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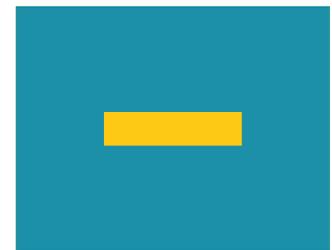
2017

UPTIME AWARDS

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HOW DOES CONDITION MONITORING

PREVENT MOTOR FAILURES



Nicole Dyess

MOTORS FAIL.

It's a fact of life that's nearly as certain as death and taxes.

Until now, preventing motor failure required early retirement, as in repairing or replacing your rotating equipment on a schedule possibly years before the motor would fail. Fortunately, the declining costs of sensors and submeters, together with the growing big data industry, have made condition monitoring increasingly accurate and affordable. The net result: condition monitoring can decrease your motor operations and maintenance (O&M) expenses by up to 25 percent.¹

This article describes how condition monitoring detects motor damaging situations and uses that information to maximize the life of your rotating equipment.



With the Internet of Things (IoT) and rapidly declining submetering costs, the use of energy monitoring is increasing as an affordable method for providing continuous, remote monitoring.



How Condition Monitoring Works

Condition monitoring works by collecting, sorting and analyzing streaming data from sensors on your equipment, as shown in Figure 1. Then, data analysis platforms apply complex algorithms to the incoming values to detect problematic conditions and update the virtual model, also known as a digital twin², of how your equipment operates. The platform compares your equipment's current performance to its manufacturer's specifications and historical readings to identify performance nonconformities or items that require action. Finally, the platform generates a report with asset history and sensor

data and alerts you to these nonconformities, enabling you to determine the proper intervention, such as correcting a potentially motor damaging stress before it creates a bigger issue or scheduling downtime to replace equipment.

Advantages of Energy-Based Condition Monitoring

Much like your doctor tracks your temperature and blood pressure, monitoring your motor's vital statistics, such as its normal operating parameters and stress levels, can indicate an issue long before it's symptomatic of a problem.

Energy-based condition monitoring offers three advantages over more common condition-monitoring techniques, like vibration and thermography. First, it's difficult and expensive to monitor vibration, thermography and ultrasound remotely, so these tools tend to be interval based, such as quarterly or annually. With the Internet of Things (IoT) and rapidly declining submetering costs, the use of energy monitoring is increasing as an affordable method for providing continuous, remote monitoring.

Second, ultrasound, vibration and thermography only identify whether your motor is operating normally or not. In the absence of an issue, they consider a motor healthy. But, energy-based condition monitoring can detect motor damaging electrical stressors, such as a voltage unbalance, as illustrated in Figure 2. With that knowledge, you have a chance to intervene and correct the issue before it harms your asset.

If damage has already occurred, then energy-based condition monitoring provides intelligence that helps you understand your motor's current performance and health. With this information, you can make an educated decision about when to retire an asset that balances its performance, operating costs and remediation costs with the risk and consequences of failure.

Third, energy-based condition monitoring uses energy efficiency as a leading indicator of motor failure. Whether a motor is just beginning to arc between windings or has a bearing issue emerging, the motor consumes more energy to generate the same output. That means its efficiency has declined. Because energy-based condition monitoring platforms continuously monitor your motors and compare new to historical measurements, these platforms detect that your motor needs attention, often before ultrasound, vibration and thermography do.

How Condition Monitoring Saves You Money

By continuously tracking the health of your motors, condition monitoring enables you to maximize your capital investments in your motor-driven systems. Here are six ways this improves your bottom line:

- 1 Preserves the health and extends the life of your assets.**
By detecting and notifying you when situations stress your motors, condition monitoring alerts enable you to proactively correct issues before they irreparably damage your rotating equipment.
- 2 Reduces your energy expenses.**
Since motor efficiency declines with motor health, using condition monitoring to preserve the health of your motors also lowers your energy costs.

- 1 Submeters / sensors collect data on the current operating conditions of your motors & motor-driven systems**
- 2 A data aggregating gateway prepares & transmits your data to an IoT Platform**
- 3 IoT platform uses algorithms to sort, consolidate & archive your streaming data**
- 4 Analytics monitor your streaming data for performance nonconformities, triggering actions when appropriate and populating your CMMS**
- 5 CMMS presents your streaming & historical data, along with analytics, to help you make better asset management decisions**

