# Monitor Power Usage for Predictive Maintenance

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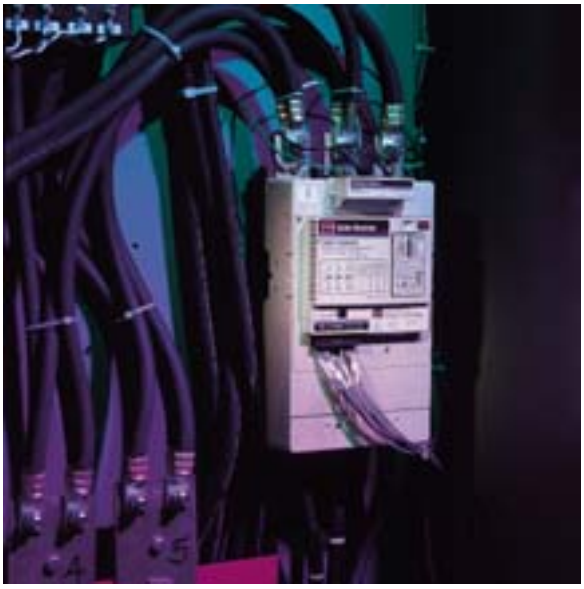

Unplanned shutdowns and downtime continue to be among the largest avoidable costs to manufacturing. In process industries, downtime frequently leaves material useless when the production process is shut down mid-stream. These shutdowns may never be completely avoidable, but new technologies can help minimize their occurrence and their impact on manufacturing.

Preventive maintenance has been one way manufacturers can maintain uptime. This requires maintenance personnel to regularly check machines for signs of failure. However, this uses valuable man-hours and resources, making the prospect costly. To reduce this cost, some companies have created predictive maintenance tools so manufacturers can monitor the health of their machine systems from a central location on the plant floor, or from a remote PC. By using technologies such as vibration sensors, and incorporating new technologies, such as control devices like Cutler-Hammer's IT Soft Start, OEMs can design machines that more accurately predict maintenance problems such as worn bearings, bent shafts, impeller problems, or other issues.

OEMs that provide predictive-maintenance features focus on bringing this technology to rotating equipment such as motors and turbines. Presently, this type of equipment is checked periodically with hand-held vibration sensors to determine the machine's health. Readouts are compared against historical records to determine if a shaft has become misaligned, bearings are failing, or to learn the existence of numerous other problems. Depending on the length of time between readings, failing equipment can go unchecked for an extended period of time.

Due to technology, smaller, more accurate vibration sensors can be built and placed permanently on machines to constantly record changes in vibration patterns. These changes, which may indicate misalignment, bent shafts, loose foundations, and

other problems, can help pinpoint when a machine begins to show signs of wear. Accordingly, work can be diverted to replacement or backup machines, thus minimizing lost production.

Vibration is not the only key to predictive maintenance. Motor current also can reveal to maintenance personnel the health of a machine. Unbalanced loads frequently produce minute disturbances in the current to the motor. New, fast digital signal processors can sense and analyze these disturbances, and neural net programs can learn to differentiate between healthy and unhealthy processes, alerting the staff of impending failure.

Power monitoring can also help detect pump problems. Through monitoring power delivered to the pump, users can determine when problems like broken or debris-jammed impellers, worn bearings, misaligned couplings or loose foundations occur. Other conditions such as cavitation, in which air bubbles on the leading edge of the impeller break and etch the blade, and low or excessive flow can benefit from power monitoring. However, this monitoring is not enough by itself. Algorithms are also being used to analyze the power spectrum to show signs of unbalance, cavitation, excessive bearing wear, and misalignment.

These technologies do little good without products that can incorporate them and bring predictive maintenance to the machines they benefit. As technology continues to improve, control devices are becoming smarter and offer better communication capabilities. In the past, a sensor might need to relay to a PLC, then to a second sensor or to a drive. Now the sensor can communicate directly to the drive or to another sensor. This allows for more intelligence to be housed in the PLCs, or for the PLC to be removed altogether, allowing for better predictive maintenance. It also allows for faster response times when problems are detected.

As technologies improve, so will predictive maintenance. Additionally, as old motors or pumps fail and are replaced, the new devices will include embedded controls or sensors that make predictive maintenance possible. Better use and application of the Internet, too, will impact predictive maintenance, allowing engineers from thousands of miles away to easily monitor machines and suggest corrections, or with a few keystrokes, reroute work to avoid failures.