable user actions.
- Integration with numerous DCS, PLC, Historian and APM/analytics systems.

 [VIEW ONLINE](#)

AMS Trex Device Communicator



- Versatile communication with HART®, FOUNDATION Fieldbus™, and Bluetooth® devices.
- Powers devices directly with Power the Loop, eliminating external power needs.
- Rugged, intrinsically safe design suitable for hazardous industrial environments.
- 5.7" touchscreen operable with gloves for easy field use.
- NIST Traceability: Calibrated using standards traceable to the National Institute of Standards and Technology (NIST).
- Connects via Bluetooth, USB, and Wi-Fi for seamless data transfer.
- Auto Sync keeps data accurate and up-to-date with AMS Device Manager.

 [VIEW ONLINE](#)

Workflow Management & Collaboration

AMS Optics



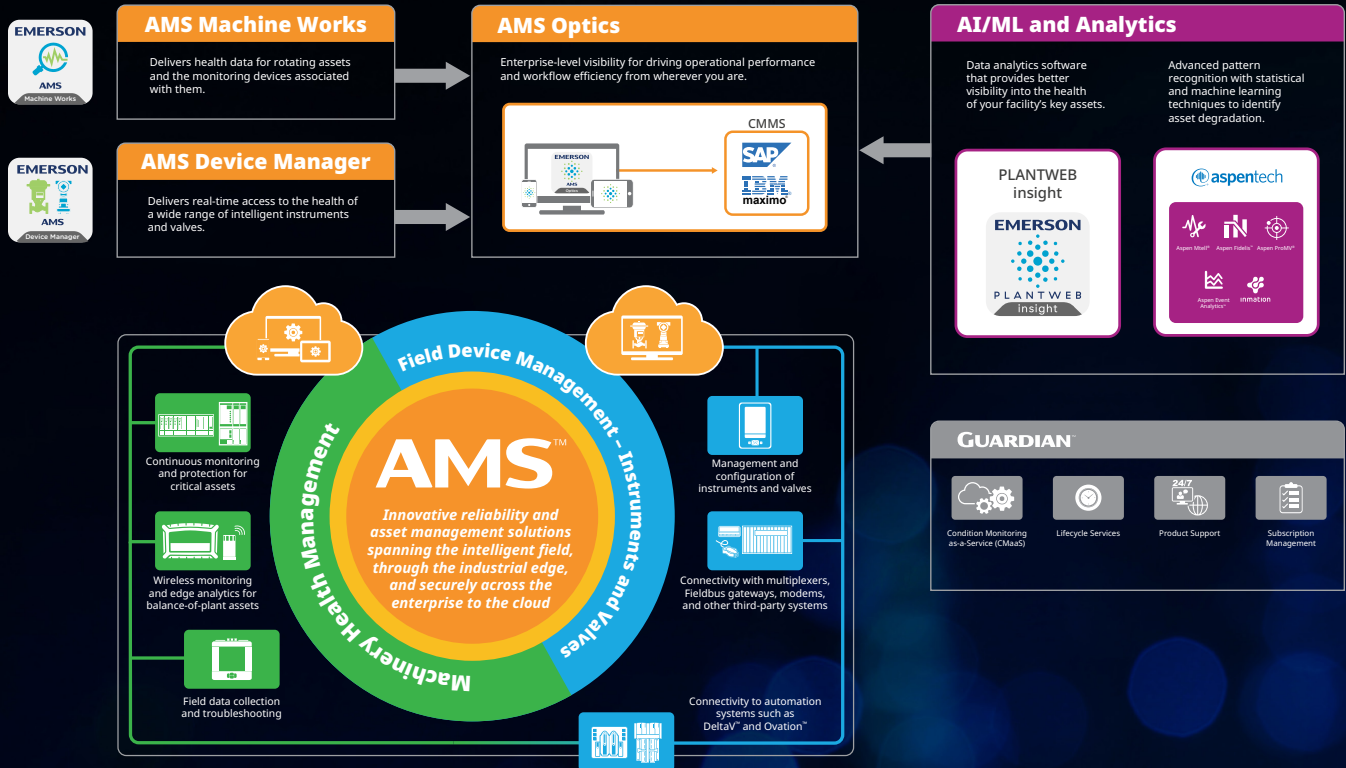
- Bridges operational technology (OT) and information technology (IT).
- Personnel can perform exception-based analysis versus inspecting every piece of data collected.
- Simplifies multivariate analysis and principal component analysis to assist in finding trouble spots.
- Provides a collaborative environment to improve plant reliability and operational performance.
- Offers workflow integration to drive proactive operations with CMMS integration.
- Securely integrate with anything, store everything, and scale-out easily with flexible deployment options.
- Built on a modern data repository to store structured and unstructured data types.
- Historian functionality enables immediate asset health and parameter history.

 [VIEW ONLINE](#)

Achieve Enterprise-Wide Reliability with Emerson—and AspenTech

Integrated Asset Management and Reliability Solutions Powered by a Cohesive and Scalable Software Architecture

Boundless Automation: from intelligent sensors and edge devices to enterprise-wide insights, Emerson—together with AspenTech—delivers unmatched asset performance through a fully connected, AI-powered technology stack.



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