Advanced Analytics: The Core of Asset Performance Management (APM)

Why Analytics for APM?

Operational and business conditions are continually evolving, particularly now as the power industry is undergoing a rapid transformation. Distributed generation, renewables, smart grids, storage and prosumers are accelerating the rate of change. This means that operational conditions and demands are changing quickly, requiring power and utility companies to refine how they monitor and maintain operating assets. Those best managing shifts in market dynamics have embraced advanced analytics to grant them insights for equipment issues, improved outage planning and more continuous operation when the market demands.

"As the Internet of Things (IoT) matures, more and better data becomes available about the operating status, condition and usage history of assets. This is enabling a new era of predictive analytics and APM."

Source: Gartner, *"Optimizing Foundational Technology in Utilities Primer for 2017,"* Chet Geschickter | Randy Rhodes, January 2017

Sophisticated analytics at the core of APM allow:

- The ability to predict asset issues well in advance of incidents impacting production and improve issue detection lead time by up to six months
- Outage planning that maximizes profitability
- Insights to optimize asset life against driving asset output when required
- A comprehensive view of all plant assets, their health and future performance with 75% fewer false alarms
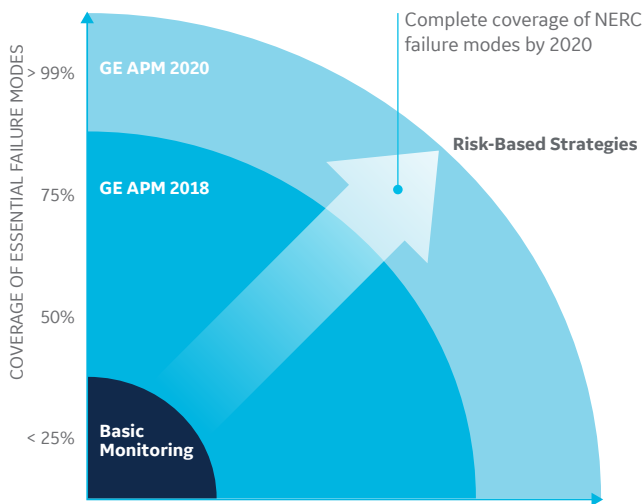
Types of Analytics Driving Asset Performance

Understanding asset performance with data has been part of industrial operations for years, with basic information collection and condition-based monitoring. However, with advancements in machine sensors and the ability to collect and organize vast volumes of machine data, the role of analytics in power operations has taken on significant importance. Today, APM uses multiple analytic techniques - including physics-based and pattern recognition - layered with machine learning and artificial intelligence. The types of analytic models deployed in APM include:

- **Performance Models:**
  Start fuel advisor, boiler performance and heat rate estimator
- **Anomaly Models:**
  Blade clearance, compressor outlet and pressure deviation, abnormal start-up vibration
- **Lifing Models:**
  Lifing odometer, risk of failure, usage and condition-based models
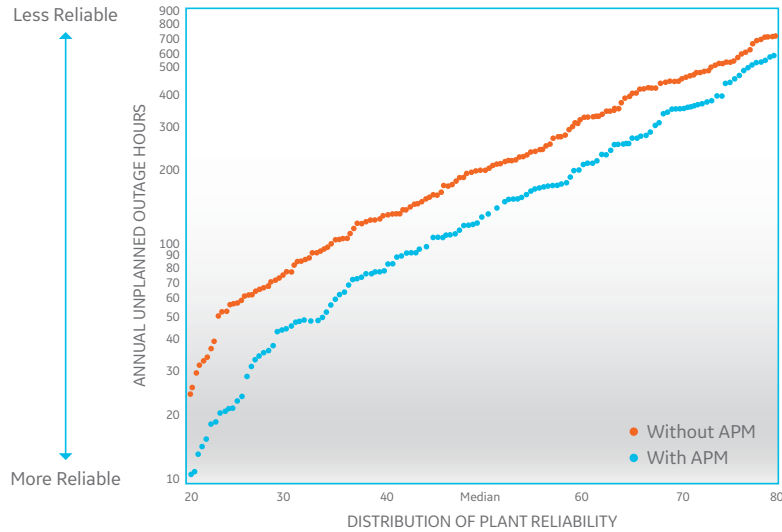
The Importance of Failure Mode Coverage

