

PERFORMANCE⁺ FOR INDUSTRIALS | ASSET PERFORMANCE

OVERVIEW

Honeywell Forge Performance+ for Industrials | Asset Performance is a SaaS-based solution combining performance monitoring with machine learning and predictive analytics, providing the latest capabilities for serving a company's asset reliability objectives. This solution is intended to monitor asset and process performance, detect potential impending health issues, and predict potential time to failure. It helps industrial facilities reveal opportunities for performance improvement and expedites analysis in finding the root cause of inefficiencies or impending issues.

Honeywell Forge Performance+ for Industrials | Asset Performance is designed to help aggregate data from assets and processes, making the data analyzable to uncover potential failures, provide recommendations on how to solve those hiccups, allowing the opportunity to bring assets and processes back to their established operational states faster. Asset Performance provides enterprise scalability, accelerated time to value, a vendor agnostic platform for third-party integration, fully managed services, and early detection enabling proactive steps before likely failure without over-maintaining equipment.

CLOUD BENEFITS

Honeywell's asset performance management (APM) solution leverages native cloud deployment for a simple, scalable SaaS solution with enterprise-wide services and business integration. The cloud delivers agility, scalability, and security. Benefits include:

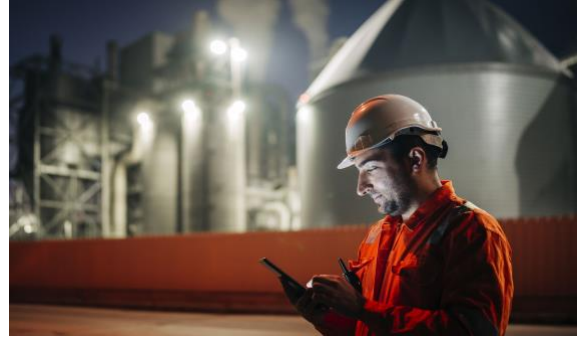
- Lower cost of entry
- Faster deployment
- Always on the latest release
- Built-in resiliency
- Improved system performance
- Increased availability
- Lower total cost of ownership

A MODULAR, CUSTOMIZED SOLUTION

Asset Performance provides a single, industrial-grade user interface to meet the needs of your operations and maintenance teams. It is a modular solution, so you can start small and scale depending on your needs.

Predictive Asset Health Monitoring

Asset Performance presents a consolidated view of operational parameters (including KPIs, OEE, run hours and downtime) using data coming from devices in the field such as sensors. Users can benefit from visualizations that are displayed for the particular personas. If the Health module is complemented by the Predict module, the dashboards can also show the predicted values of operational parameters into the future to indicate possible anomalies based on patterns in historical data.



Predictive Performance and Energy Calculations

State-of-the-art machine learning models and other data analytics tools allow the identification of never-before-seen patterns, their labeling, and ingestion so they can be included back into the solution. These models can be used to create custom alerts or codify SME knowledge through, for example, codes that include end users' machine learning algorithms. Teams can predict potential failures that impact the health of critical equipment, uncover the main variables driving deviations from normal behavior, and take informed corrective actions. To achieve this, the solution analyzes past trends in the operational data that is fed into Asset Performance.



PREDICTIVE ASSET HEALTH MONITORING

MACHINE LEARNING MODULES & RULE-BASED DIAGNOSTICS



PERFORMANCE OPTIMIZATION

PREDICTIVE PERFORMANCE & ENERGY CALCULATIONS



MAINTENANCE STRATEGY

RISK & COST REDUCATION

FOUNDATIONAL ASSET LIBRARY

Asset Performance draws from a wealth of standard asset libraries and tools to integrate existing plant data sources. An extensive Advanced Performance Library includes hundreds of out-of-the-box first-principles asset models and templates quantifying machine efficiency (performance) and gives a leading indicator of process and/or asset health issues. Your teams can compare current live data against predicted performance and highlight deviations.

This library is vendor-agnostic and extensible, allowing inclusion of in-house or OEM generated models including custom Python scripts. Engineering teams are empowered to interact and maintain these model libraries without having to involve subject matter experts or data science teams. A Standard Performance Library provides a pre-defined set of performance equations and fault models that can be customized and enhanced for vital assets.

THREE-LAYER ASSET MODELING

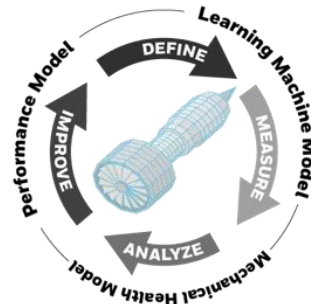
Asset Performance is powered by a unique 3-layer, holistic asset modeling approach. The first layer of analytics monitors the health and performance of assets in near real-time. Mechanical health models correlate symptoms with faults in assets and instrumentation exposing causes, consequences, and potential corrective actions. Maintenance teams can quickly assess which assets require immediate attention based on criticality of the asset and severity of the fault. Intuitive root cause analysis workflows accelerate investigation of issues and provide clear next-step actions.

