

# Remote monitoring applications in continuous process industries



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## Introduction

Manual processes for tracking equipment health can't provide you with immediate access to data needed to understand the current state of critical assets, determine where conditions leading to a downtime event may be developing, or gain insight into a failure if it occurs. Remote monitoring of electrical power equipment and operational assets provides new opportunities to safeguard people, productivity and equipment.

When integrated into critical assets, remote monitoring provides 24/7 insights into the current state of equipment health, and immediately alerts and alarms your plant personnel when abnormalities are present. In addition, remote monitoring solutions use this data to track trends in equipment state or condition that could impact availability and reliability.

Alerts and alarms for specific events ensure the ability to deploy your personnel safely, and with the tools and parts appropriate to the specific issue or failure. Notification of anomalies allow your operations and maintenance teams to respond to changes or trends that may cause downtime or equipment damage. The trending data can also assist with preventive maintenance planning, improving reliability and equipment lifespan.



## Substation and asset utilization monitoring

Substations are intersection points in a power system where multiple facility loads are served from upstream power sources through several feeder units. A downtime event from these areas is likely to cause outages in wide areas of the facility, often for lengthy periods. Sites with multiple electrical rooms housing substations across a large facility face a common challenge: due to time and cost constraints, these substations are rarely visited.

Equipment may operate for 20-30 years in remote substations with a maintenance cadence of every 5 to 10 years, so the current health of electrical room equipment such as distribution switchgear and transformers is unknown. This "set it and forget it" approach means every failure is unexpected and has the potential to cause unplanned downtime that disrupts continuous processes essential to production such as automated assembly lines, paint booths, welding and stamping machines, conveyors and robots.

Remotely monitoring electrical equipment gives plant personnel current readings from sensors, monitors, and other digital devices placed in electrical equipment to monitor specific components, states and conditions, including environmental conditions. The system transmits data to a cloud-based solution so personnel who have access to the application can see current data trends on all monitored aspects of substations and their associated rooms and receive alarms based on predetermined thresholds and events.



## Continuous thermal monitoring of electrical equipment

There are hundreds to thousands of electrical connections in every electrical room, and each one is important to electrical reliability and equipment health. Manual thermography audits are labor- and time-intensive and involve deploying staff or contractors across the site, including remote or hazardous areas. Despite these costs and risks, manual audits only provide a snapshot of connection health, which isn't sufficient to support trends analysis or preventive maintenance.

Solutions included within switchgear and other assemblies provide alarms and relays for pre-determined setpoints to the control room but can't communicate those anomalies directly to relevant maintenance personnel.

Some recent sensor technology solutions now capture continuous readings from equipment but deliver a huge volume of raw data without context or analysis so the work of identifying a bad connection or spotting a trend falls to the plant staff. This diminishes the usefulness of the data to prevent anomalies from becoming downtime events.

A remote monitoring solution augments internal continuous thermal monitoring within electrical assemblies by capturing sensor data from within each bucket for trend analysis. In addition, the application sends notifications directly to the necessary site personnel if readings are outside of the normal expected range.



## Motor and control monitoring

Approximately 70 percent of electricity used by industry is used to drive electric motors. Often motors power the most critical loads in production lines, such as operating pumps in pipelines and water treatment facilities. Understanding the health of motors and the electrical systems that power them is vital to reliability and productivity in continuous process industries.

With motors and electrical rooms spread across operations spanning thousands of square acres and potentially harsh environments, manual monitoring is time- and cost-prohibitive. This leaves operations teams blind to line, load and motor conditions and current device status, risking unplanned downtime. To avoid these risks, you need continuous, current readings on your system, from the quality of incoming power source feeding the motor to individual pump or load conditions.

A cloud-based remote monitoring system provides you with current readings on any aspect of your operation, from vibration or excessive heat in the motor to key metrics in the electrical system including device status, temperature inside the enclosures, status of fans and blowers, breaker condition, current and voltage, overload protection and voltage anomalies.

