



Condition Monitoring as Key Component of an Asset Performance Management Solution

Hannover – 19. September 2019



The Industry 4.0 Journey



Get Connected

Start with the foundation completed so you can have visibility to the right information to make decisions.

**Data from assets
and systems**



Get Insights

Deliver insights to the right people at the right time by receiving predictive insights, not just alarms.

**Turned into insights
by analytics**



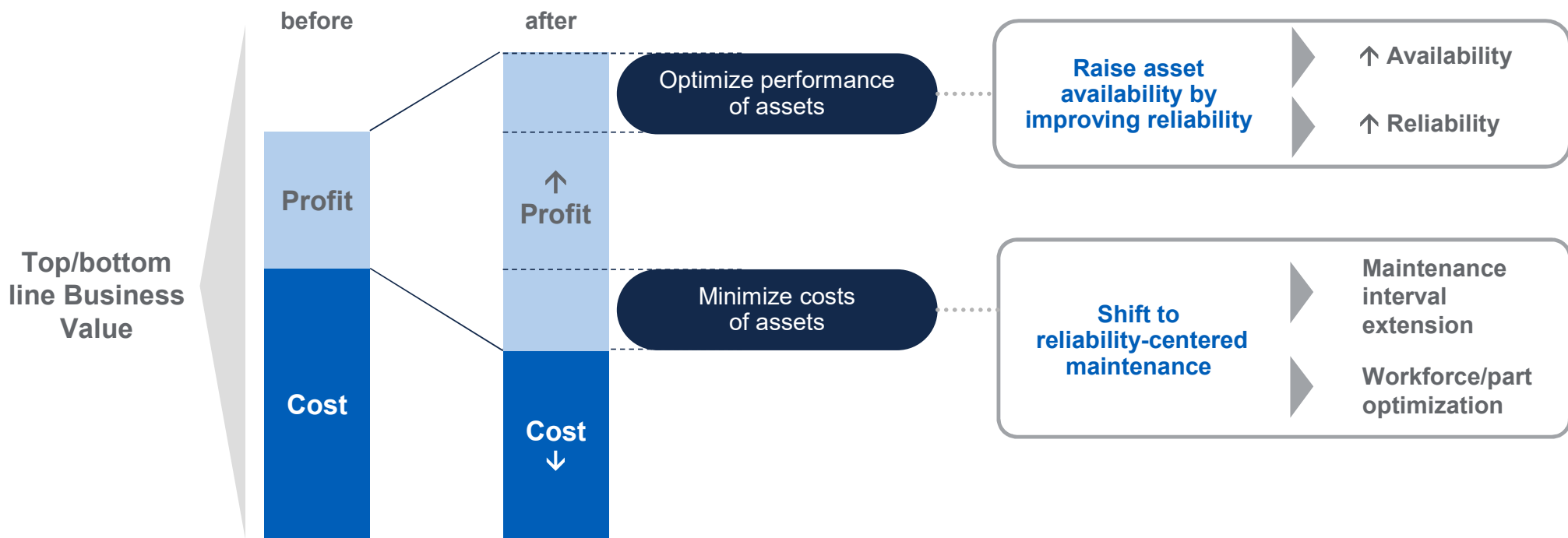
Get Optimized

Run adaptable facilities and maximize the return on your assets and impact of your people.