The second layer of analytics uses predictive capabilities to identify potential failures that could impact the health of critical equipment, uncover the main variables driving deviations from normal behavior, and enable informed corrective actions. Based on state-of-the-art machine learning, it allows identification of never-before seen patterns, their labeling, and

incorporation back into the model by experts without previous experience in data science.

The third layer of analytics uses asset data to discover equipment that is underperforming either because of design or operational declines. It identifies underlying causes of low performance to address the situation and bring assets back to established KPIs. This includes assets consuming high energy levels and recommendations on improvements to comply with industry standards and regulations.

By combining asset libraries with holistic modeling, Asset Performance deploys rapidly and detects impending issues earlier.



Hollistic Models

Out-of-the-box Models

Pre-built Library

Includes out of the box centrifugal compressor, Pump, Electric Motor models including performance, Faults and ML

ADVANCED ASSET LIBRARY

Asset Performance embeds decades of proprietary domain know-how from Honeywell into standard advanced asset libraries for specialized and more comprehensive, fit-for-purpose monitoring of mission critical or more reliability-challenged assets. The advanced asset library not only includes decades of Honeywell process automation knowledge but also domain intellectual property from UOP and Compressor Controls Corporation (CCC), a Honeywell Company. With these advanced models, your teams can leverage specialized domain expertise that enhances reliability and performance monitoring in the most critical or troubling areas of your operations.

Turbomachinery Advisor with CCC

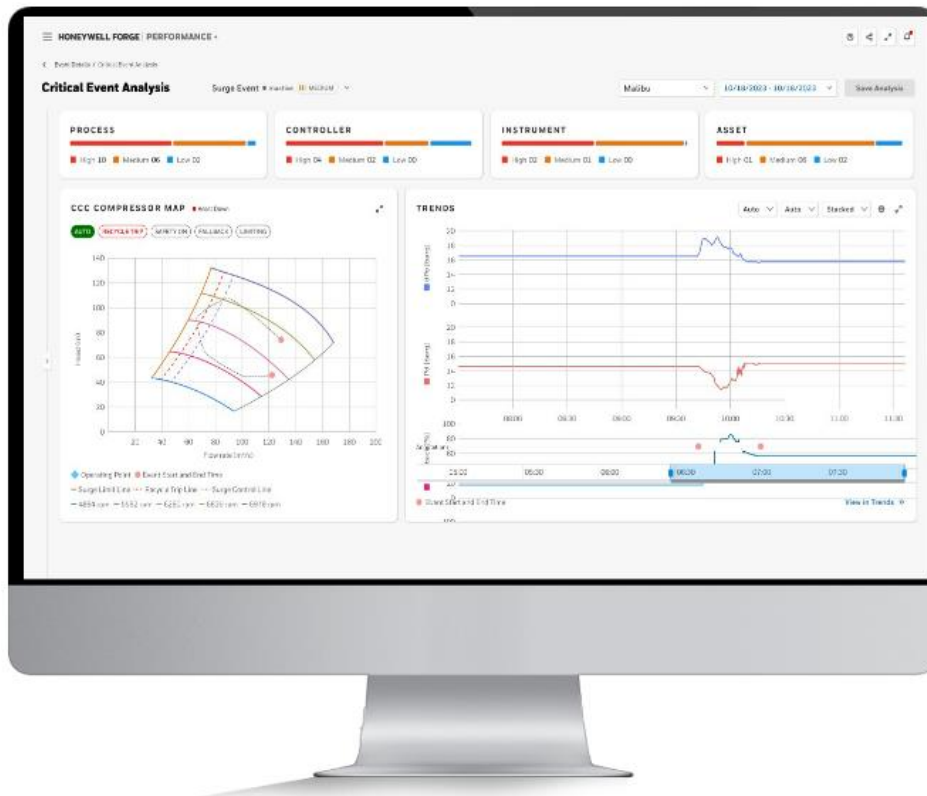
Helps industrial operators get the most out of their CCC turbomachinery control systems and mission critical assets like compressors by leveraging self-guided tools and diagnostics designed with CCC turbomachinery controls know-how. It achieves this by enabling quicker and more thorough critical post event analysis, recommendation of the optimal operating condition to reduce excess recycle and energy use, and identification of unperforming control performance loops.