This data can reveal issues that might otherwise go unnoticed, such as phase loss and harmonics, triggering notifications to relevant personnel. This allows maintenance teams to proactively correct issues that could otherwise lead to equipment damage, downtime or power factor charges from your utility. Planned repairs ensure that maintenance personnel won't need a hot work permit and can work as safely as possible.



## Facility power management and asset utilization

Power failures are particularly problematic for continuous process industries. Data on power usage and equipment performance is essential for the operation of production lines as well as for capacity planning. What processes/equipment consume the most power in your facility? How is capacity currently allocated and how does that impact operational equipment usage or changes? Why are two similar assets consuming power at substantially different rates? Are issues like harmonics driving up power factor penalties?

Because manual monitoring is expensive and time consuming, many facilities have little to no information on these important questions. Being blind to power usage, capacity and equipment health trends leads to a reactive approach to maintenance that causes increased operating costs, unplanned outages and lost productivity.

Remote monitoring of assets provides ongoing insights into critical aspects of facility power management and asset utilization. By capturing power usage from each piece of equipment, the system provides essential information on equipment health as well as opportunities to decrease power usage and utility costs by resolving issues like harmonics. Monitoring also makes clear the balance of capacity to usage, which is essential information for facility planners.



## Monitoring electrical equipment in hazardous environments

Electrical reliability is always a complex undertaking and presents additional challenges when electrical lineups operate in Class I, Division 1 and 2 or Class II environments. NEMA 7 and NEMA 9 enclosures allow the safe operation of electrical equipment in areas with flammable gases, liquids or vapors and combustible dust. Manual monitoring of this equipment would require opening these enclosures, which is too hazardous. The cost of wired monitoring solutions is typically out of reach, estimated by electrical experts at \$100-200 per foot for installing rigid conduit and wiring alone.

When electrical equipment is unmonitored, every failure is a potential unplanned downtime event – in an environment where even a small repair can require hot work permits, specialized PPE and safety tie-off equipment, trips to the parts room and the process control center and/or bringing in a specialist, all while the downtime clock keeps ticking.

Remote monitoring equipment in explosion-proof enclosures provides alarms, notifications and data trends on electrical equipment health and enclosure conditions to inform preventive maintenance planning and incident response down to the specific connection or condition. This allows maintenance staff to respond effectively before failure occurs, minimizing time spent in hazardous areas while also safeguarding equipment.





## Benefits of remote monitoring

### Worker safety

- Reduced staff interaction with electrical equipment to take readings
- Ability to capture a continuous flow of data from equipment in remote and hazardous environments
- Sensor data identifies location, equipment monitored and condition or state so maintenance can deploy with appropriate tools, parts and PPE

### Equipment health and longevity

- Continuous metrics give you an updated understanding of the current state of any monitored asset
- Escalating alarms and notifications ensure prompt response when a sensor reading falls outside of pre-determined thresholds and events

### Productivity and profitability

- Reduction in frequency and duration of downtime events
- Data is immediately available to relevant personnel so they can act without delay
- Reliable current and historical data informs preventative maintenance scheduling
- Greater efficiency in response by eliminating troubleshooting in the field

### Cloud-based application

- Role-based alarms, notifications and access to equipment data
- Alarms are sent instantaneously to correct personnel via SMS and e-mail for timely action
- Equipment health data is available 24/7 on any device
- Captured data is reflected in dashboards and trend lines for actionable insights
- Equipment data is available for reporting and for use in other software systems
- Greater accuracy of sensor data improves quality of monitoring

### Planning and reporting

- Insights into facility power management, asset utilization and capacity to usage to support facility planning
- Consistent data to support compliance reporting and your organization's ESG goals

For more information, please visit:

[www.eaton.com/IndustrialRemoteMonitoring](http://www.eaton.com/IndustrialRemoteMonitoring)

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