Honeywell

ASSET PERFORMANCE MANAGEMENT

Near real-time unified analytics suite for improving industrial asset performance and reliability in an enterprise-grade platform

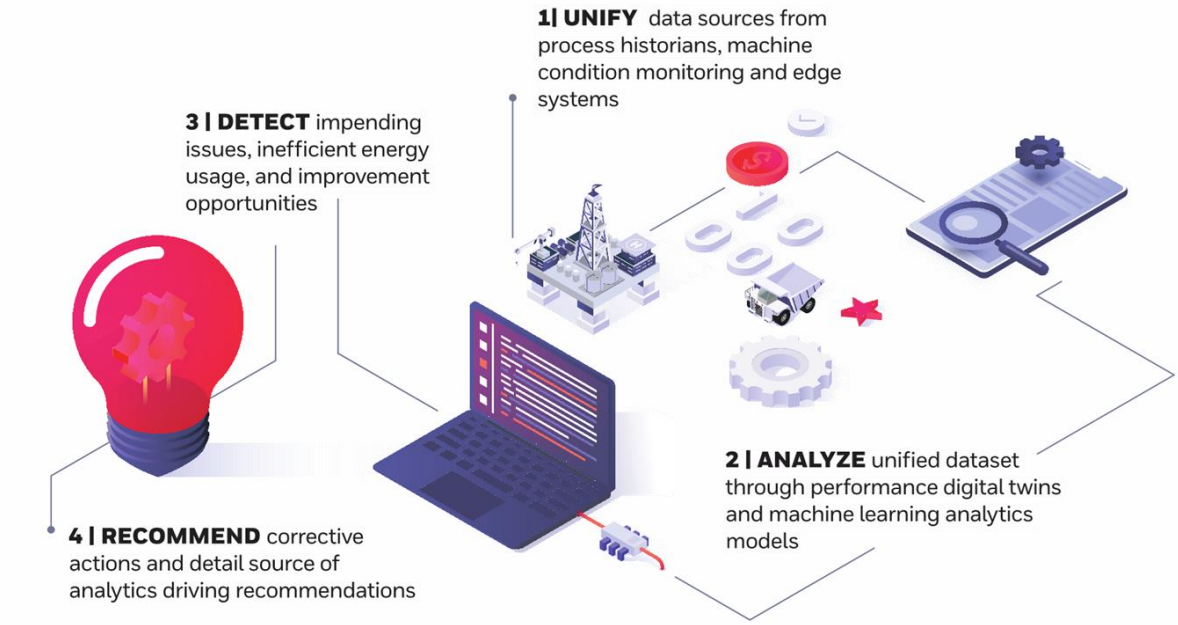
MODERNIZING YOUR RELIABILITY STRATEGY

Asset performance Management (APM) platforms are nothing new.

But for many asset intensive industrial companies, their current asset management strategies remain fragmented and fall short of meeting long-term business reliability objectives. Siloed systems and site-specific models that rely on limited expertise have led to ineffective practices that cannot scale and meet future needs.

Honeywell's Asset Performance Management (APM) solutions provide an innovative approach to reliability that leverages advanced modeling techniques with proven reliability domain-know how to deliver transformative and sustainable outcomes related to the health, performance, energy efficiency, safety, and integrity of assets.

HONEYWELL ASSET PERFORMANCE MANAGEMENT STRATEGY



A Unified Platform for Enterprise Scalability and Flexibility

Honeywell Asset Performance Management provides a unified and vendor-agnostic platform that is modular and scalable and can be deployed on-premises or cloud-hosted via Honeywell Forge allowing companies to connect the balance of plant assets across all sites. The solutions are designed to be vendor-agnostic, allowing for the integration of data and custom models across different equipment types and OEM vendors into a single solution for comprehensive, near-real time asset health and performance monitoring and closed loop reliability and maintenance practices.

