

Uniformance[®] Asset Sentinel

Product Information Note

Asset Sentinel is a real-time asset analytics solution that continuously monitors asset and process health, predicts and detects asset failure in advance. It helps industrial facilities to minimize unplanned losses and maximize uptime while reducing cost of operations and maintenance.

Challenges in achieving optimal asset performance

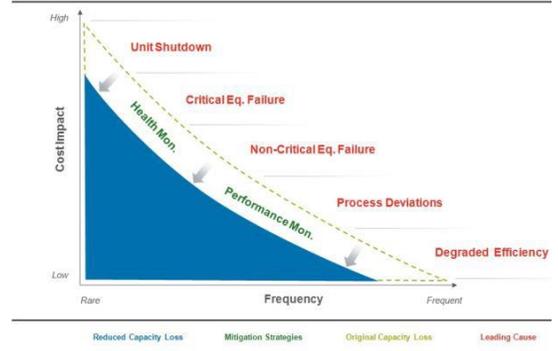
For asset-intensive industrial facilities, equipment failure and almost imperceptible reductions in process efficiency are constant threats to achieve optimal asset performance. As a result, organizations are spending more on operations and maintenance and losing potential revenue. In order to minimize losses and spends, businesses must be equipped with systems to make asset health and performance problems visible.

Through proliferation of systems and sensors more asset data is available in real-time than in the past. Current inefficient and manual monitoring practices using spreadsheets often miss early signs of deterioration. Also finding the data required for decision making can be tedious and time consuming. Due to limited skilled workers, home grown calculations and tools are hardly sustainable.

Asset Sentinel Solution

Uniformance Asset Sentinel enables converting asset data from various systems into useful actionable information in real-time.

Fig 1: Unplanned capacity loss reduction



FEATURES & BENEFITS

Data Collection & Processing

- OPC-Real-time data, historical data and events
- Relational Data (lab data, oil analysis, transactional data)
- Excel
- Data Cleansing and Validation
- Automatic Unit Conversion

Analytics

- Advanced Calculation Engine
- Comes with broad asset library
- UniSim Runtime for advanced models
- Fault-Symptom model
- Thermo package for process calculations
- Data driven models

Contextualization & Visualization

- Asset Model
- Heat map
- Performance overview
- Event viewer
- Trends and Performance curves.
- Templated Asset Graphics

Event Management

- Rules Engine
- Fault-Symptom model
- Event management work process
- E-Mail notification
- Operator alerts/advisories
- Work order request based on events

Technologies

- Thin client HTML 5
- Supports all browsers
- Complex Event Processing (CEP)
- https support

Continuous surveillance of key operating and equipment conditions with Uniformance Asset Sentinel allows the earliest possible indication of performance degradation and the appropriate prioritization of actions to prevent failure by employing **multiple asset analytics methodologies**.

Models based on first principles;

Monitoring process performance for broader set of assets that are critical to production process through first principles model covers common causes of process degradations. Deviation from predicted versus actual performance serves as an early warning indicator of process performance.

Sentinel comes with out of the box process models for most commonly used assets in process industries like compressors, turbines, Heat Exchangers, Boilers, Pumps etc. It accelerates speed of deploying Asset Sentinel for asset monitoring reducing the time to get initial benefits.

Data driven models: Data driven models make use of historical performance as a baseline to determine Equipment failure. Data driven algorithms can predict behavior of group of parameters according to historical baseline and also can predict single variable time to reach a value – e.g. predict heat exchanger fouling

This unique dual modelling approach of using both first principles model and data driven model for asset analytics improve the accuracy of prediction by bringing down the false positives.

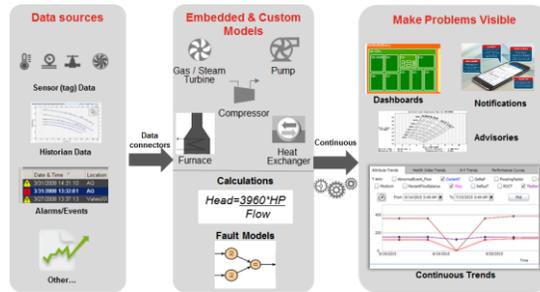


Fig 2: Asset Sentinel makes it easy to predict complex asset problems through in-built models and easy to build data driven models enabling users with actionable insights with enough time to take actions.

