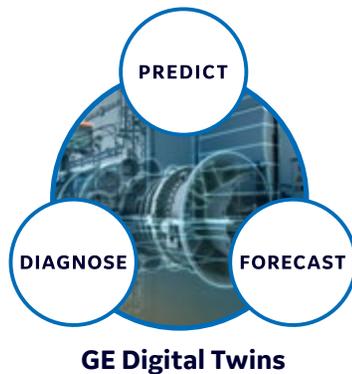




SmartSignal from GE Digital

Predict and prevent equipment failure

SmartSignal is a predictive maintenance solution to detect and prevent emerging equipment failures. With Digital Twin analytics and a complete maintenance toolset, SmartSignal drives improved reliability with maximum O&M efficiency



SmartSignal Digital Twin analytics and content are built on years of GE expertise in industrial manufacturing, operations, servicing and software.

Advanced analytics for over 320 common assets across OEMs can predict, diagnose and forecast equipment malfunctions.

SmartSignal makes predictive maintenance simple and cost effective

Predictive Analytics: Provide early detection of pending issues for 100's of common industrial assets

Diagnostic Analytics & Rules: Indicate probable cause and suggest maintenance alternatives

Time-To-Action Forecasting: Estimates when an actual alarm limit will be reached, allowing optimal maintenance prioritization and scheduling

Analysis, Case Management & More: Provide a complete toolset for predictive maintenance

Sensor Health & Coverage: Monitors sensor status and current failure mode coverage per asset to ensure continuous optimal results

Rapid Time-To-Value: Out-of-the-box Digital Twin blueprints are rapidly trained and deployed per asset

Deployment & Services Options: Available as on-premises software, cloud subscription, turnkey service, and an integrated component of GE Digital APM software

GE Digital's Asset Performance Management



SmartSignal is available as a standalone product or an integrated component of GE Digital APM software

How SmartSignal Analytics Work

With SmartSignal, every piece of equipment is unique, as reflected in its own historical data and our approach to monitoring its performance via Digital Twin technology. SmartSignal Digital Twin analytics and content are the foundation of standard blueprints for over 320 rotating, fixed, electrical and mobile equipment classes across OEM providers. The blueprints are rapidly trained to create accurate predictive, diagnostic, and time-to-action models for each monitored asset.

Anomaly Detection

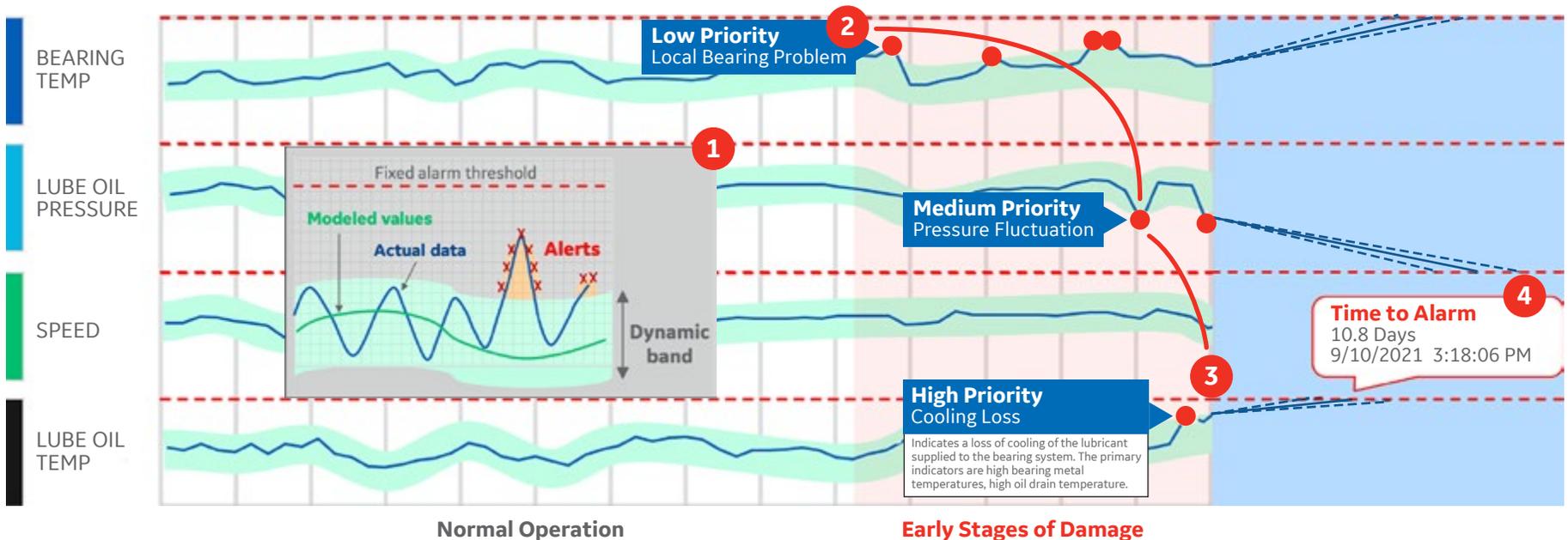
Anomaly detection models contextualize normal operating relationships among all relevant parameters, such as load, temperatures, pressures, vibration readings, and ambient conditions. Real-time analytics compare sensor readings to a particular machine's normal, predicted values. SmartSignal detects and identifies events and abnormal behavior by the differences between real-time actual data and predicted, normal behavior—not by thresholds on actual values.