**Enabling
people at work**

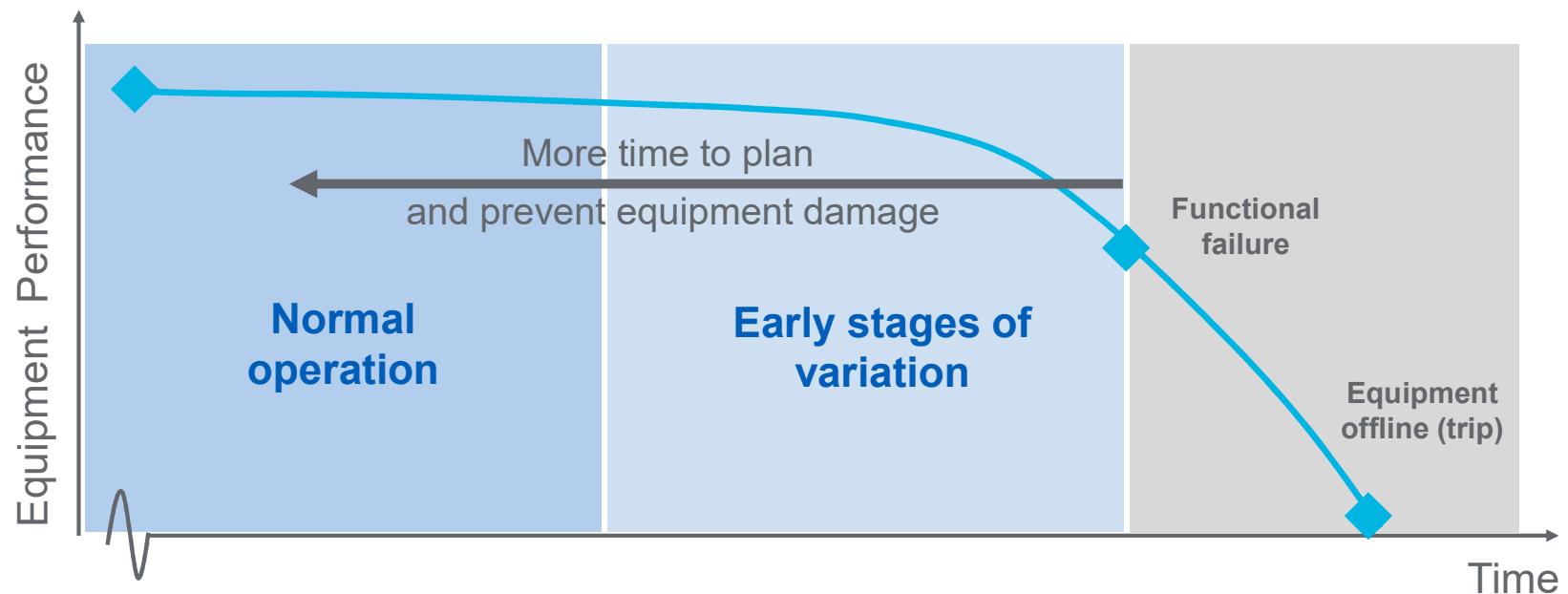


Asset Performance Management



Condition Monitoring is all about Time

Condition monitoring is the use of advanced technologies to **determine the condition of equipment and predict its failure.**



Condition Monitoring Steps

There are six steps to a healthy machine:

- 1) What are the **possible failures**?
- 2) Which of these **failures are significant**?
- 3) How can we **avoid these failures**?
- 4) If we can't avoid failure, can we get an **early warning**?
- 5) Select a suite of tests to **detect early warning signs**.
- 6) Collect the results of the tests at **one decision point**.



Condition Monitoring Techniques

Stator Current

- Sensing electrical signal of motor supply currents, which contain a direct by product of rotating flux components caused by specific faults

Vibration

- Fault of certain parts in machines generates specific vibration spectrum which can be measured by vibration sensors

Shock Pulses

- Detecting mechanical ultrasonic shock generated by contact of damage ball bearings with the raceways of bearing or debris, or vice versa

Residual Saturation Harmonics

- Measuring harmonic frequencies of stator induced voltage after a motor is switched-off

Flux Monitoring

- Monitoring small part of sinusoidal leakage flux, which can be affected by various asymmetries and fault conditions

Voltage induced Monitoring

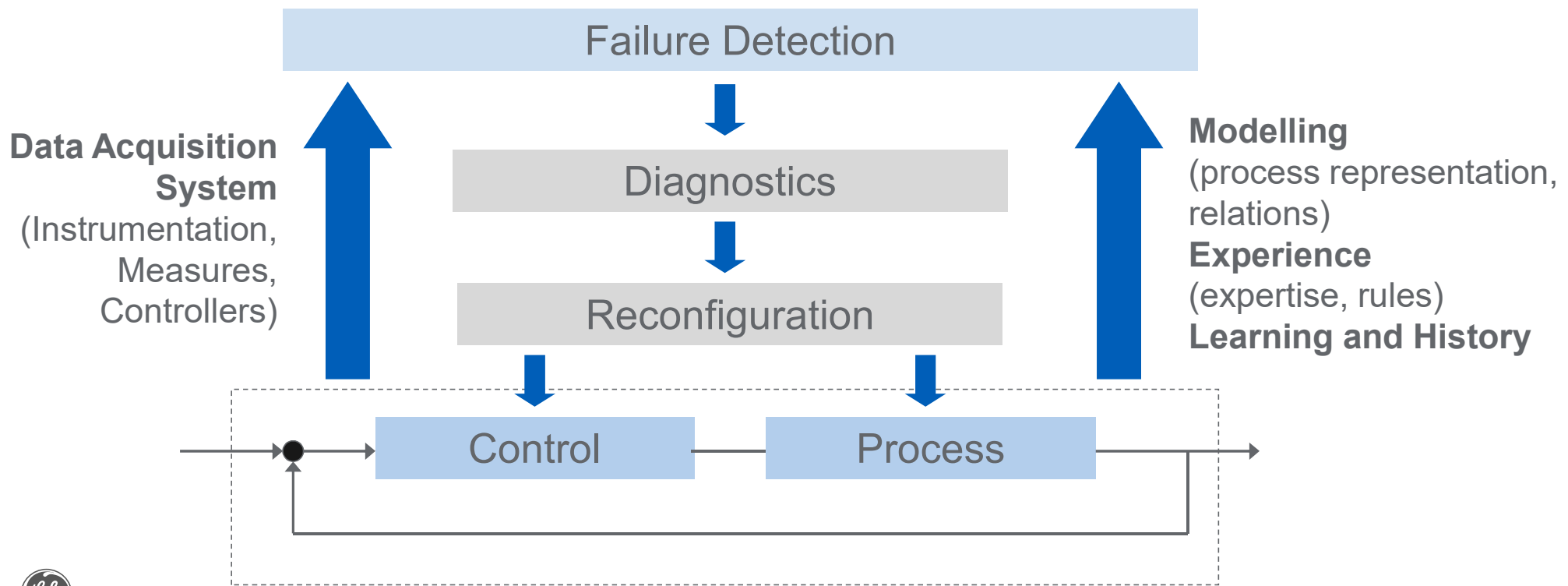
- Monitoring of stator voltages, which may contain valuable line frequency or other information

