Diagnostics: Evolution in the Revolution

The newest independent, modular, networked online diagnostic systems can now be remotely monitored, maintained and controlled. This technological revolution is based on simplicity, robustness, connectivity and diagnostic intelligence.

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More efficiency through automation. Greater productivity from centralizing or outsourcing technical expertise. These evolutions of global market demand have launched a technological revolution in online monitoring.

Where online systems were once relegated to monitoring only critical plant assets because they were expensive to purchase and even more expensive to install, innovative new system technology now allows plants to automate diagnostic functions and monitor remote installations.

Historical Barriers to Online Monitoring

Once upon a time, high sensor and cable installation costs made online monitoring systems an unattractive alternative to portable systems, or limited their use to only the most critical of plant assets. Back then, traditional online systems consisted of a central processor to which all of the sensors were connected. This meant laying a great deal of cabling, often in conduit, to get the signals to the central processor. The cable installation costs would often dwarf the actual hardware and software costs required for the online system.

But sensor prices have dropped considerably the past few years, and design innovations greatly lowered both system and installation costs. The newest modular designs, using Ethernet or Wireless Ethernet (IEEE 802.11 WiFi), make installation easy and inexpensive.

Wireless Sensors vs. Wireless Systems

Two competing models share the common aim of reducing cabling costs or removing cables entirely.

Wireless sensors contain small transmitters that relay data back to a central processor, often through a wireless access point. The benefit of these sensors is that there really are no wires. They easily move from machine to machine if necessary.

There are many drawbacks, however. The sensor costs are high and the user is limited to choosing the sensor that has a transmitter, not necessarily the best sensor for his application. But the greatest limitation is that these sensors are configured to collect and transmit data on a schedule, not based on what the machine is doing. Though this saves battery life, it creates a significant technical limitation of the devices themselves for applications involving variable-speed or load machines.

In these applications, the benefit of an online system is that it checks the machine state before testing to ensure repeatable test conditions for trending, as well as identifying whether the operating state itself has changed. Without repeatable test conditions, vibration monitoring is not very useful.

Wireless systems assume there will be multiple sensors per machine and multiple machines to be monitored within a relatively small area. In this case, it makes sense to use off-the-shelf, inexpensive sensors (including non-vibration related sensors) that are right for the application, and cable them short distances to a processor located on or near the machines of interest.

The processor then sends diagnostic results and/or data wirelessly (802.11 WiFi) or via Ethernet to a central server or to individual workstations. Multiple processors are installed plant-wide, close to the machines they are monitoring, then integrated on a higher level at a server or control center.

Diagnostics vs. Data and Alarms

Now that system and installation costs are so affordable, the next question is *what is the system used for?*

Many older online systems use simple overall alarms to determine increases in vibration, but because many operators already know that certain increases do not necessarily indicate mechanical problems, these alarms are often ignored.

If these alarms are not ignored, operators face the challenge of deciding what to do next to

determine what, if any, problem exists with the machine. This often requires more technological knowledge and time than is currently available onsite.

Some older online systems simply send heaps of data to a central site for analysis, as if they were just replacing portable systems. But what does one do with multiple machine tests per day when hundreds of machines are being monitored? Who analyzes this data? How does this manual approach to data analysis improve efficiency?

The newest patented online technology is unique because it contains an industry-proven and widely-used automated diagnostic system loaded right on it. This patented concept independently monitors the machines and sends data to a central site only if there is a change of status and/or on a predetermined time basis. This diagnostic system includes over 4,500 individual rules, detects over 650 specific mechanical faults, and applies to most common machines such as pumps, motors, blowers, compressors, and generators.

Independent studies find these patented diagnostic capabilities to be 96 percent accurate in determining specific machine faults and their severities. Reports include specific faults, with corresponding severities, plus an overall repair recommendation.*

Remote Monitoring & Control

Effectively monitoring critical pumps in remote pipeline stations is very challenging. To perform high-quality machine condition assessments, vibration and other data must be sampled at very high rates. This large amount of data cannot be easily transported to central monitoring facilities.

A key design feature of the newest online system is its patented proactive nature. It continuously assesses machine condition locally, but alerts

SpriteMod2 SpriteWavesLarge

The DLI Watchman® Sprite-MAX™ is a new modular online diagnostic system using multiple processors, installed near ma-chines, to send diagnostics and/or data to a central server or to individual workstations through Ethernet or Wireless Ethernet. Its Real Time Data server presents live data in spreadsheets for further manipulation. SpriteMAX interfaces with most existing distributed control systems through OLE for Process Control.

specific individuals of a machine's health problem only when a repair recommendation is made. This means complex data is now processed and reduced to actionable information at the pump itself.

This information, including concise fault diagnostics and severity, is sent to monitoring centers in near real-time. Raw data becomes available periodically, on demand and – most importantly – when a machine's status changes. If a problem is detected, it is quickly confirmed so machinists can be deployed with proper parts to repair the problem before a catastrophic failure occurs.

This new online system itself is also remotely managed and maintained. As new software components become available, they are automatically downloaded and installed with no user intervention. Engineers can troubleshoot a remote installation, update machine baseline data or test configurations easily through the Internet.

Interface

Results produced by new online system technology can be incorporated into a wide array of user interfaces, depending on the site requirements. As a generic out-of-the-box-solution, the new technology produces XML-based web pages containing machine status and fault information that are viewed on work stations in the plant and beyond.

A real-time data server presents live data in Excel spreadsheets that can be further manipulated by efficiency, power and differential calculations. Formatted spreadsheets may include plant and machine schematics and cells that change color based upon diagnostic-fault severity or calculated alarms.

New online system technology interfaces with most existing distributed control systems through OLE for process control, meaning machine status and fault diagnostics are easily added to existing displays.

Join the Revolution

New online system technology offers a unique solution to ever-increasing demands for efficiency, automation, remote monitoring and consolidation of technical expertise. Greatly reduced system and installation costs, local intelligence, modular design and web-based connectivity are revolutionizing the condition-monitoring world with new systems that are affordable and accessible to facilities that would never have considered them in the past. **P&S**

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