Diagnostic Analysis

From experience with over 12,000 rotating, fixed, mobile and electrical assets, anomaly notifications are compared with precursor signatures based upon pattern and persistence. These provide prioritized diagnostics with a localized, apparent cause for each developing problem. For all problems identified, advisories are issued, supported by charts of pattern differences, so reliability and maintenance experts can track and diagnose the developing failures.

Time-To-Action Forecasting

Next, time-to-action analytics can be applied to the analysis process. Using multiple analytics and desired time windows, engineers can forecast when the equipment will actually reach an alarm limit and require immediate remediation. With this intelligence, teams can prioritize and schedule corrective actions to avoid downtime at minimal cost. Time-to-action analysis can also be applied independently at any point to forecast future maintenance needs.



- 1 Predictive analytics provide early warnings by comparing actual data to expected values within a dynamic band
- 2 Detected anomalies generate prioritized alerts and diagnostic information

- 3 Diagnostic analysis across readings indicates a correlation to bearing lube issue as possible cause
- 4 Time-to-action forecasting provides timeframe requirements for remediation

Additional Features & Functions

Visualization, Analysis & Action

SmartSignal's rich visualization, analysis and case management tools coupled with analytics intelligence provide a full closed-loop solution for predictive maintenance and asset reliability management. Reliability and maintenance engineers can work together to investigate alerts, perform root cause analysis, determine immediate and long-term maintenance strategies, and track ultimate success.

Sensor Health & Failure Mode Coverage

To help ensure accurate detections, SmartSignal monitors incoming data to detect possible sensor malfunction. Per sensor configurable criteria track reading ranges and indicate any significant anomalies. Asset failure mode reports help assess risk by providing an accurate view of known failure modes coverage based on configured sensors for each individual asset.

Specialized Digital Twin Blueprints

Additional Digital Twin analytics packages are available for specialized systems or use cases:

- **Cycle Watch for Combustion Turbines:** Monitors extensive startup performance parameters to identify emerging issues
- **Extended Vibration Monitoring:** Expands standard vibration monitoring to detect and diagnose journal bearing problems
- **Thermal Performance Diagnostics:** Monitor plant and subsystem heat rates and diagnose degradation issues

Deployment Options & APM Integration

SmartSignal is available as an independent on-premises software product or a cloud-based subscription service. It is also available as an integrated pillar of GE Digital APM, combining powerful analytics within a comprehensive asset and O&M management solution. The close integration with APM Reliability and general APM capabilities allow SmartSignal data and results to be a core component of APM health dashboards and reports, reliability management activities, strategic planning and other functions.

Managed Services for Simplicity & Success

GE Industrial Management Services (IMS) offers a range of expert services to guide and facilitate your SmartSignal success. GE monitoring centers worldwide can provide 24x7 asset monitoring, issue triage and notification, remediation guidance, analytics management, and strategy consulting. IMS services are available with software purchase/subscription or as a turnkey outsourced offering – eliminating the need to own or manage software all together. GE IMS monitors thousands of assets around the globe and has saved our customers over \$1.6 Billion USD over its history.