Acoustic Emission Monitoring

- Monitoring elastic waves which is produced spontaneously within a material under stress

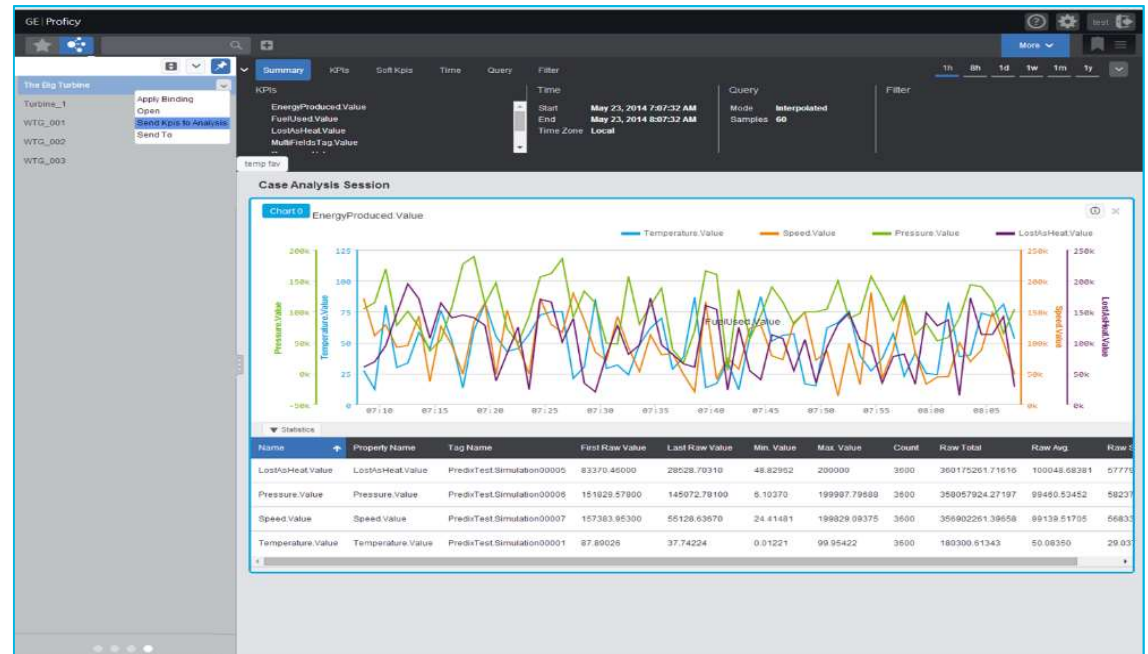


Condition Monitoring Supervision Stages



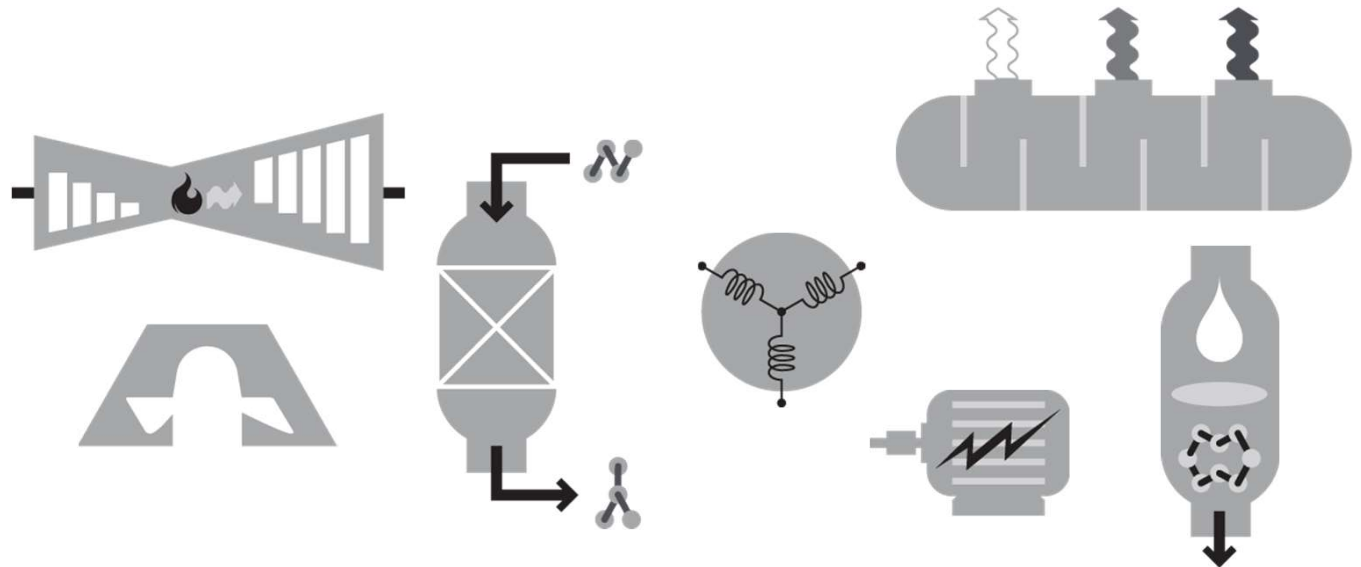
Enterprise Operations Data Management

Ensure **Connectivity and Data Collection** with software that collects industrial data (time-series process data and alarms & events data) at very high speed, stores it securely with robust Redundancy for high availability, distributes it and allows for fast retrieval and analysis



