



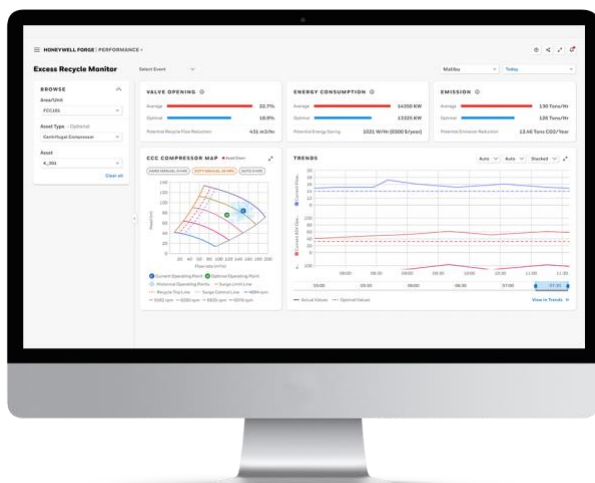
**HONEYWELL  
FORGE**

# TURBOMACHINERY ADVISOR | HONEYWELL ASSET PERFORMANCE FOR INDUSTRIALS

Turbomachinery Advisor is an advanced compressor performance model in Honeywell Forge Performance+ for Industrials | Asset Performance (APM) solution and can be deployed on-premise or in the cloud via Honeywell Forge. Turbomachinery Advisor combines 50 years of proprietary Compressor Controls Corporation (CCC) turbomachinery controls with Honeywell's 20+ years of asset monitoring experience to bring a first-of-its-kind CCC controls monitoring solution that provides actionable insights on how compressor controls can be improved to enable greater reliability and performance. Enriched with guided root cause analysis tools, expert insights and powerful visuals, Turbomachinery Advisor is a comprehensive tool that helps controls and reliability engineers get the most out of their CCC control systems and compressors – helping them discover optimization opportunities in increasing uptime, reducing energy consumption and increasing production.

## CHALLENGES

Dynamic compressors are some of the most expensive and mission-critical assets in a plant. Operating these assets efficiently and reliably is key to profitability and plant availability. While advanced turbomachinery controls can make a significant impact on optimizing and maintaining the availability of compressors, changes in the operating environment, process conditions, component wear and tear, etc. can cause the overall asset performance to deteriorate. When such conditions are undetected or unattended in time due to resource constraints or lack of data, unplanned downtime, excess energy use, process bottlenecks and/or machinery damage may occur.



## SOLUTION

Turbomachinery Advisor extends beyond health and performance monitoring by incorporating controls monitoring. Maintenance, reliability and controls engineers can leverage these advanced models and tools to:

1. Perform faster and more in-depth event investigations with high-resolution process data combined with machinery data
2. Safely operate closer to the surge limit line while reducing energy use and emissions
3. Implement control strategies and maximize compressor performance controls to sustain optimal performance and improve the reliability of individual compressors and complex trains

