

An Ounce of Prevention for Critical Equipment

Condition monitoring devices provide a window into equipment operating conditions

Rotating equipment can deliver optimal performance and long life reliability if installed, maintained and operated properly. Increasingly, condition monitoring devices, part of the family of options for predictive maintenance, are being used to keep tabs on the operating conditions of equipment to ensure peak performance. Tools exist today that allow monitoring of equipment, including in hard to reach and dangerous locations, allowing for a complete predictive programme that reduces downtime, failures and costs.

Condition monitoring alerts users when a problem exists and needs their attention. This allows maintenance personnel to take action proactively in a planned and scheduled manner rather than reacting to unexpected component failures.

Deciding What to Monitor

When approached properly, condition monitoring tools can improve equipment production, uptime and profitability.

Monitoring candidates include rotating components like bearings, gears, motors, pumps, compressors, fans and other critical machine elements. When these elements become worn, contaminated, damaged or suffer from improper lubrication, the components or the entire machine may experience increased vibration and temperature, leading to potentially costly problems.

Applied to a broad number of applications, environments and industries, manufacturers, like The Timken Company, offer a variety of condition monitoring tools that aid in predictive maintenance and meet the needs, budgets and resources of a customer.

Deciding How You Will Monitor

When deciding to implement a condition monitoring device or system, it is critical that the chosen tools provide the expected return on investment. As such, plants should consider the number of points to be monitored, their budget, the



critical value of the equipment in question, and the expertise of their maintenance personnel to ensure they procure the proper mix of condition monitoring tools to meet their performance expectations.

Careful review of the needs and expectations can lead customers down several paths. Popular choices in condition monitoring include comprehensive continuous monitoring systems, modular condition monitoring systems, and route-based condition monitoring using handheld devices. The key is knowing the pros and cons of each.

Wireless Condition Monitoring

Ideal for difficult-to-reach locations, dangerous environments and remote or satellite operations, wireless tools provide operators with quick, real-time assessments of the equipment being monitored.

The benefits of a wireless device are its ease of installation, ability to provide 24/7 monitoring of the equipment, and its ability to monitor areas that are too difficult to monitor manually. The upfront costs of a wireless system are more than a route-based handheld device but are less than that of a wired continuous monitor system.

Available in a variety of options, the general operations of wireless tools are similar. Take for example Timken® StatusCheck™. This device is designed to detect and monitor excessive levels of temperature and vibration. The system monitors vibration on two-axis and consists of a wireless transmitter and receiver. The wireless monitoring device, which includes an accelerometer, temperature sensor, processor card and transmitter, can be installed on the target equipment. The transmitted data is then sent to a designated computer, which can be up to a half mile away, to

display the vibration and temperature readings.

Data provided by wireless monitoring devices offer equipment operators and maintenance personnel the ability to establish a baseline for acceptable performance levels of vibration and temperature on a particular piece of rotating equipment. This baseline is then used to establish warning and alarm limit thresholds. If temperature or vibration levels exceed the thresholds, operators receive an alert of the condition. As time passes and the thresholds are adjusted, wireless monitoring devices become an increasingly accurate and reliable tool to track process fluctuations, provide warnings and therefore prevent unexpected downtime.

Oftentimes, wireless devices are used to trend the overall operating condition over time. In this case, they require very minimal expertise to interpret the data and are best used for equipment that runs in near steady state operation of speed and load, such as pumps, fans, motors and gearboxes.

Portable Instruments

Depending upon the critical nature of the operating machinery, availability of resources to take readings and established budget, a portable instrument is often the foundation of an effective reliability program. Portable instruments are available in various configurations ranging from simple RMS vibration meters to advanced spectrum analysers with data logging capabilities.

Among the portable instrument types offered by Timken are the machine tester and machine evaluator series. These instruments offer similar monitoring options to their wireless counterparts. Unlike a wireless device, an individual machine tester or evaluator is intended for either spot checks on machinery or periodic route-based data collection.

Machine testers can be used with a vibration or shock-pulse sensor. The vibration sensor measures overall vibration for detection of misalignment, out of balance and looseness conditions. The shock pulse sensor measures at 32 kHz and is ideally suited for detecting marginal lube conditions and mechanical damage in bearings. With a route based approach, maintenance personnel can download measuring results into a computer to generate alarm lists and



graphical trends for easy identification of trouble spots.

Making the move from a machine tester to a diagnostic tool, machine evaluators are more advanced handheld monitoring instruments. The machine evaluator measures both shock pulse and overall vibration with the added capability of performing advanced analysis on a base-band signal. The availability of the signal allows for analysis in the time or frequency domain. Time domain analysis provides a plot of signal amplitude verses time, and is useful in determining time and/or phase relationships as for example when, in a shaft rotation cycle, an event occurs. Frequency domain analysis provides a plot of signal amplitude verses frequency, called a frequency spectrum. The frequency spectrum is helpful in identifying the vibration source from a complex machine having bearing and/or gear damage.

In summary, the machine tester is a frontline tool to alert operators to an adverse operating condition with minimal training required. The machine evaluator provides a trained technician with the information necessary to better identify the root cause to the potential problem.

Hardwired Continuous Monitoring Solutions

When handheld or wireless equipment will not meet the objective, hardwired monitoring solutions are available. This is the most costly alternative due to the installation expense. If 24/7 monitoring is desired, customers can opt for a stand-alone monitoring

device that is hardwired to critical equipment. The device has the capacity for up to two shock pulse and/or two vibration.

When properly installed, this type of monitoring provides easy access to the condition of the equipment and can provide analog or digital signals to communicate with a programmable logic controller (PLC) or other system.

With the capacity for two vibration channels and/or two shock pulse channels, a continuous monitoring tool is ideal for applications where multiple elements need monitoring. For example, it could be used to monitor the motor that drives a pump, as well as the health of the pump itself.

In the case where multiple locations, results and capabilities are required, an online monitoring system provides an integrated solution. Such a system provides online detection for thousands of measuring points for bearing damage, lubrication condition, vibration severity, spectrum analysis and other process parameters. A condition monitoring system uses advanced software to generate reports and trending results and would require additional training and analysis from a specialist. Choosing to monitor critical equipment is a step in the right direction and can help extend the life of the bearings, gears and other power transmission components.

(For more information on condition monitoring devices or with help assessing your specific challenges and needs, contact: communications-india@timken.com or visit www.timken.com/conditionmonitoring)