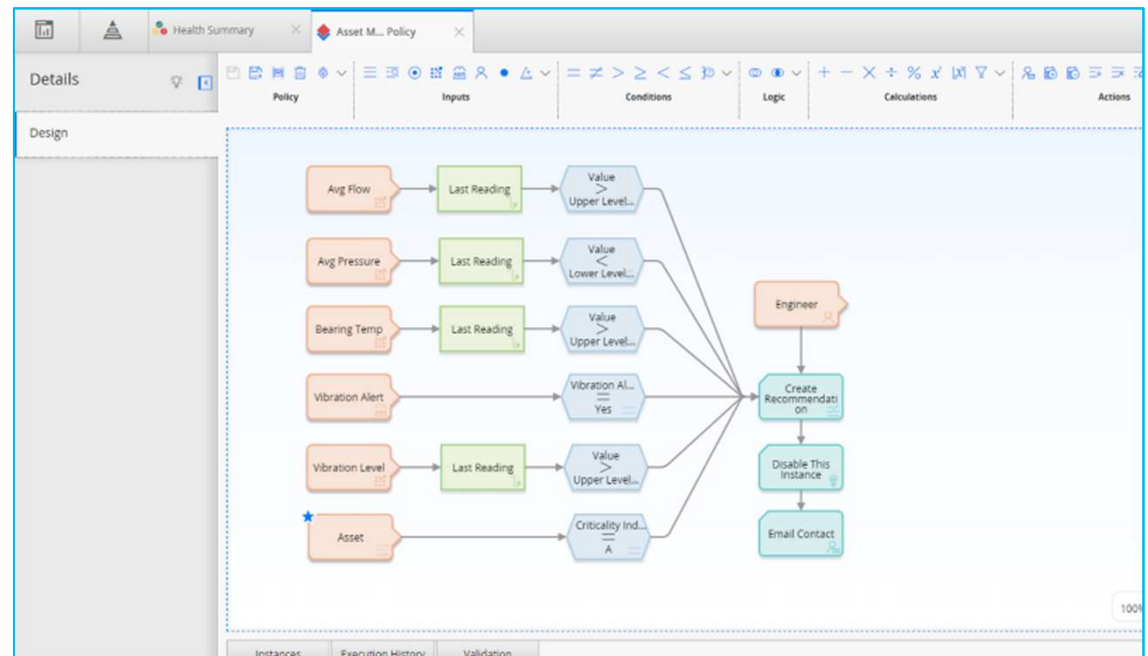
Manage and Implement Digital Twins

Develop Predictive Diagnostics using our catalog of Digital Twin Blueprints, that model failure modes, monitor sensor based data and create alert events when current behavior deviates from expected behavior

