GearGard™ condition remote monitoring and early failure warning solutions

The future of maintenance. Eaton's Monitoring Solutions provide added confidence, peace of mind and increased equipment reliability.

Added confidence and increased equipment reliability

The future of equipment maintenance is based heavily on real-time monitoring, statistical analysis and making condition-based maintenance decisions. GearGard is Eaton Electrical Services & Systems' newest progressive maintenance practice. By providing 24/7, real-time response to multiple sensors,* GearGard can alarm, provide immediate notification of significant conditions via phone, email or pager, remote troubleshooting and problem resolution, quarterly status reports, maintenance recommendations, and if necessary, dispatching of Eaton field service engineers.

Eaton Electrical Services & Systems continues to lead the way in advanced maintenance practices. Our customers have similar concerns.

They include:

- The need to have fewer outages
- The requirement of higher equipment reliability
- The current status of the electrical system is unknown

All this while faced with lower or limited capital and maintenance budgets.

End user needs include:

- Tell me when I should do maintenance
- Tell me that there are problems NOW

Features

- Web-based monitoring and condition alarming
- No firewalls to go through to access your data
- Monitor up multiple sensors: temperature, water, dust, smoke and many more
- Quarterly equipment monitoring summary reports sent to as many as four site contacts via email
- Notification of significant condition alarms sent via phone, text, email or through Eaton's 24/7 Instant Response Center
- Quarterly maintenance and/or inspection recommendations

* Additional sensors, as well as integration into Eaton's PowerXpert Foreseer -Class software is available

Sensor	Failure Causes
Humidity	23.1%
Dust Sensors	14.9%
Temperature	9.0%
Relay Outputs	7.2%
Motion	4.9%
Water	3.6%
Smoke	3.4%
Total	66.1%

Other inputs of value:

- Currents
- Circuit Breaker operations
- Smart Meters:
  - Surges / Sags
  - Harmonics
  - High loads
  - Programmed alarm outputs

GEARGARD RETURN ON INVESTMENT	New Gear	Existing Gear
Time to failure (years)	11.7 (Avg.)	5.4 (Min.)
Total loss (repairs, lost profits)	$162,500	$173,500
Failure costs - annualized	$13,851	$31,846
Percentage of failures prevented	50%	50%
Annual portion of failure costs prevented	$6,925	$15,923
Initial investment + 3 years of monitoring	$18,800	$18,800
Initial investment payback (years)	2.7	1.2
Payback on follow-on years (4th year on)	0.5	0.2

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Eaton researched technologies from other industries and evaluated them to determine if they would work in electrical equipment and if they had value. Temperature detectors and dust sensors were looked at as well as other types of devices. Eaton found that these devices are very effective in monitoring dust buildup and other known failure causes in electrical equipment.

Eaton also found that, with most companies, when IT gets involved things tend to come to a standstill so we looked for other methods of monitoring that did not require firewalls and would not cause IT issues. The result is a cellular device built into the gear. This requires nothing connected to the gear to monitor the status. Data from the cellular device goes to a website accessed to retrieve historical data for trending, review alarming issues, pick up a breaker trip on a weekend, pick up cubicle temperatures, etc. If cellular coverage is weak due to being below grade, a simple land-line phone connection is all that is required.

For customers or locations that require all data to be maintained on-site, we can provide integration into existing building management systems.

Using historical data and current temperature algorithms, Eaton can recommend when to do maintenance through either IR Scans, internal inspections, cleaning or equipment repairs. This enables you to make more informed management decisions. Trending and analysis assist in scheduling preventive maintenance and system capacity planning.

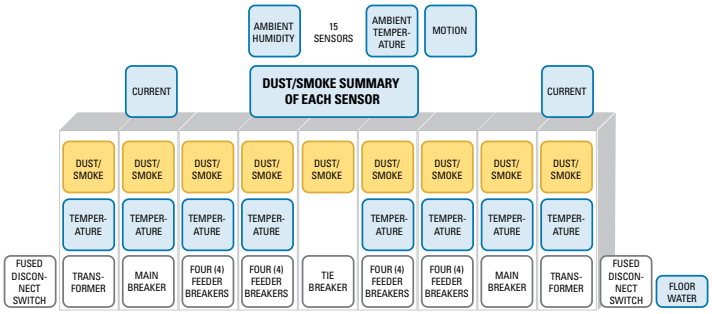
A typical application may include multiple sensors with options to be connected via a land line, a cell or even a satellite connection. Our command center continually looks at the data and is ready to notify the end user of any pre-programmed parameters to allow for quick action should this be necessary. Quarterly reports and alarm recommendations including recommendations for inspections, thermography, cleaning, etc are available for review and action.

GearGard's Equipment Condition Remote Monitoring fulfills the needs previously identified by offering:

- Early warning failure detection
- Maintenance planning efficiency
- Failure diagnostics

Typical graphical representation of data

This sampling of data shows the proper difference in temperature and humidity in an outdoor bus duct



A typical sensor configuration for a Main-Tie-Main substation is shown above

- IP67 rated fiberglass box suitable for outdoor applications
- Mount internal or external to equipment being monitored
- Dimensions 17"H x 15"W x 8"D

- On board battery back up will allow data to transmit to the secure server for up to five days after the loss of AC control power
- In the event that AC power is lost, data will continue to log locally into the Data Logger for up to six months

- Plug and play sensor ports
- Up to 15 (more if required) port sensors per application being monitored
- IP67 rated sensor ports
- Pick and choose the sensors
- Custom configurable

- Dust / particle / smoke sensor
- Designed to mount in the rear compartment of switchgear
- Connect up to ten sensors per GearGard application
- Dimensions: 4"H x 4"W x 6"D

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