Asset Sentinel not only detects or predicts the asset health and performance problems, it also provides a well-defined work process to take actions and bring the problems to closure.

Events detected through these multiple asset analytics models can be structured as **Fault-Symptom model**. It helps in categorizing the asset problems as early warning, initial on set of failures and failures. Every symptom or fault can have cause, consequence and corrective actions for that specific event. It helps users in performing root cause analysis and direct actions to appropriate stakeholders.

Benefits

Asset Sentinel delivers a wide range of benefits and significant savings for the business:

- Data is turned into digital intelligence for smarter operations and maintenance. Proactive decisions improve plant performance and safety.
- Predicting and detecting potential problems avoids unplanned downtime and production losses.
- Maintenance costs are reduced by minimizing emergency work, eliminating secondary damage, and maintenance based on the known state of the asset.
- Engineering teams spend more time solving problems and less searching for data

Why do I need Sentinel if I already have a CMMS /Asset Reliability Management system?

A CMMS system like SAP PM, IBM Maximo etc. helps to manage maintenance processes like managing work orders, scheduling and tracking maintenance tasks and managing spare inventories. Reliability systems like “Meridium” manages front end engineering tasks like defining maintenance strategies. Unlike Sentinel, they do not help in early detection of equipment health and performance degradation.

How does Sentinel differs from traditional Equipment Condition monitoring systems?

Unlike condition monitoring solutions focusing solely on equipment’s physical condition, Asset Sentinel also uses performance degradation as a leading indicator of potential equipment problems.

Sentinel can bring data from various systems like vibration monitoring system, Historians, LIMS, loop monitoring system and provide a comprehensive view of asset health and performance in one single view

Features and Functions

Asset Sentinel is a real-time asset-centric application monitoring multiple data sources to detect and predict conditions requiring attention. Built around a Complex Event Processor (CEP) core and an advanced analytics and process modeling engine, it packages powerful calculations and analysis tools in an easy-to-use solution. It includes a range of powerful features:

Asset Sentinel is an asset health and performance prediction system that would provide users with early indication of any abnormal asset conditions along with credible actionable advisories allowing users to proactively avert asset downtime.

• **Calculation Engine**

User defined calculations are entered using a fourth generation scripting language, simplified for use by engineers rather than programmers. From basic to the most complex processing, users can quickly define the signs to look for to detect problems and the data required. Calculations can be scheduled or run in real-time as the input data changes.

Starting from simple mathematical operations to advanced functions like regression and other numerous mathematical functions are supported. The practical applications of these functions are wide ranging. For example, Time window functions enable comparison of a key operating parameter's long-term historical standard deviation to the current short-term deviation to detect sudden changes from the norm. This technique has been used to successfully catch potentially catastrophic compressor issues.

• **Data Cleansing** ensures decisions are made on reliable information. Detecting and cleansing data with flexible rules, the software automatically compensates for corrupt, inaccurate, or missing data.

• **Connected Assets and Streams** support seamless sharing of data, conditions and properties between assets and data streams.

• **Automatic Unit Conversion** ensures engineering units from source system is converted automatically to suit engineering units in Asset model.

• **Advanced Performance Models**

An Advanced Performance Library provides first-principles models for pumps, compressors, gas turbines, steam turbines and heat exchangers. Users can compare current performance against predicted performance to highlight deviations that provide the earliest possible notification of equipment health problems such as valve wear, fuel nozzle issues, sensor problems, and turbine erosion. Users can quickly and easily compare performance against design curves or performance baselines.

Standard Performance Library contains a pre-defined set of performance equations that can be customized and enhanced for vital assets such as furnaces, blowers and motors.

• **UniSim Runtime** allows design models from UniSim to run in real-time from Asset Sentinel for dynamic monitoring needs, including column flooding or separation efficiencies.

• **Thermodynamic Property Package** – An extensive database of physical properties, transport properties and phase behaviors enables high-accuracy performance calculations. These support process modeling of distillation, reaction, heat transfer, rotating equipment, and logical operations in both steady state and dynamic environments.

• **Custom Code** supports equations and logic written in C#. This environment allows OEMs and others to develop content that will not be exposed and supports very complex and specialized applications.

- **An Excel® Add-in** allows calculations to be configured in Microsoft Excel and executed from Asset Sentinel's runtime engine.