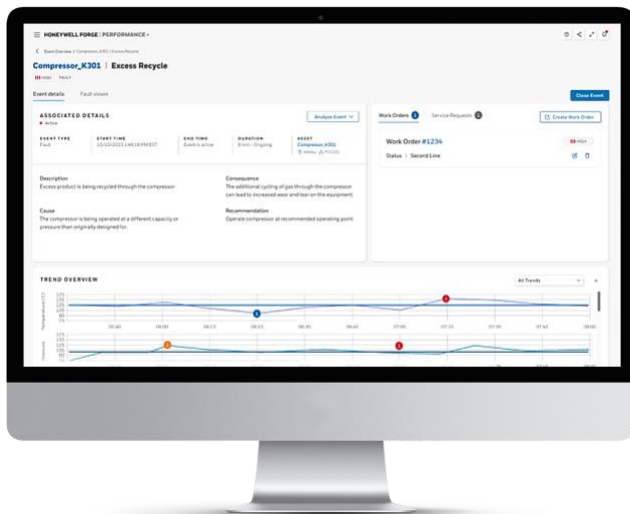
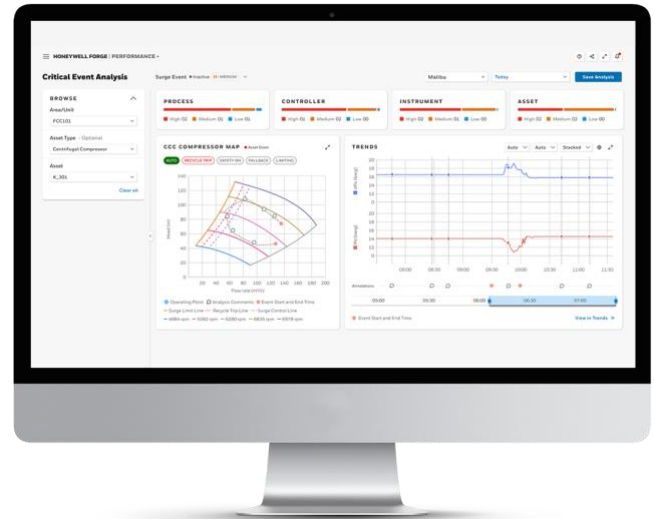
# INTRODUCING THE USE CASES

Turbomachinery Advisor includes three submodules that embed CCC know-how to bring a more comprehensive monitoring of compressors that includes control performance, energy and critical event monitoring capabilities.

## Advanced Honeywell APM Capabilities for Compressors Exclusive to Turbomachinery Advisor:

### Critical Event Analysis

Extract, historize and aggregate high-resolution (100+ milliseconds) process data from CCC control systems coupled with low-resolution data for a more in-depth analysis of critical events like surges, shutdowns and/or trips. Perform faster and more comprehensive investigations by leveraging descriptive diagnostics, playback capabilities, multi-user comment logging and pre-annotated compressor maps and trend charts to visualize and understand each critical control loop response during the event.

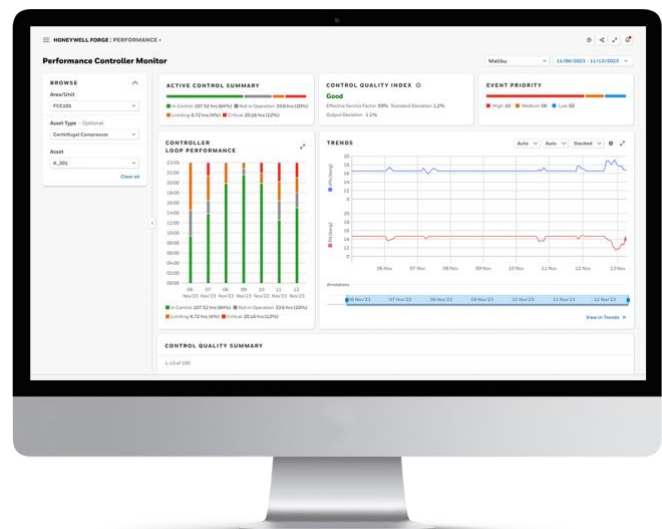


### Excess Recycle Monitoring

Automatically flag control loops in which the anti-surge valve is operating in manual mode or when the valve is open greater than required, resulting in excess energy use and emissions based on pre-configured user rules. Calculate the emissions equivalent, energy waste and potential savings by operating in excess recycling. Determine the optimal operating point determined by the analytics.

### Performance Controller Monitoring

Identify underperforming control loops and process disturbance patterns that can lead to machinery downtime or damage. Track the Control Quality Index of performance controllers against primary and secondary control objectives based on Effective Service Factor, Standard Deviation and Output Deviation calculations. View scorecards and stacked bar charts to visualize KPIs and control mode plotted against user-selected time periods to understand cyclical patterns due to environmental and human factors.