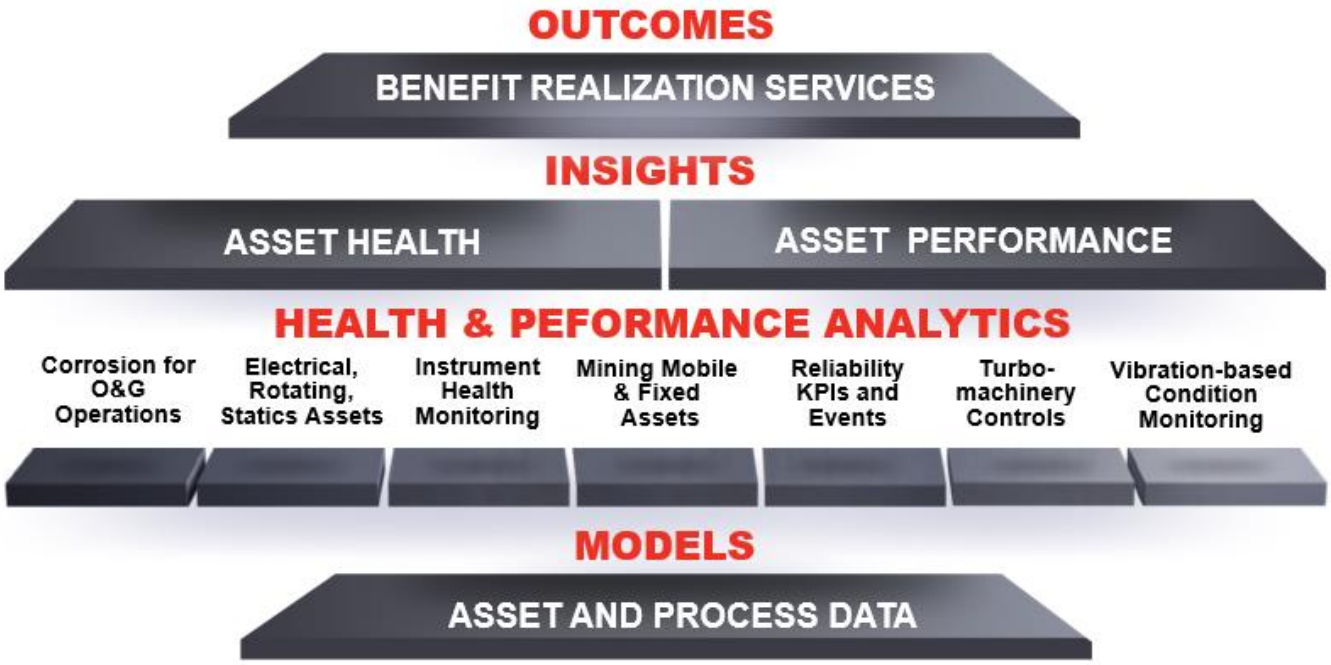
Domain Know-How to Deliver Faster Benefits

The domain knowledge gained from Honeywell UOP, Compressor Controls Corporation (CCC), Honeywell Join-Industry Corrosion programs, and the Honeywell Reliability Center of Excellence helps companies navigate the complexities of managing and deploying APM strategies to maximize benefits while reducing loss of expertise risks driven from attrition and strain on tight resources. Our deep experience not only guides enterprise level reliability

and maintenance strategies and technology strategies but is built into the application and capabilities of APM.

Programmatic Approach to Delivering Reliability Outcomes

Reliability strategies require more than technology to achieve transformational outcomes. Honeywell's comprehensive approach leverages deep domain knowledge to help establish a robust reliability strategy and user adoption program designed to achieve sustainable performance. Honeywell helps customers with asset selection, plan deployments to achieve rapid results, implement organizational and process changes, and provide after market services to improve business performance metrics.

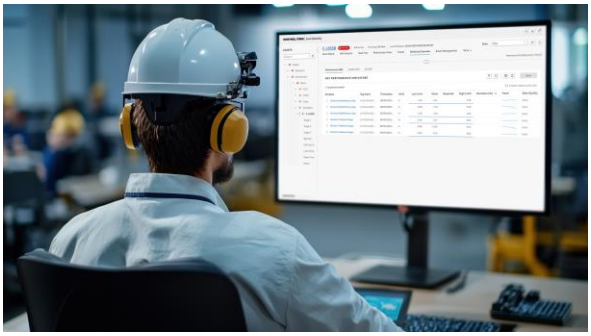


Field-Proven Advice to Accelerate Value from the Start

With over a decade of experience in deploying asset reliability solutions, Honeywell goes beyond technology by providing end-to-end services. We have partnered with large, global enterprises for multi-site APM deployments with asset monitoring counts as high as 20,000 for a single enterprise. Through these extensive partnerships, we have developed a programmatic, value-based execution methodology to help maximize customer outcomes incorporating crucial elements such as organizational change management as well as sustainment services to lead to measurable business results.