- **Data Access**

Data is readily accessible from a variety of sources:

- Real-time data from DCS or PLCs via OPC DA
- Real-time alerts from DCS or PLCs via OPC A&E
- Historical (OPC H.D.A)
- Relational Data (lab data, oil analysis, transactional data)
- Excel
- Other via flexible “plug-in” architecture.

- **Event Detection**

A flexible rules environment supports FMEA (failure modes and effects analysis) or RCA (root cause analysis) logic to predict and detect conditions contributing to degraded health or performance.

Detection mechanisms can be simple thresholds, statistical movement or learned patterns, or predicted and model based deviations.

- **Plant Reference Model**

Sentinel is asset-centric for a more powerful, efficient solution. Asset templates define all the required parameters, attributes, calculations, and rule/fault models for each asset or equipment component. This template is created just once for each type of equipment. It eliminates tedious tag-by-tag calculation configuration for each piece of similar equipment and allows efficient change management for calculation and logic configurations.



Fig 3: The color-coded heat map quickly identifies priority issues (in red), based on the severity of the fault and the criticality of the asset

An asset-centric approach also hides underlying cryptic tag structures in typical DCSs and historians from the user. Tag names (such as 03F2014.PV) are referenced in Sentinel based on the asset hierarchy: Plant1.FCCU.HeatEx100.InFlow, for example. This user-friendly reference is also supported in the Asset Sentinel user interface when selecting attributes to trend or display.

- **Intuitive User Interface**

Asset Sentinel's web-based user interface brings problems to responsible individuals' attention quickly for effective management by exception. An intuitive performance and health color-coded heat-map (above, right) pinpoints problem areas effortlessly, prioritizing symptoms and faults according to users' roles and by plant area.

- **The heat-map** allows users to rapidly drill-down to identify underlying problems, with troubleshooting displays to see the underlying fault logic. Users also have rapid access to the fault history, trends and graphic displays from the heat-map.

- **Event Monitor** lets user to monitor and review all new events. From this display users can access the detailed event view for more information, launch event trends, or choose what to do with the event (accept, reject, or close).

- **Event Investigation** allows user to investigate, review, and update all the events that are accepted. User can also lock the events or add comments while investigating.

Intuitive user interfaces of Sentinel help user to quickly comprehend the information through easy to understand visualizations and in place data drill downs

Uniformance Asset Sentinel provides visibility to asset data at all levels starting from plant control network to Business network through its secured and flexible architecture

- **Event History** allows user to review all the events for the selected time period, including those currently accepted or closed. This view is useful when analyzing an event for past occurrences or reviewing all events in a historical time frame.

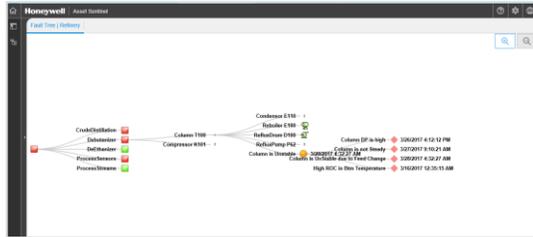


Fig 4: Fault Tree maps the faults and symptoms of related assets in a mind map to quickly assess impact of symptom/fault

- **Performance Overview** users can view list of key performance indicators of a selected asset and their details including current value, deviations from target, minimum value, max value, average and its historical performance through a spark line. User can use this list to review and update asset attribute information, as well as to open Asset Trend to view more details.
- **Performance curves and trends** help users in identifying underlying causes through attribute trends, design versus actuals comparison.
- **Asset Graphics** allows users to overlay calculated performance indicators from Sentinel along with process parameters in a familiar DCS HMI graphics format. Users can play back the graphics in historical time frame to review process conditions during asset failures as part of root cause analysis or troubleshooting.

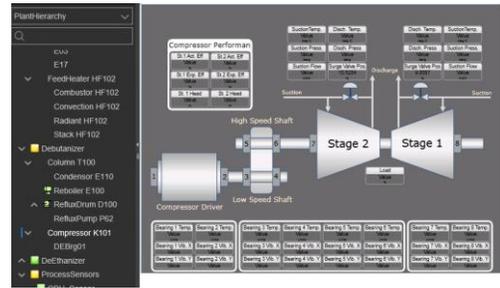


Fig 5: Equipment displays with calculated asset attributes in a familiar DCS HMI Graphics

- **Architecture**

Built on Microsoft .NET technologies, Asset Sentinel supports flexible architectures. Database servers, web servers, and application servers can be distributed across servers or installed on a single server. With Microsoft Integrated Windows Security a single sign-on by users is supported. The flexible role and security model allows role-based control of who can perform functions, such as creating or viewing assets. Access to specific assets in the plant hierarchy can also be controlled.