Integrated Instrument Asset Manager Suite

Building upon Honeywell's Experion® PKS Field Device Manager, the integrated asset manager suite powered by Honeywell Forge Performance+ for Industrials Asset Performance solutions takes instrument asset management to the next level. By expanding your monitoring coverage of asset health, Instrument Asset Manager provides you with an added view of the critical, near-real time for smart and non-smart instrument health data and diagnostics needed to comprehensively assess the impact of instrument health on asset and process performance.

Honeywell's UOP Polybed™ PSA Monitoring:

Pre-packaged Process Technology Analytics (PTA) that revolutionize how PSA units operate by integrating over 50 years of proprietary UOP process expertise. This innovative asset library is designed to enhance PSA unit availability significantly. It achieves this through near real-time monitoring and analytics of valve health, coupled with targeted recommendations for valve maintenance.



WHAT DOES ASSET PERFORMANCE DELIVER?

Asset Performance is an enterprise-grade, near real-time analytics solution that monitors asset and process performance, detects impending health issues, and helps drive continuous improvement.

First, the solution provides surveillance over local and remotely located machinery and processes. It unifies plant asset and process data from various sources – including historians, machine condition monitoring and edge systems - and organizes it within a cyber-secure cloud environment or on-premises installation.

It integrates process and asset data into a single, unified dataset, and creates digital twins with advanced predictive analytics. Continuous data feeds the digital twins and drives near real-time KPI calculations, event notifications, and on-demand report generation.

Machine learning and big data predictive analytics continuously quantify inefficiencies and detect earlier onset of reliability issues, impending equipment problems, and root causes. This insight into potential machinery downtime aids planning and prioritization of asset maintenance and corrective actions.

THE OUTCOMES ARE THAT:

- Personnel stop wrangling raw data and cobbling reports. They are freed to analyze, improve, and control a wider range of asset and process improvement opportunities.
- Integrated process and asset models reveal root causes of bottlenecks, identify new levels of untapped productivity, and uncover potential EHS threats.
- The unified environment of data and KPI event generation establishes a common source for

workflow in applying corrective actions among engineering, maintenance, and operations teams.

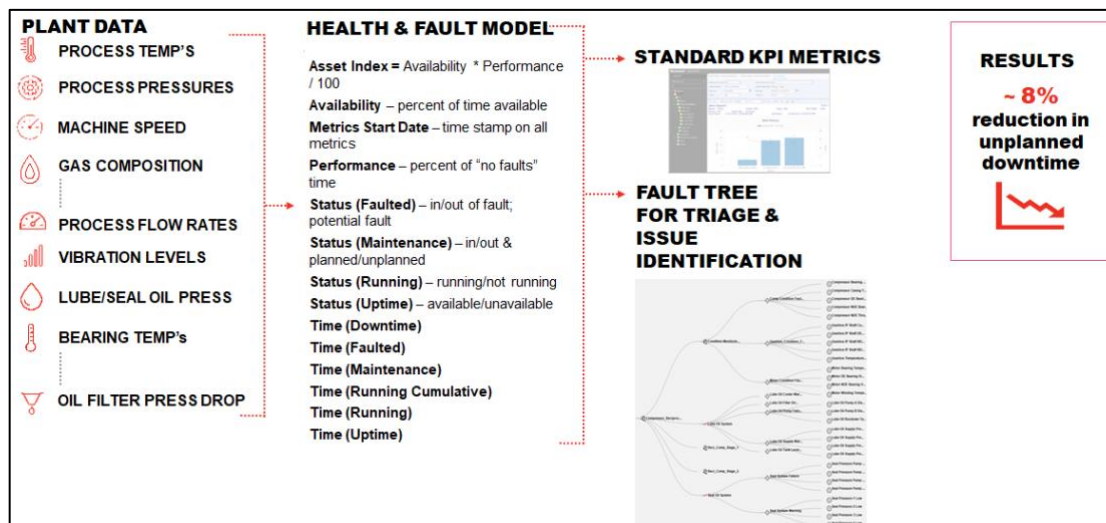
- The solution provides supplemental support to safety, QMS, environmental and regulatory agendas.

The solution closes the loop between operations and management teams through the integration with CMMS and other ancillary enterprise systems. This automates work orders to trigger field inspections to investigate issues or start recommended maintenance activities.

The result is increased performance and reliability from both your assets and the processes the assets serve.

General value gained includes the following*:

- **Plant Availability / Reliability Improvement:**
1-4% per year
- **Recurring Annual Savings:**
\$2-3M+ for small deployments
\$7-10M+ for large deployments
- **People Productivity:**
Waste elimination by up to 30% per week
- **Operation and Maintenance:**
Cost reduction up to 10%
- **Efficiency Improvement:**
Energy savings cost reduction by up to 5%
- **Increased Safety:**
 - Minimized risks by ensuring normal and stable operations
 - Eliminated production stops for safety system verification



FEATURES AND CAPABILITIES

Unlike traditional equipment condition monitoring systems, Asset Performance focuses on early detection and diagnostics of both equipment health and performance. It uses performance degradation as a leading indicator of potential equipment problems and machine learning analytics to recognize early signs of physical health issues.