What we do:

- Assess your baseline performance
- Audit work practices
- Identify bad actors
- Determine criticality
- Establish KPIs
- Develop a business case & roadmap
- Plan more effective deployments



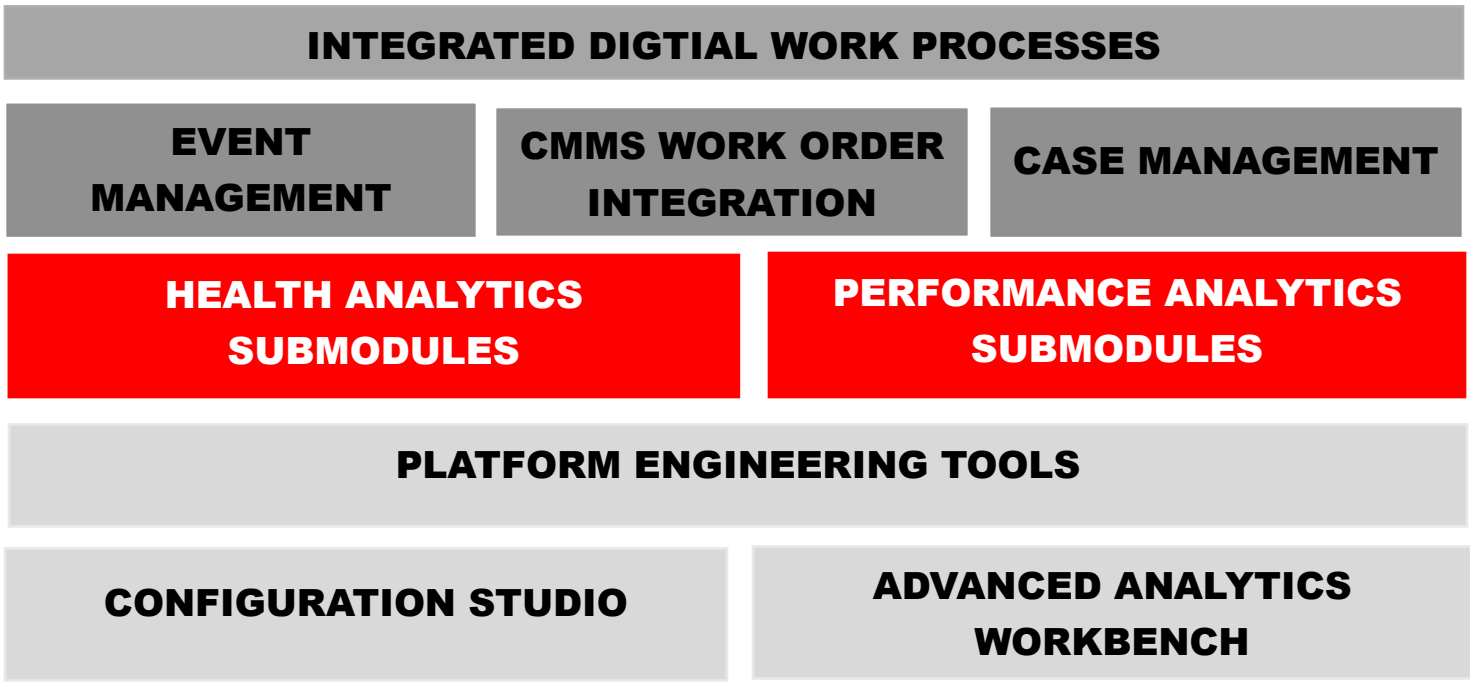
Domain Built Asset Models

Honeywell APM provides customers with out of the box, field tested models that incorporate SME experience and help speed up the time to value. The platform offers a standard asset model library with over 40 asset types and more than 100 asset variants, developed by Honeywell engineers from different domains including asset reliability, instrumentation and controls, machinery, maintenance, process simulation, and corrosion. The models are vendor-agnostic, extensible, and updated based on industry standards and field experience. They include predefined fault models, fault trees, KPIs, causes, consequences, and corrective actions.