Shadow Server is a powerful capability that allows replication of the Asset Sentinel server from the process level (Level 3 in the Purdue model) to the business domain (Level4). It allows users who do not typically have access to Level 3 information to view and receive information.

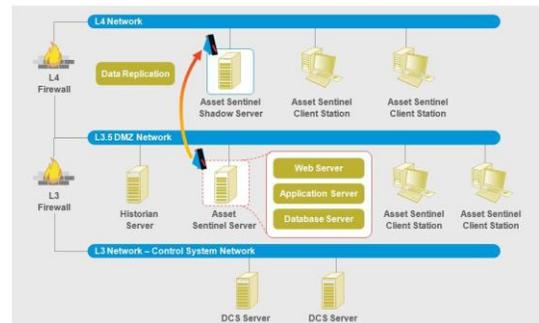


Fig 6: Architecture

Summary

Honeywell's Asset Sentinel is a powerful, scalable solution for maintaining critical industrial assets. Addressing all aspects of equipment health monitoring and asset management, the sentinel provides an integrated environment where users can view and assess different types and classes of assets across the enterprise. It's a powerful tool to optimize efficiency and reliability, and ensure a low cost-of-ownership throughout the asset lifecycle.

Uniformance Asset Sentinel R511 Technical Specifications

PARAMETER	SPECIFICATION
DESKTOP CLIENT OPERATING SYSTEM	Microsoft® Windows® 7 x86 and x64 Microsoft® Windows® 8.1 x64 Microsoft® Windows® 10 x86 and x64
DESKTOP WEB BROWSER	Microsoft® Internet Explorer 11 and above Google® Chrome 50 or later
SERVER OPERATING SYSTEM	Microsoft® Windows® Server 2012 R2 Microsoft® Windows® Server 2016
INTERNET INFORMATION SERVICES (IIS)	IIS 8.0 IIS 8.5
DATABASE	Microsoft® SQL Server® 2014 R2 Standard or Enterprise Microsoft® Windows® Server 2016 Standard or Enterprise

* Extremely large architectures should be planned using Honeywell services to ensure optimal hardware and system tuning.

The Uniformance Suite: Real-time Digital Intelligence Through Unified Data, Analytics and Visualization

Uniformance® Suite is Honeywell's integrated, best-in-class data, analytics and visualization solutions built on a common platform. Provided either on premise or in the cloud, Uniformance software meets complex customer challenges, delivers significant business value, and reduces the total cost of ownership.

Uniformance is a fully integrated suite, and all types of data are efficiently captured and stored for easy retrieval. Information is easily visualized and explored for effective engineering analysis; events are predicted and detected based on underlying patterns and correlations; and process intelligence is



Uniformance PHD:

Capture and store real-time process and event data across the enterprise



Uniformance Asset

Sentinel: Monitor plant performance and equipment health



Honeywell Pulse:

Notifications and alerts on your smartphone, for alarming and process data limits



Uniformance Connected

Historian: Enable enterprise wide visualization and big data analysis in the cloud



Uniformance Executive:

Make informed decisions and take action in line with business goals



Uniformance Insight:

Visualize process conditions and investigate events from any web browser

Uniformance Support Services

This product comes with worldwide, premium support services through our Benefits Guardianship Program (BGP). BGP is designed to help our customers improve and extend the usage of their applications and the benefits they deliver, ultimately maintaining and safeguarding their advanced applications.

Honeywell provides a complete portfolio of service offerings to extend the life of your plant and provide a cost-effective path forward to the latest application technology. Honeywell services include:

- Software installation services
- On-site engineering services
- Migration services
- Scope expansion services
- Assessment services
- Performance baseline and tuning services
- Customized training

For More Information

Learn more about how Honeywell's Uniformance Asset Sentinel can optimize your operations with real-time digital intelligence, visit uniformance.com or contact your Honeywell Account Manager.

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PN-17-10-ENG
December 2017
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