How portable condition monitoring improves maintenance effectiveness

The Industrial Internet of Things (IIoT) has the capacity to reshape plant operations. The main idea behind IIoT is that by connecting the digital and physical worlds through the latest technology and equipment, you can improve the quality and speed of critical information. That information then can be shared and used to make better-informed decisions.

Many factories employ a preventive maintenance (PM) program to regularly check critical equipment with portable tools to find signs of degradation. These essential methods for discovering glitches in the system often miss intermittent problems. Readings must be taken at the right moment. If a maintenance technician cannot capture the right information at the right time, intermittent faults that go unnoticed escalate into complete failure. This is where the latest portable condition monitoring devices and software enter the picture.

Portable condition monitoring technology is both modular and manageable. This matters for teams wanting to adopt more proactive approaches to maintaining expensive assets on the production floor.

Plants often deal with underperforming motors, and it's crucial to figure out the root cause of the motor's failure. In this common scenario, technicians may discover the motor is running hot due to insufficient insulation in the windings. Narrowing down the cause or causes—whether it's environmental stress, a power quality problem, or mechanical wear—proves difficult. The maintenance manager sends a team out to gather current, voltage, power monitoring, and temperature measurements in the hopes of correlating data to find the motor's source of instability.

A tale of two solutions

The traditional solution to this problem relies on standard tools and research, logging, and temperature readings. This hands-on method can produce incomplete data, as it's difficult to isolate variables and correlate among current, voltage, and temperature while operational conditions change. Overcompensation could happen if the team fails to isolate variables, which may lead to a temporary solution with an unfavorable outcome, like replacing the deteriorated motor with an oversized motor. This approach trades one set of problems for another.

The newer approach uses smart technology that communicates between plants, equipment, and employees. Wireless sensors—that are networked to data systems—create a trend of volt and current measurements over time. In the motor example, logging becomes unnecessary with portable condition monitoring, as phase discrepancies can be remotely pinpointed as occurring at specific times during the equipment's duty cycle. The production of manufacturing and processing plants relies heavily on hundreds to thousands of components and secondary assets.
First versus second tier assets

Some plants have at least one multimillion dollar machine, also known as a tier one asset that is powered by smaller equipment down the line. Often, these tier one machines are equipped with monitoring sensors by design. Thus, plant managers can keep tabs on first tier machine performance through technical data.

Taking a step down one finds second tier assets, often worth many thousands of dollars, that are process critical. These assets rarely have fixed sensors, so plant operators are often in the dark when it comes to raw data. For example, if a circuit is tripping intermittently and shorting a motor, and the conditions revert to normal by the time a technician arrives at the panel to troubleshoot, there’s not much to do other than wait for the next circuit trip.

With portable condition monitoring sensors, mounted on panels of this second tier equipment, managers and technicians can see intermittent faults as they happen or over time from their desktop, smartphone or tablet. The equipment condition data allows “eyes” into what is going on with operating equipment, leading to better decision making on repairs, adjustments or replacement.

Detect glitches in mechanical processes

Portable condition monitoring sensors, for example, can simultaneously measure all three legs of three-phase power for motors, generators, or electrical cabinets. A technician can attach one current sensor to each phase or utilize the power monitor and then monitor the results on their smartphone. Since all three phases can be viewed simultaneously in real time, one quickly sees differences between phases.

Setting a threshold on the sensor and the real-time alarms informs the technician if there’s a sudden spike or drop in current to help them quickly identify intermittent faults. The results help to identify overloads or degradation or failure of one or more phases before it causes a safety hazard or a breakdown.

Value of correlating data

Before getting into the assessing measurement needs, the maintenance manager needs to set a baseline, or an initial set of critical observations or data used for comparison or control. This will set a uniform starting point for “what good looks like” and lead to trending, the visual process of collecting data on a routine basis to identify patterns and anticipate imminent machine failures. After a plant operator finds fault indications, they can
analyze, take action, and approach the dilemma with a productive mindset. These are all foundations of a proactive maintenance system.

Temperature, current, and voltage sensors as well as associated cloud-based software allow technicians to capture and monitor remote readings, all without disrupting operations during the inspection route.

When these versatile devices are mounted and connected to operational equipment or in electrical panels, collaborative maintenance managers and technicians can check circuit breakers in an electrical panel for overload, find three-phase power imbalances from harmonic distortion, or degradation or failure of one or more phases. They can capture spikes and drops in temperature within the panels to prevent failure in busbars, overload relays, and other components. To dive deeper into motor health, positioning sensors can help identify motor amperage spikes or overheating from bad bearings or insulation breakdowns.

A centralized reliability team may stay focused on the most mission-critical assets, but the data gathering practice has “democratized,” and with that, the benefits have spread to more areas of the plant. The bottom line is that equipment data availability helps everyone.

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