HONEYWELL APM SOLUTION OVERVIEW

Honeywell Asset Performance Management provides a unified enterprise-grade reliability platform that is modular and scalable as needs expand. APM uses predictive analytics to monitor asset health and performance and anticipate abnormal behaviors so teams can prevent unplanned downtimes and drive continuous improvement from a single source of truth across different asset types, balance of plant assets, and OEM condition-based monitoring systems.

Unlike traditional equipment condition monitoring systems, Asset Performance focuses on early detection and diagnostics of both equipment health and performance. It uses multiple modeling methods with both first principle-based efficiency models, Machine Learning (ML) powered anomaly detection algorithms for asset health, and mechanical fault monitoring as leading indicators of potential equipment problems. APM applies advanced analytics to the unified data set to recognize early signs of physical health issues and predict potential time to failure. The analytics are packaged into actionable insights that provide operations teams with guidance on the next right step to take to prevent failure and reinstate assets to the desired operating performance by closing the loop between reliability and maintenance. APM can be deployed incrementally from a single site to an enterprise.



INTEGRATED DIGITAL WORK PRACTICES

Honeywell Asset Performance Management closes the loop between reliability and maintenance teams with seamlessly integrated work practices. APM can integrate with Computerized Maintenance Management Systems (CMMS) and Enterprise Resource Planning (ERP) systems to convert insights into action faster with automated workflows, historized event details, work order management, autonomous maintenance recommendations, and guided root-cause analysis tools.

HEALTH ANALYTICS SUBMODULES

PREDICTIVE HEALTH ANALYTICS: Combine pre-built fault symptom models with machine-learning based anomaly detection algorithms for detecting asset health issues before failure occurs.

CONDITION-BASED VIBRATION MONITORING: Leverage plug-and-play, wireless IIOT sensors combined with AI-powered vibration analytics in APM.

INSTRUMENT HEALTH MONITORING: Extract more value from Experion PKS Field Device Manager by monitoring both smart and non-smart instrument health.

PREDICTIVE CORROSION MONITORING: Now part of APM as Corrosion Advisor, Predict RT provides O&G and Refining engineers with predictive corrosion insights without requiring corrosion sensors.

MOBILE & FIXED EQUIPMENT MONITORING FOR MINES: A comprehensive software for health monitoring of mobile and fixed assets across fleets.

PERFORMANCE ANALYTICS SUBMODULES

FIRST PRINCIPLES PERFORMANCE MONITORING: Identify performance degradation and its root causes in near real-time to avoid production/energy losses through proactive actions and out-of-the-box asset models or integrating with Honeywell UniSim Design process simulation software.

TURBOMACHINERY ADVISOR BY COMPRESSOR CONTROLS CORPORATION (CCC): Turbomachinery advisor embeds 50+ years of CCC know-how to extract actionable insights from CCC control systems for critical event management, energy monitoring, and control performance monitoring to improve compressor reliability.

HONEYWELL UOP POLYBED PSA VALVE ANALYTICS OFFERED THROUGH PROCESS TECHNOLOGY ANALYTICS: Provides out-of-the-box valve health analytics enriched with 50+ years of propriety UOP Process expertise to enhance PSA unit availability.

PLATFORM ENGINEERING TOOLS

Honeywell Asset Performance Management's suite of engineering tools enable faster time to value. Our Configuration Studio provides an intuitive interface enriched with templatized and digitalized tools to help you deploy your digitalized reliability programs more efficiently.

The Advanced Analytics workbench provides users with the option to Bring Your Own Machine Learning and or to leverage powerful, patented asset anomaly detection algorithms to deploy AI and ML based predictive analytics.