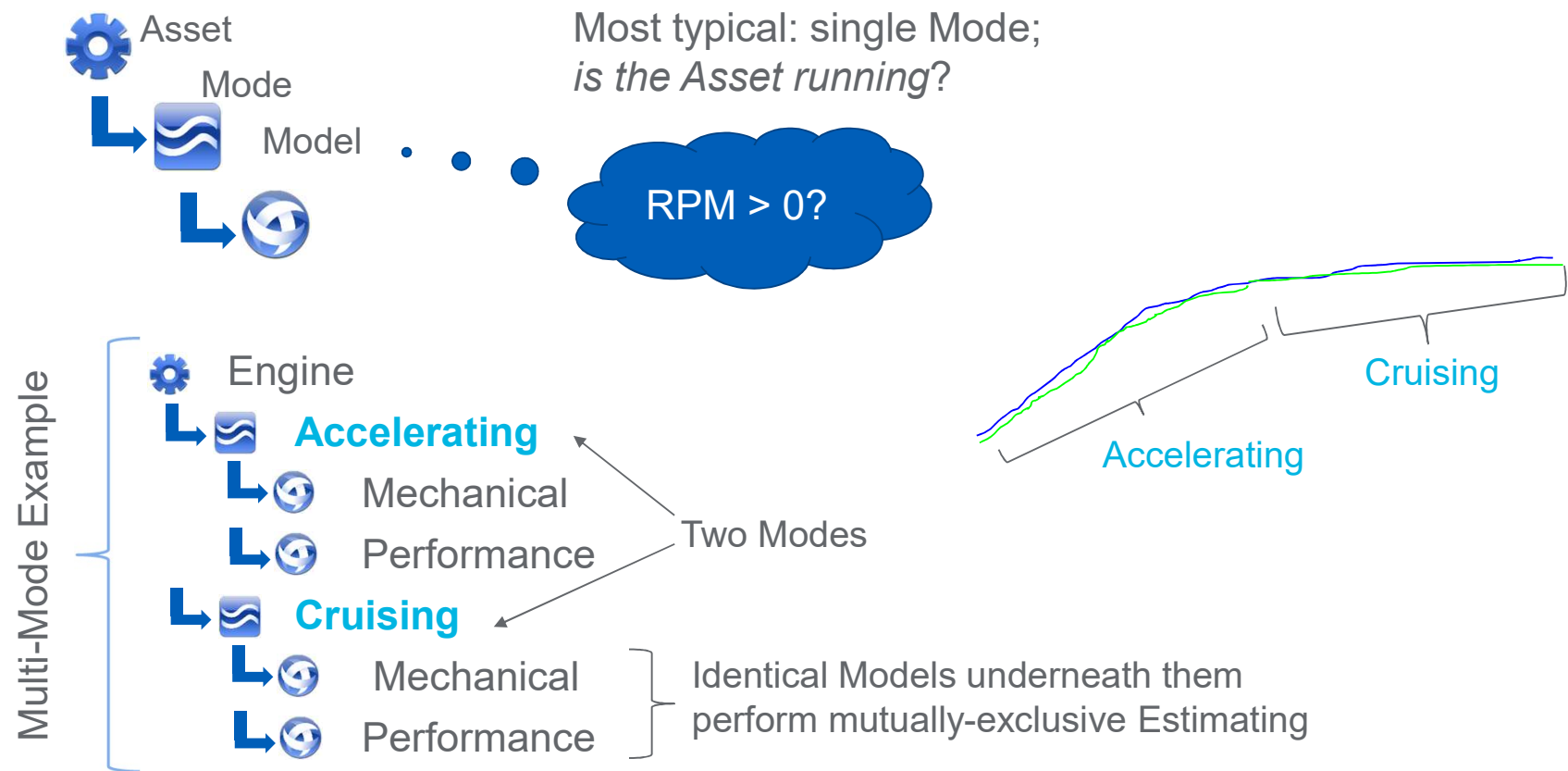


Applying Preventative and Predictive Rules

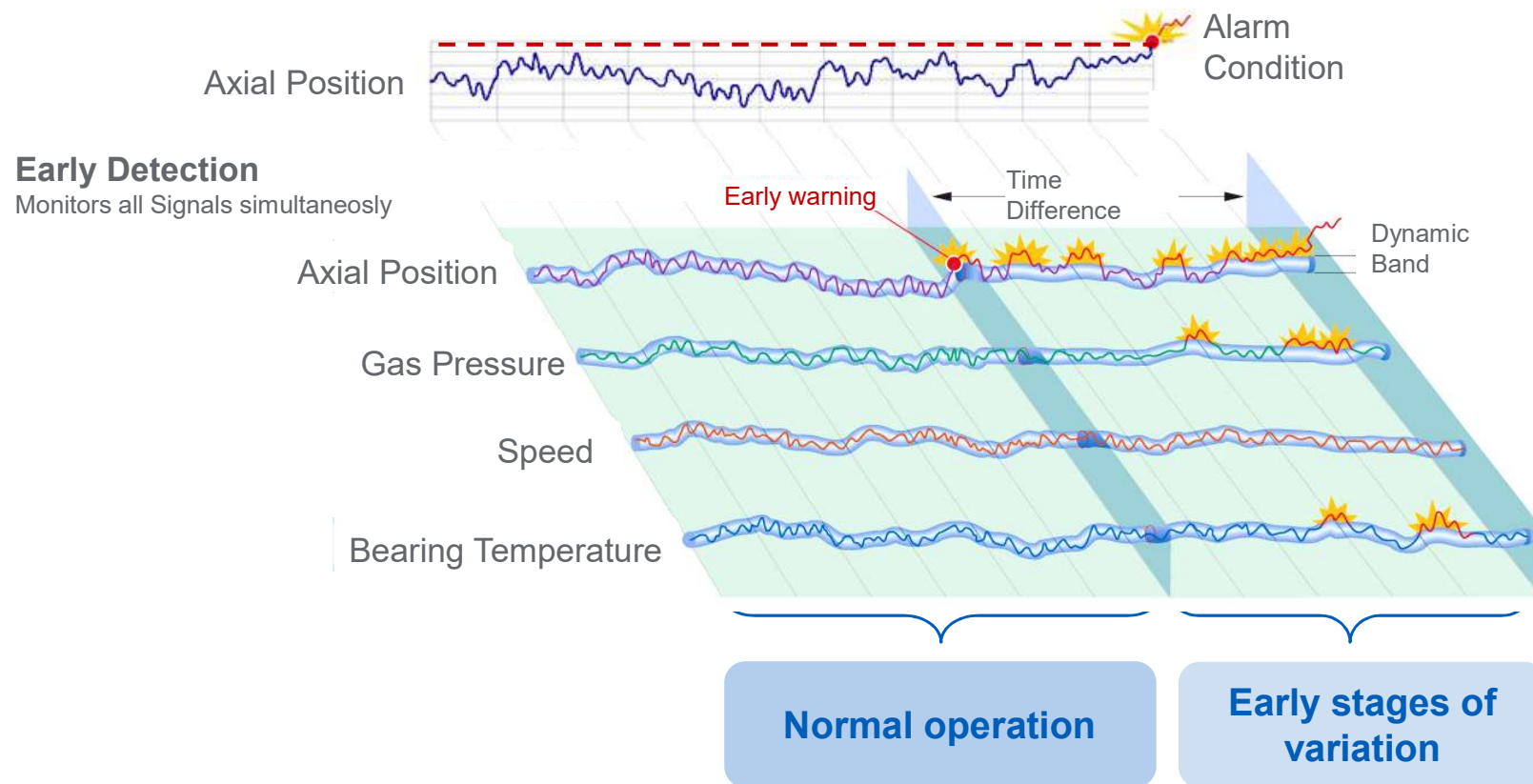
Leverage **Automated Exception-Based Rules** (Descriptive and Diagnostic analytics), combining asset health and maintenance history data to identify emerging threats and build reliability analyses