Every asset within an operating environment contributes risk to the overall functioning of the plant or grid. For an APM solution to be most effective, the analytics of that solution must monitor every asset with sensors and must cover the most critical failure modes of those assets. In this sense, not all APM solutions are created equal. The North American Reliability Corporation (NERC) has defined the failure modes for operating assets. To cover the majority of these critical failure modes requires deep machine experience, a catalog of analytic capabilities and a platform for analytic execution that can operate in real time.

COVERAGE OF ESSENTIAL FAILURE MODES

- > 99% — GE APM 2020
- 75% — GE APM 2018
- 50%
- < 25% — Basic Monitoring

Complete coverage of NERC failure modes by 2020

Risk-Based Strategies

INDUSTRY-LEADING ANALYTIC COVERAGE

GE analytics are what powers APM. GE APM analytics provide 75% coverage of the most critical NERC failure modes for gas assets.

REAL-WORLD RESULTS: GE APM IS PROVEN TO REDUCE UNPLANNED DOWNTIME

Less Reliable

More Reliable

ANNUAL UNPLANNED OUTAGE HOURS

DISTRIBUTION OF PLANT RELIABILITY

- Without APM
- With APM

APM FOR GAS/STEAM
+10% starting reliability
+3% total plant availability

APM FOR RENEWABLES
+2% site/farm availability
-5% maintenance cost

APM FOR GRID
+15% asset utilization

APM FOR WORKFORCE
5%–25% increase in productivity

Plants utilizing APM are more reliable and have fewer annual unplanned outage hours than plants without APM. *(Source: 2015 ORAP Data)*

CASE STUDY: SSE

Challenge: Scottish and Southern Energy (SSE), the UK's broadest-based energy company, needed to increase reliability of its thermal generation fleet after experiencing a number of technical failures over the previous several years.

Solution: With GE APM, SSE created an Equipment Performance Center (EPC) to continuously monitor asset health for over 11 different locations, tracking for factors such as combustion dynamics, turbine vibration analysis, boiler temperatures, creep analysis and safety case management.

Results: Using APM's predictive analytics and monitoring to understanding pending issues before they became production issues, SSE has experienced a significant reduction in plant failures, resulting in increased plant availability and production. Early detection has resulted in:

- Savings of more than £3 million per year
- Savings of £100K in repair costs by not running the generator into a failed state
- Savings of £6 million per year in insurance cost
- 1,026 total monitored assets

CASE STUDY: RASGAS

Challenge: RasGas is one of the world's premier integrated liquefied natural gas (LNG) enterprises. The Qatari-based company exports 77 MTA to the market, which represents roughly one-third of the global supply. RasGas is focused on cost and value optimization to reduce overall expenditures and enhance efficiency by improving plant reliability and availability without comprising safety, health and the environment.

Solution: RasGas began a pilot in 2014 using GE APM to cover both GE and non-GE equipment using machine data sensors, predictive analytics and process optimization to provide a unified user view to identify anomalies and increase visibility into asset performance and health.

Results: By 2015, the pilot project had demonstrated that APM analytics could detect equipment failures early and identify process optimization opportunities, resulting in:

- Move from reactive to predictive maintenance
- Reduction in unplanned downtime
- Improved productivity and reliability

GE APM solution is now expected to cover the entire plant by monitoring and connecting 2,300+ assets with over 65,000 GE and non-GE Devices.

Start Reducing Your Unplanned Downtime Today

Asset Performance Management from GE, with the highest failure mode coverage in the industry, helps asset-centric organizations drive safer and more reliable operations while facilitating improved performance at a lower, more sustainable, cost.

Conduct an APM value assessment to identify reliability challenges and opportunities for improved asset performance. Contact your GE representative today to get started.

ge.com/power/software