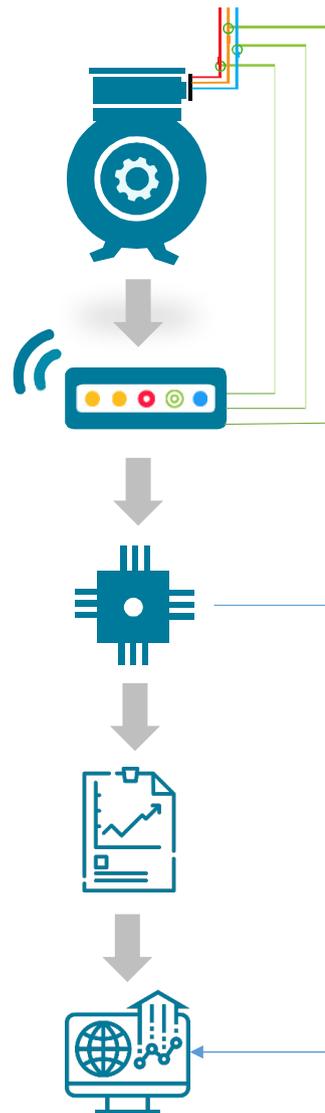


Figure 1: Process of condition monitoring through the use of sensors

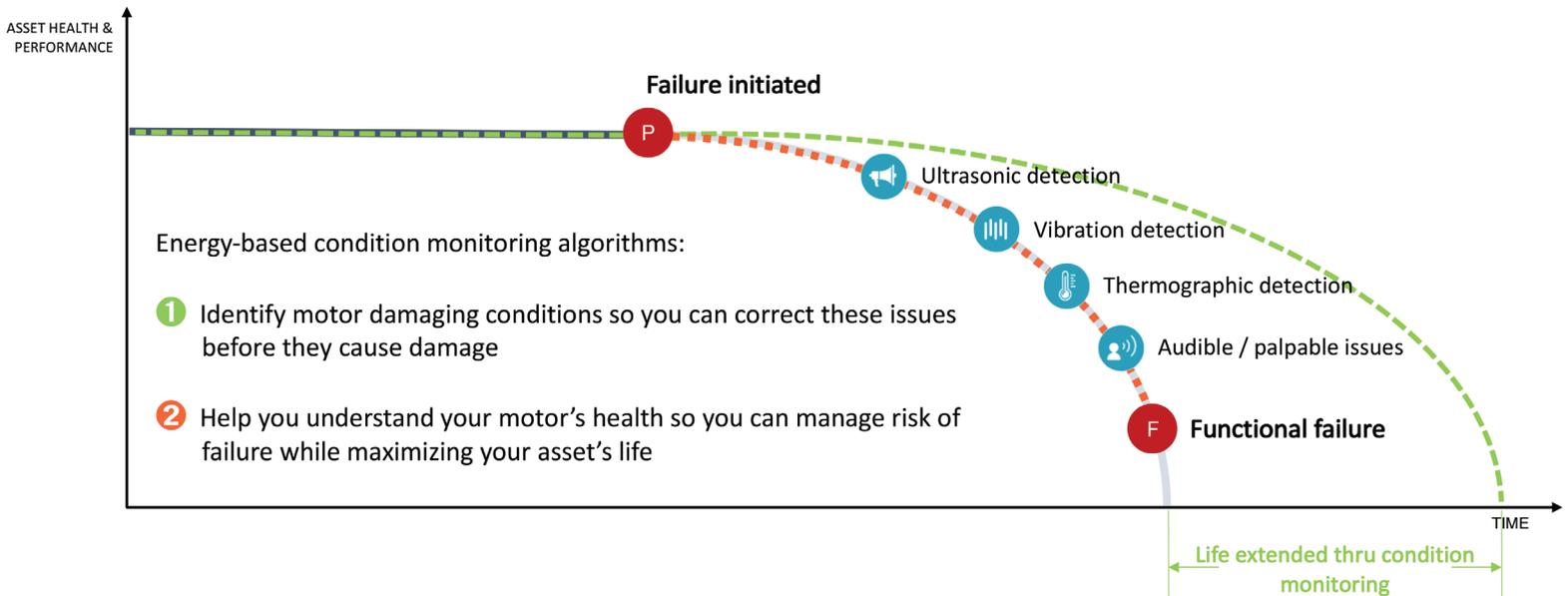


Figure 2: Energy-based condition monitoring continuously watches for motor damaging stresses, such as voltage unbalance, and alerts you when these conditions occur. Taking actions on these alerts prevents damage and extends the life of your asset. Or, if your motor is already damaged, then energy-based condition monitoring supplements other diagnostics to provide insight on the motor's performance so you can balance operating costs, remediation costs and risk of failure in an informed manner.

- 3 Extends your maintenance staff's reach.**
Your staff focuses on the motors only when they need maintenance and can perform other tasks when they don't.
- 4 Optimizes your maintenance processes.**
By intervening only when the asset needs maintenance, condition monitoring enables you to eliminate the 19 percent of preventive maintenance activities that are unnecessary³ and the 45 percent of preventive maintenance practices that are ineffective,⁴ while still achieving high availability and reliability performance.
- 5 Makes smarter asset management decisions.**
Avoiding the premature replacement of a healthy motor extends your capital investment, while maintaining high availability and reliability metrics. Providing operations, maintenance and engineering with visibility on how your equipment is performing helps these teams make more collaborative and better informed asset management decisions.
- 6 Avoids unplanned outages, minimizes downtime, works safer and reduces defects.**
Insight on your assets' health enables proactive, risk- and economic-based asset management decisions about the type and timing of maintenance. By making these decisions proactively instead of in the heat of the moment after the asset fails, you can order supplies, stage equipment and schedule the outage at a time that works best for you. Eliminating catastrophic failures and prepping people and supplies in

advance halves the time it takes you to complete maintenance.¹ Studies also show that planned, condition-based maintenance is safer (i.e., results in fewer injuries) and results in up to 70 percent fewer defects.⁵

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