

# PowerNode: Motor Health Management

Electrical machines play a vital role for the modern industrial world. The impact of unplanned downtime due to breakage of these electrical motors is estimated to be more than \$30 billion USD<sup>1</sup> each year.

Leveraging more than 100 years of engineering experience focused on the protection and control of motors, generators, and associated control equipment, we bring together physics-based analytics with advanced machine learning to provide early identification of operational abnormalities before they become faults or failures.

With this advanced notification, operators can enable a proactive maintenance and operational approach, delivering reduced costs while improving motor performance and processing uptime.

## Key Benefits

**REDUCE UNPLANNED DOWNTIME:** Provides advanced diagnostics and prognostics to ensure you can plan your actions before the asset fails and avoid unplanned downtime, and reduce O&M costs.

**MAKE THE MOST OF YOUR PROTECTION DEVICES:** Leverage existing protection and control devices, including existing communications infrastructure, without the need for additional wiring or sensors, thereby minimizing the cost of deployment and installation impact.

**LEVERAGE GE's MANAGED SERVICES:** Our Managed Services team will accurately interpret the results and guide you on the right decisions to make.

<sup>1</sup> GE Power. (2016). *Electrical Rotating Machine APM Overview*.  
[https://www.ge.com/news/sites/default/files/GEA33604%20Motor\\_Fleet\\_APM\\_Paper\\_0.pdf](https://www.ge.com/news/sites/default/files/GEA33604%20Motor_Fleet_APM_Paper_0.pdf)



## Motor Analytics Features

Based on GE motor protection IEDs, the list of failure modes predicted by the Motor Health Management solution include:

### Bearing Faults

- Outer race defects
- Inner race defects

### Insulation & Temperature

- Stator intern-turn short
- Bearing temperature
- Stator temperature
- Broken rotor bar

### Mechanical & Thermal

- Mixed eccentricity
- Bent rotor shaft
- Foundation looseness
- Misalignment
- Thermal capacity used

### Electrical Supply

- Voltage THD
- Current THD
- Sequential currents & voltages
- Power factor monitoring
- Current harmonics
- Voltage harmonics
- Motor start monitoring

### Security

- Aligned with IEC 62443 for authentication of data transfer and data access
- Cyber Security authentication, hardening, whitelisting for embedded platforms
- Various user access levels

## System Architecture

PowerNode: Motor Health Management services leverage the latest in condition-based asset health monitoring to deliver high-accuracy monitoring of critical motors. GE's advanced health algorithms, based on Electrical Signature Analysis (ESA) and Machine Learning provide early detection of electrical, mechanical, or thermal abnormalities before they become critical failures that bring plant processes to an unexpected halt.

## Reduced Unplanned Downtime

Adding the PowerNode Motor Health Management solution as part of your operations and maintenance strategy allows you to aggregate and proactively monitor and manage your fleet of motors. With easy-to-read and interpret dashboards, we provide you with actionable intelligence to ensure you can more effectively plan your actions before the asset fails - enabling operators to **avoid unplanned downtime** and **reduce operating and maintenance costs**.

## Make the Most of Installed IEDs

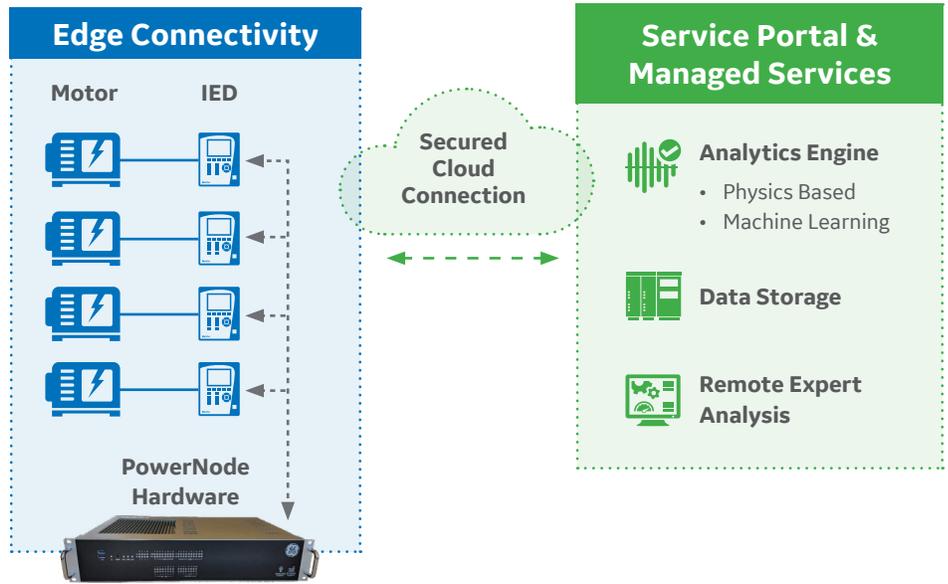
Leveraging the data collected by existing protective relay devices within a network, the PowerNode Motor Health Management system utilizes advanced motor algorithms to detect anomalies or changes in a motor's operating condition.