The 'Mode' Concept of Assets

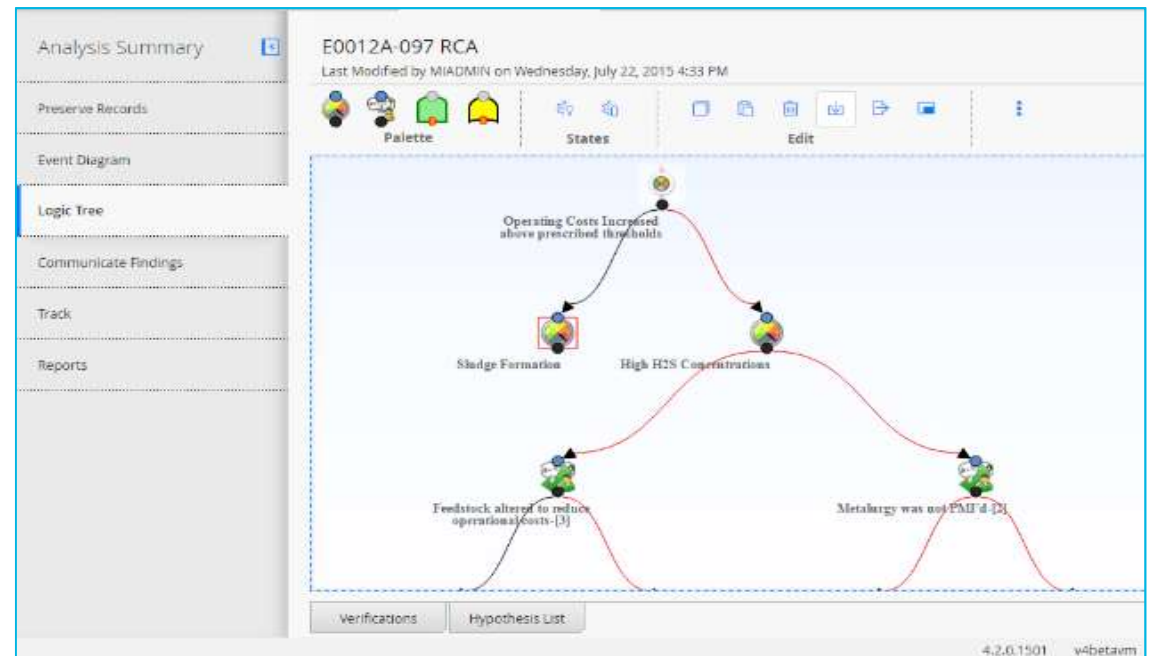


Early Detections based on dynamic Bands



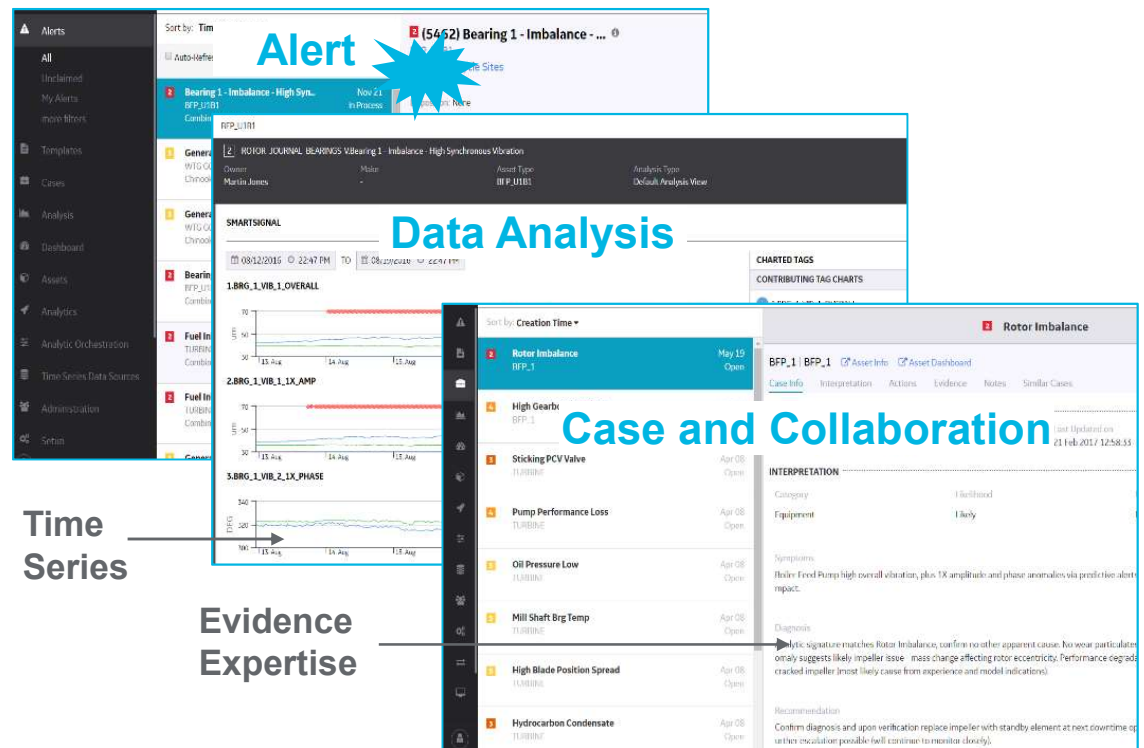
Analyze the Root Cause of Events

Consistent Methodology and tools enabling the execution of root cause analysis, allowing process owners to track the performance of the equipment following the implementation of recommendations.