APM USE CASES

HEALTH

- Boiler Tube Leakage
- Compressor Lube Oil System Loss of Pressure
- Fire & Gas Detectors Fault Intensity
- Furnace Decoking Cycle Improvement
- Haul Truck Engine Failure Prediction
- Remaining Useful Life of PD Pump
- Remaining Corrosion Allowance Estimates in Crude Distillation Units

PERFORMANCE

- Compressor Deviation Efficiency Low
- Compressor Critical Event Analysis
- Compressor Excess Recycle Detection
- Compressor Inlet Supply Anomaly
- Compressor Load Sharing Imbalance
- Crude Distillation Heat Exchanger Fouling
- Polybed PSA Valve Fault Detection

AFTER MARKET SERVICES

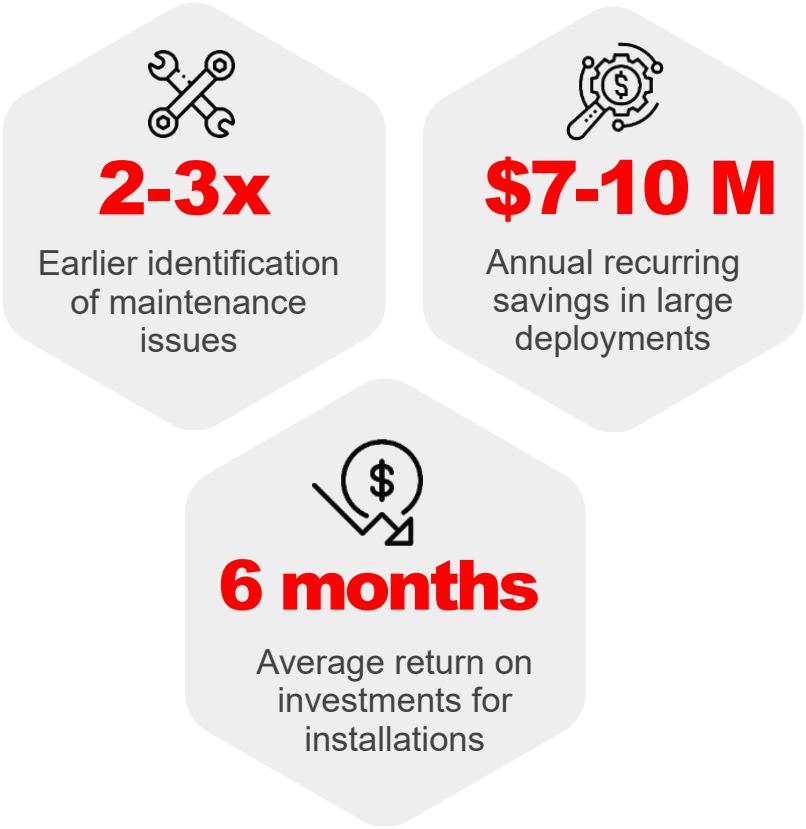
Honeywell offers a variety of subscription-based services that are designed to help transform business performance, reduce total cost of ownership, and align service programs with business priorities. Flexible engagements modes are available to enable critical outcomes with ownership of service KPIs or scalable, adaptable support to augment in-house service capabilities.

Remote Monitoring Services for APM

Let Honeywell reliability professionals at our Honeywell Reliability Center of Excellence do the heavy lifting to help maximize APM technology investments while minimizing downtime. Our reliability and engineering subject matter experts take ownership of technical support, monitoring events, managing cases, and quarterly tracking of value realization reports.

BENEFTIS

Honeywell APM is commonly deployed from plant to enterprise-wide levels across Oil & Gas companies, Fuel Refineries, Petrochemical facilities, Chemical plants, Semi-conductor manufacturing facilities, and Mines.



Calculations based on observed outcomes of Honeywell customers in period 2012-2022 using Asset Sentinel. Asset Sentinel is on the on-premises version of Honeywell's asset performance product. Results may vary depending on multiple factors, including status of digital maturity using a cloud-based deployment. Large deployments often involve thousands of assets while small deployment involve a few hundred assets.

WHY HONEYWELL APM

- **50+ years** of Compressor Control Corporation turbomachinery know-how
- **50+ years** of process technology design and operation
- **20+ years** of Joint-industry corrosion research with 20+ major O&G and refining companies
- **15+ years** of first-principles thermodynamic modeling and process simulation
- **10+ years** of field proven APM deployments and out-of-the-box asset models
- **10+ years** of monitoring mobile and fixed equipment assets across metals & mining fleets

For more information

To learn more about Honeywell Forge Performance+ for Industrials | Asset Performance, visit our website or contact your Honeywell Account Manager.

Honeywell Connected Enterprise

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