By using GE's advanced Multilin 869 motor management devices, operators have the added benefit of identifying thermal, mechanical, and electrical abnormalities within a motor, without the need to add sensors or additional wiring to the relays.

GE's PowerNode Motor Health Management system is able to collect data from both GE and non-GE devices, providing operators with a holistic view of connected assets within the network.

## Managed Services

The managed service center receives all potential failures detected by the service portal. A team of experts perform three main actions:



### Service 1

Review and validate the incipient failure of the motor. Prepare and send recommendations of actions to be taken by site maintenance team to address the problem.

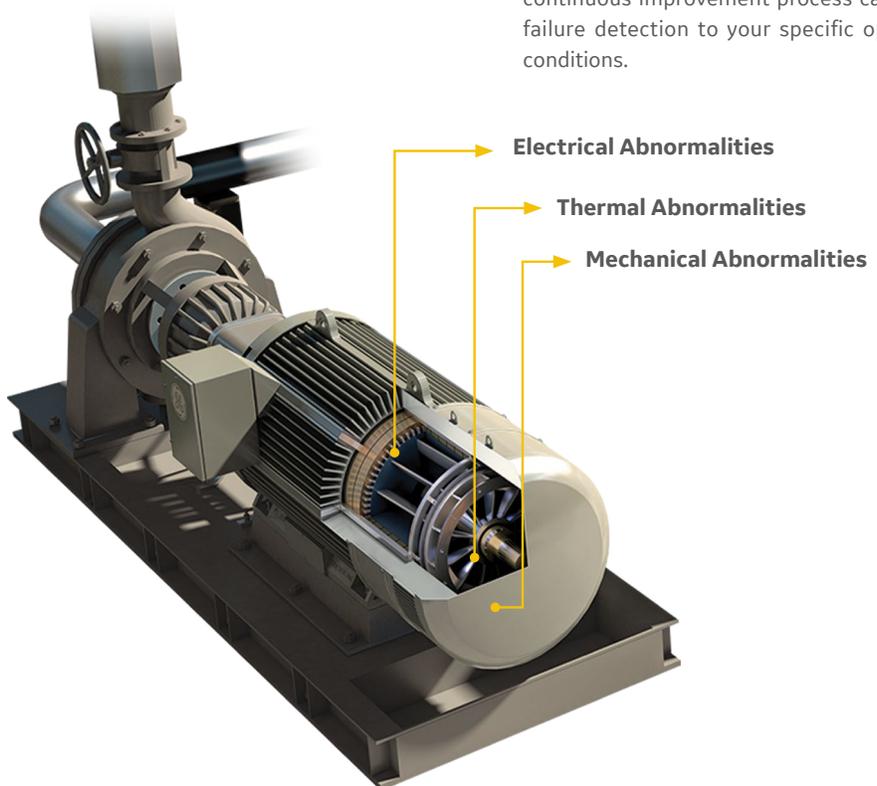
### Service 2

Support the site maintenance team to investigate and correct the problem.