Collaborate to address exception-based Events

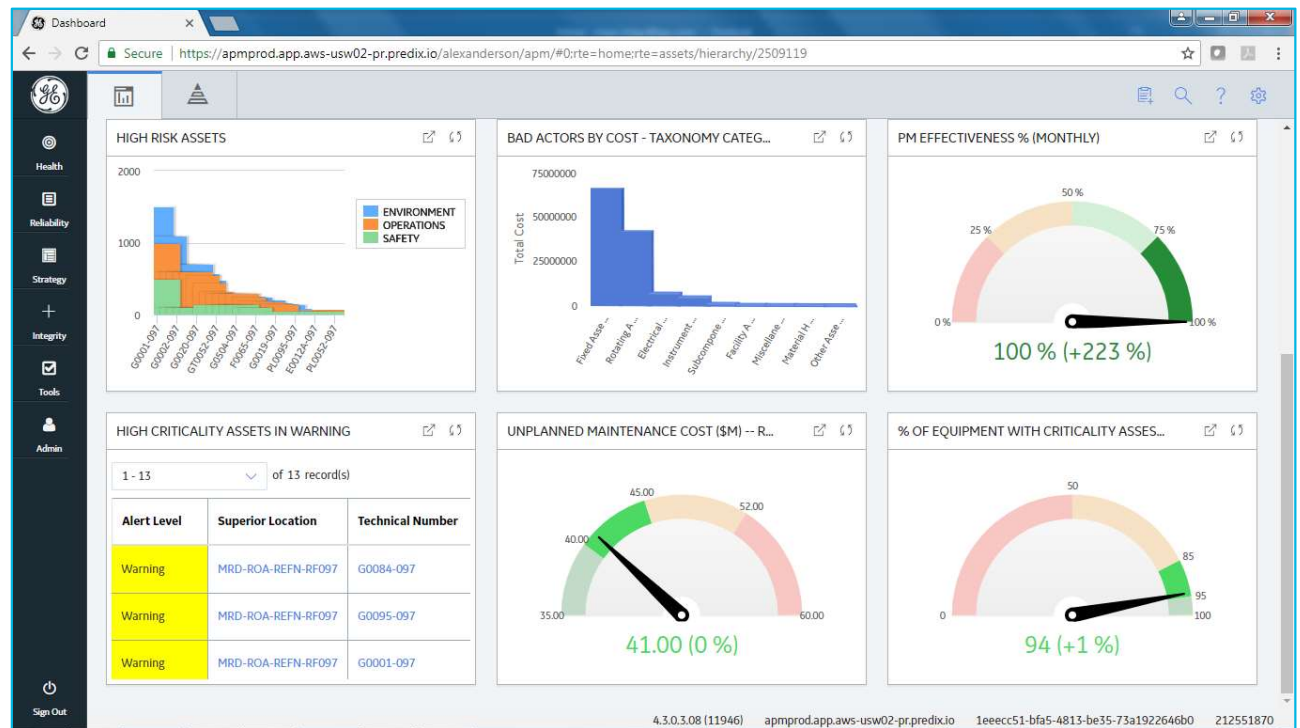
Complete visibility into asset events allowing analysts, engineers and maintenance teams to strategize on resolution and create corrective actions for implementation in the field via EAM/ERP systems.



Analytics Overview Graphs

Assets Overview:

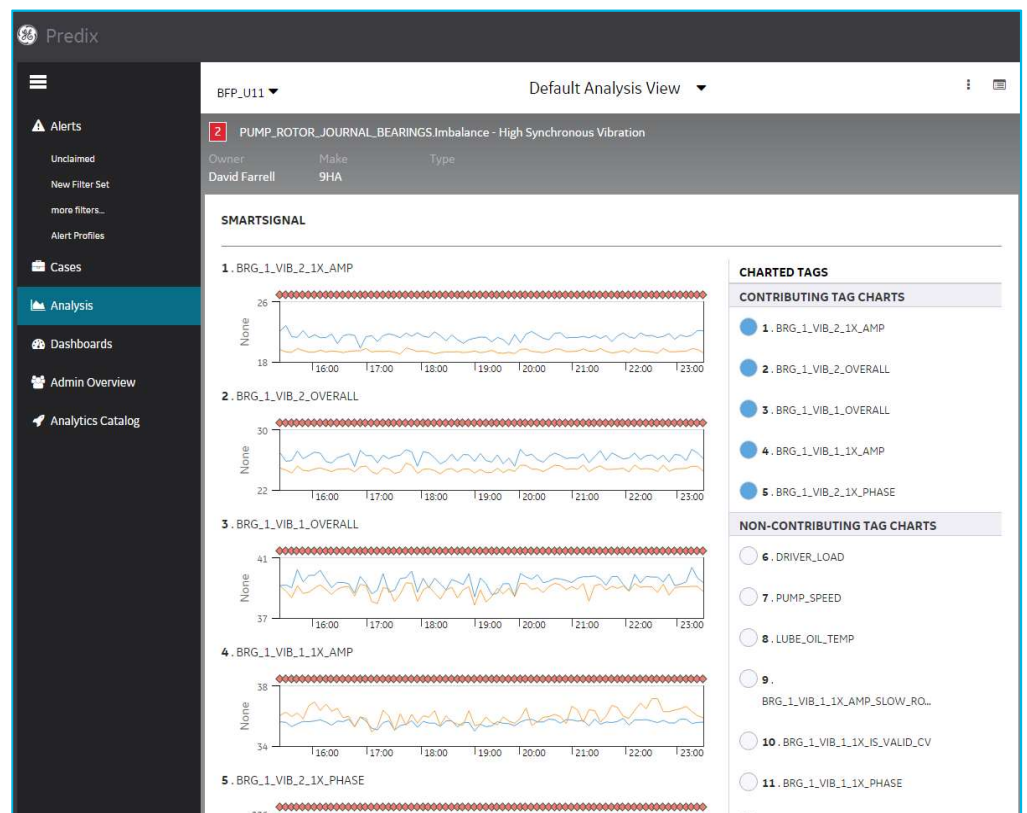
Displays all the information that is available for a given Asset record that exists in the Performance Monitor data source



Analytics Overview Graphs

Condition Monitoring:

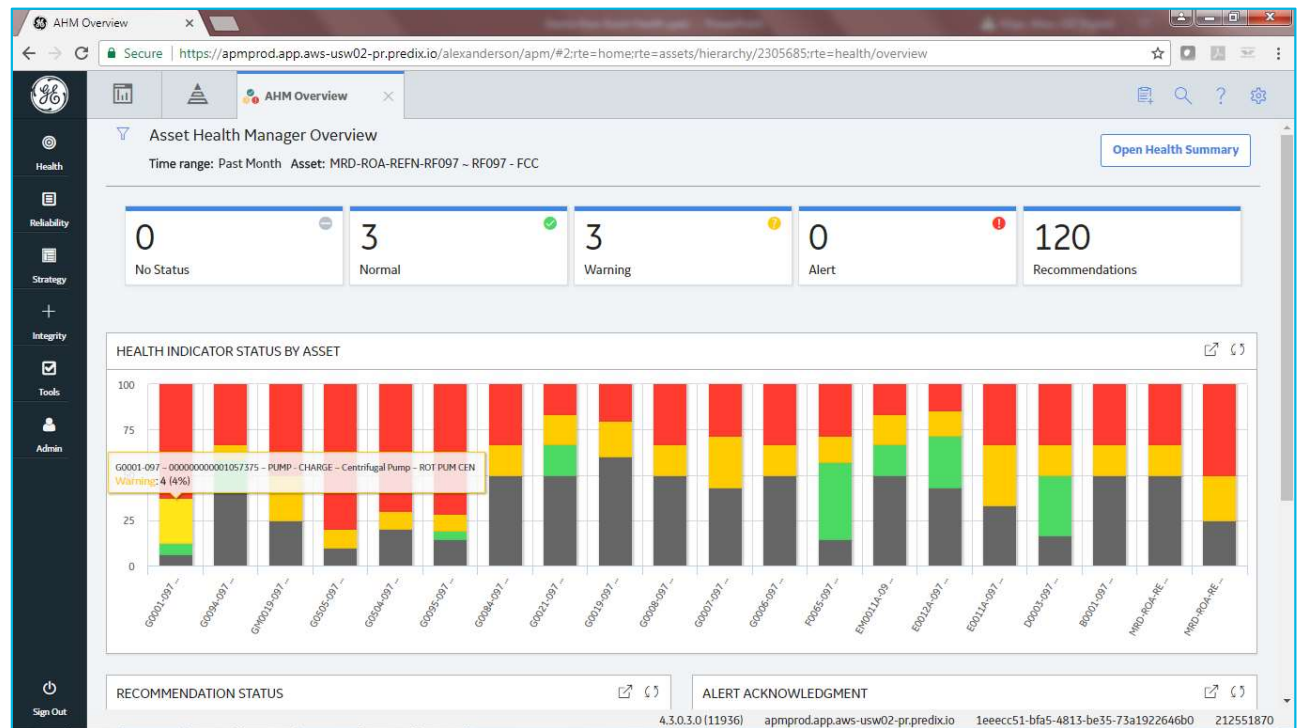
Asset monitoring using sensor analysis, anomaly detection and KPIs to present the current operating state and health of the asset



Analytics Overview Graphs

Assets by Health:

Displays the number of Assets for each range of health index values



Condition Monitoring Benefits

Integrated condition monitoring helps **optimize maintenance by judging the health of machinery** using non-invasive sensing technology:

- early detection of impending machinery failure to help lower the risk of unscheduled downtime
- scheduling and utilization of maintenance resources is more efficient
- reductions in time spent in dry dock, if a pre-dry-docking fault locating survey is performed
- reduced likelihood of 'maintenance induced' failures
- availability of global condition monitoring data.



Thank you very much for your attention.
Do you have questions?

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