# FEATURES AND CAPABILITIES

- **Embedded Proprietary CCC Turbomachinery Controls and Operation Know-How:** The compressor model library incorporates CCC process know-how from 50+ years of implementing and optimizing turbomachinery controls across 10,000+ critical machines with over 2+ billion operating hours.
  - **Prioritized Alarms and Events:** APM automatically prioritizes events identifying the causes, consequences and corrective actions. These automated workflows expedite the investigation of issues and trigger required actions to bring compressors back to optimal performance and safe operating conditions faster.
  - **Near Real-Time Event Visualization:** Ability to track and store all event data. Functionality includes multi-user comment logging, historical data tracking, risk matrixes, heat maps, compressor maps and fault trees. Visualization helps teams prioritize activities based on assets that require attention the most and identify recurring bad actors.
  - **Guided Root Cause Analysis:** Ability to perform in-depth event investigations through fault trees, pre-annotated compressor maps and actionable insights based on CCC know-how.
  - **Persona-Based Dashboards:** Visualization dashboards are customized to serve the needs of operations, controls, reliability and maintenance teams and are available on any computer or mobile device.
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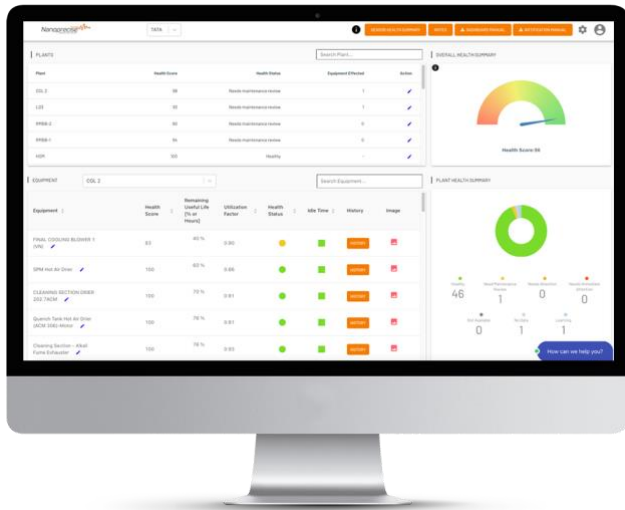


## HONEYWELL FORGE Performance<sup>+</sup> Asset Performance

Turbomachinery Advisor is one of over 40+ pre-built asset models available in Honeywell Forge Performance+ for Industrials | Asset Performance (APM) solution. Honeywell APM is a near real-time machinery analytics solution that continuously monitors asset and process performance, detects impending health issues and predicts time to failure. It helps industrial facilities reveal opportunities for performance improvement and expedites analysis toward the root cause of inefficiencies or impending issues. Honeywell APM helps reduce cost of operations and maintenance and allows personnel to manage more assets concurrently. Honeywell APM is trusted to monitor static, rotary, instrument, electric and mobile asset types across a variety of industries.



Turbomachinery Advisor is just one of many asset models and capabilities available in Honeywell APM that can be deployed to improve the reliability and performance of mission-critical assets. Other featured capabilities include:

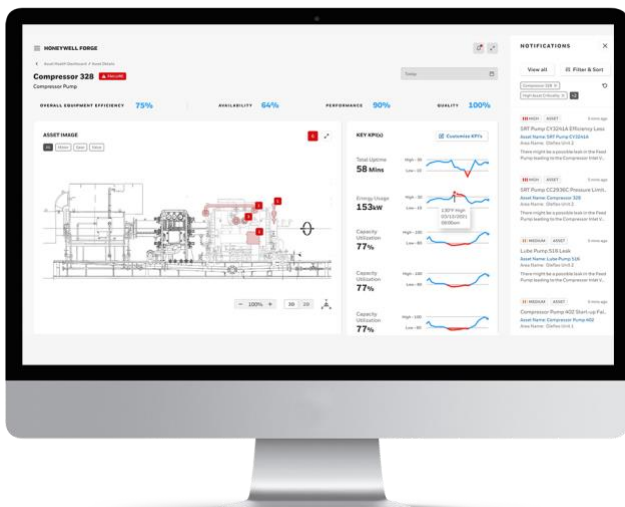
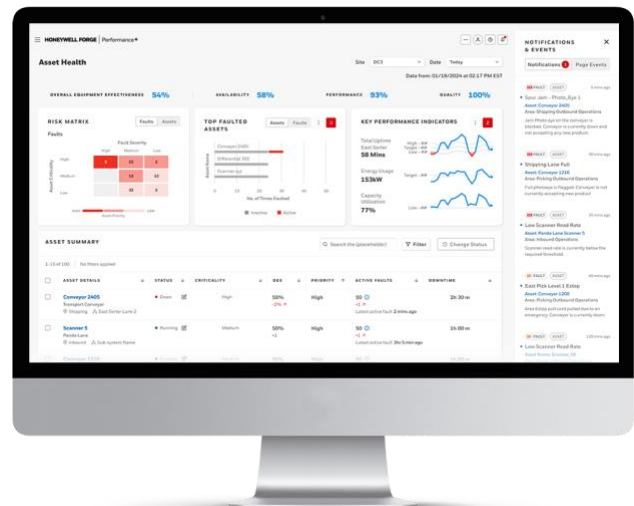


## Quick Connect Vibration Analytics and Wireless Sensors for Compressor Health Monitoring

Provides a scalable APM solution that utilizes Honeywell Verastilis™ “plug and play” wireless IoT sensors and pre-built predictive maintenance analytics to provide condition-based monitoring of rotating equipment. This easy-to-deploy solution provides a scalable way to monitor and predict the health for a balance of plant assets or uninstrumented critical assets.

## Near Real-Time Compressor Health Monitoring

Take advantage of machine learning (ML) analytics to detect faults of compressors and subsystems before issues occur based on enhanced AI/ML algorithms and advanced pattern recognition. Leverage a powerful, intuitive health status dashboard, heat maps, pre-defined risk matrixes and fault trees, and predictive analytics to monitor compressor health in near real-time. Maintenance engineers can utilize the recommended corrective actions and automate prioritized alerts based on the criticality of the asset and severity of the fault to manage workflows.



## Near Real-Time Compressor Performance Monitoring

Leverage out-of-the-box first-principle asset models and templates quantifying the machine efficiency and displaying performance curves including head, power and efficiency. This library is vendor-agnostic and extensible, allowing inclusion of in-house or OEM-generated models including custom Python scripts. Track and compare performance degradation and efficiency of compressor and auxiliary systems based on performance KPI tracking of capacity, OEE, uptime, and energy usage. Analytics can also be leveraged to identify the cause of low performance and potential corrective actions to bring assets back to performance goals.

# WHY HONEYWELL

Part of Honeywell's APM solutions, Turbomachinery Advisor builds upon a heritage of delivering outcome-based reliability results for industrials. Expanding on a longstanding partnership of delivering turbomachinery controls and optimization innovations with CCC, Turbomachinery Advisor differentiates by combining the expertise of 50 years of process, turbomachinery and controls know-how from CCC with 20+ years of Honeywell's machine modeling know-how to take monitoring of critical machinery to the next level by providing controls monitoring for CCC control systems. Turbomachinery Advisor is just one of over 40 pre-built asset model libraries available in the platform. Whether you are looking to unify to a singular digital asset management platform, transform an established condition monitoring system or deploy an end-to-end digitalized reliability program across a site or enterprise, Honeywell can partner with you to deliver increased performance and reliability to a variety of processes and assets – not just critical machines.

## For more information

To learn more about Honeywell Forge Performance<sup>+</sup> for Industrials | Asset Performance, visit [our website](#) or contact your Honeywell Account Manager.

### Honeywell Connected Enterprise

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