### Service 3

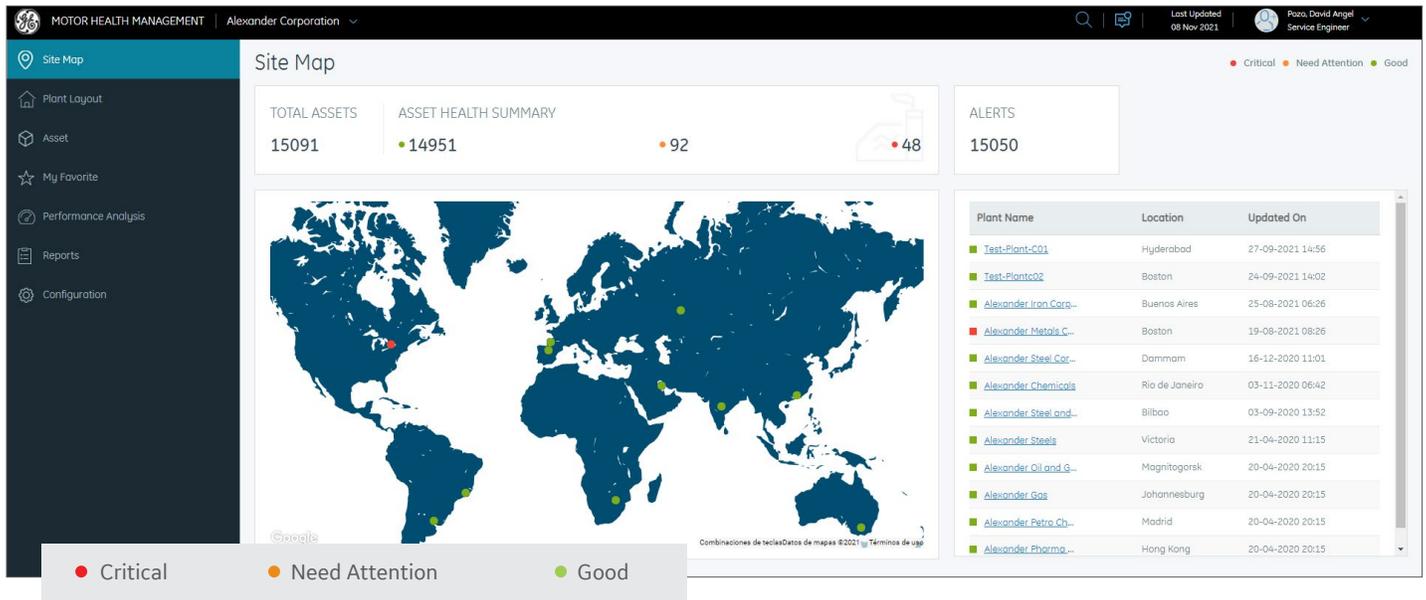
If failures are missed or incorrectly detected, the managed service team performs an investigation and performs modifications of asset parameters and/or performs enhancements to the failure detection algorithm to increase failure detectability.

Electrical motors operate under different load conditions depending on the application. A continuous improvement process can adapt failure detection to your specific operating conditions.



## PowerNode: MHM Service Portal Web Interface

GE's PowerNode: MHM services uses a cloud-based application to store and display data for analytics and monitoring.



### Site Map

Provides an overview of the location of all monitored sites and assets of a company. Locations with an asset with potential issues will be highlighted in orange or red.

### Plant Layout

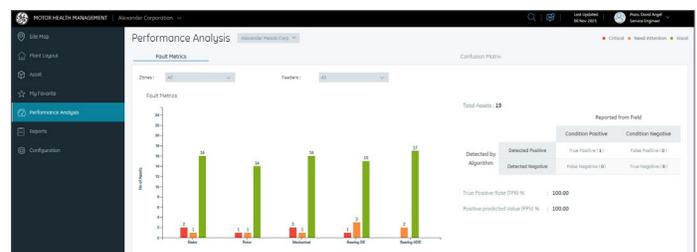
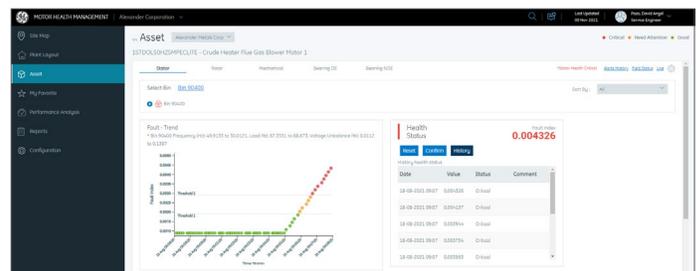
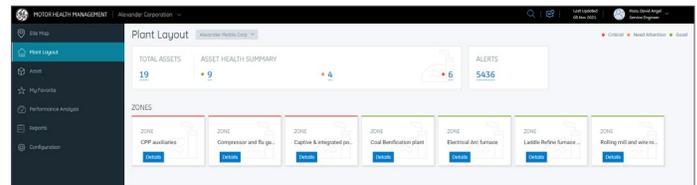
View the status of an asset by navigating to a specific zone. Assets can be organized into four hierarchical levels for easy access.

### Asset Details

View current and historical data for each asset and failure type to validate a potential motor failure.

### Performance Analytics

Monitor the performance of your assets with a set of dashboards that displays the status of the assets by failure type, and a confusion matrix that displays the failure detection accuracy.



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