Infinitely Scalable Capability: Scalable from unit, to site, to the extents of the organization's enterprise – anywhere in the world. Asset performance management delivers continuous access and insight from a centralized vantage point. This affords collaboration beyond localized teams and facilitates global virtual collaboration by all plant equipment stakeholders.

Data Access: Asset Performance aggregates data from a variety of sources:

- Near real-time data from DCS/ PLCs via OPC DA
- Near real-time alerts from DCS/PLCs via OPC A&E
- Historical Data via OPC HDA
- Relational Data (i.e. lab data, oil analysis)
- CMMS, MEM, and other enterprise systems
- Excel
- Other via flexible “plug-in” architecture

Data Cleansing: Honeywell's solution automatically compensates for corrupt, inaccurate, or missing data. This ensures monitoring and analysis are performed on reliable data. Likewise, users have the flexibility to modify rules or create their own cleansing routines.

Automatic Unit Conversion: Ensures engineering units from source systems are converted automatically to suit engineering units in the asset models.

Persona-based Dashboards: Expose the right level of relevant information depending on the user. Visualization dashboards are customized to serve the needs of operations and maintenance teams and are available on any computer or mobile device. The solution closes the loop between O&M teams through the integration with CMMS systems. This automates the generation of work orders to trigger field inspections to aid in the investigation of issues or start the process of recommended maintenance activities.

How Does Asset Performance Work with CMMS?

A CMMS system such as SAP® PM or IBM® Maximo helps manage maintenance activity through work orders, scheduling, maintenance reports and spares

inventory tracking. However, it does not provide the early detection of maintenance needs.

The solution continuously monitors for failing equipment health and performance degradation. Likewise, it provides the analysis tools to determine what maintenance is required and within what timeframe. Asset Performance can link directly to a CMMS, therefore, when a health or performance event occurs, it can trigger the CMMS to start the process of maintenance activity.

In the absence of a dedicated CMMS, Asset Performance is highly configurable to support many traditional CMMS functions.

End-To-End Visibility of Operations

1. Asset Hierarchy

Asset Performance provides a holistic view of operations including geographically distributed sites and assets. Users can drill down through the different levels of the hierarchy to get detail information on the state of assets and components.

2. Plant Performance KPIs

Asset Performance for Industrials provides continuously tracked plant or site KPIs such as Overall Equipment Effectiveness or Uptime. This dashboard allows quick visualization of historical values and trends of plant performance.

3. Near real-Time Event Visualization

Ongoing events are categorized based on the criticality of the asset and the severity of the failure. This visualization helps O&M teams prioritize activities based on the assets that require their attention the most and identify recurrent bad actors.

4. Prioritized Alarms and Events

Asset Performance automatically prioritizes ongoing events identifying the causes, consequences, and recommended corrective actions. These automated workflows expedite the investigation of issues and trigger the required actions to bring assets back to optimal performance faster.



SUMMARY

Asset Performance is practical APM at your fingertips. We can provide accelerated deployment of our solutions, thanks to our embedded library of pre-built models that can be configured and validated in an accelerated fashion.

This allows you to extract value faster and in combination with our persona-centered user experience, the learning curve gets accelerated as well. Our intuitive, productive user interface shows what matters to the final users based on their role, but at the same time allows them to collaborate with the rest of the organization.

Under the hood, our patented, out-of-the-box modeling approach can extend lead times weeks in advance with a very low rate of false positives. It is also flexible enough to allow the incorporation of third-party models from OEMs or your own custom models.

- 3 Layers of Analytics
- 25% Earlier Detection*
- 50% Fewer False Positives*

** Calculation based on observed outcomes of Honeywell customers in the period 2012-2022 using Asset Sentinel. Asset Sentinel is the on-premises version of Honeywell's asset performance product. Results may vary depending on multiple factors, including current status of digital maturity and using a cloud-based deployment.*

Finally, our approach to APM allows us to close the loop with other parts of the organization. This includes not only integration with work order systems, but also with people in the field supporting the accelerated resolution of problems.

Honeywell provides the data and analytic foundation needed to enable operational excellence. Honeywell is an industry leader in integrated solutions of Manufacturing Execution, Process Optimization and Asset Management Systems that improve plant profitability by enabling plant staff to work more effectively and make better decisions.

For More Information

To learn more about Honeywell Forge Performance+ for Industrials Asset Performance, visit [Asset Performance Management](#) or contact your Honeywell Account Manager.

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