Refine Your Condition-Monitoring To Prevent Recurring Failures

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Are your condition monitoring technologies deployed and integrated in the most efficient way? Have they succeeded in improving machine availability and reducing recurring equipment failures?

If your answer is not a resounding "yes," then it might be time to review your condition-monitoring strategy. Programs most likely to succeed are those that have a formal structure and feature route-based monitoring activities that emphasize the routine collection, trending, and analysis of machine data.

Technologies introduced over the last decade place powerful monitoring capabilities in the hands of machine operators, and maintenance and reliability technicians on the factory floor. Professionals equipped with the proper instruments can often detect problems early in the failure curve, well in advance of functional failure.

Your mix of monitoring technologies should complement your plant’s machinery and production activities. Plants with large numbers of inaccessible machines, for example, are likely to make greater use of remote monitoring technologies than those with readily accessible machinery. The technologies used can also vary by industry sector. Mining operations, for instance, may rely on different monitoring instrumentation than paper mills.

Monitoring Operating Machinery

Although monitoring functions overlap somewhat, monitoring equipment can generally be divided into first- and second-level technologies. Front-line technologies give the earliest indication of machine problems; the second-level supplies additional information and in some cases can identify a problem's cause.

Typically, first-level devices are portable, require minimal training, and are designed for use while plant machinery is running. They gather information on basic operational parameters such as temperature, speed, and vibration. These include data collectors, vibration and thermometer pens, thermal cameras, optical tachometers, and electrical discharge detectors.

Enhanced, upgraded versions often combine multiple monitoring functions in a single device. A new condition-monitoring instrument, for example, takes both overall vibration and enveloped acceleration measurements of operating machinery and automatically compares them with established bearing vibration standards. An alarm warning is triggered when the readings exceed acceptable limits. The instrument also employs an infrared sensor to take surface temperature readings. This multifunction capability reduces labor and saves time for collectors of data.

Using Remote Technology

A construction company recently turned to noncontact thermal imaging in a difficult, potentially hazardous application: monitoring live electrical equipment for signs of overloading. The difficulty was increased by the equipment's location in an underground airlock with pressures of 1.5 bar over atmospheric pressure.

The company equipped maintenance workers with a hand-held thermal camera, which detects changes in thermal energy by measuring infrared radiation and generates images of thermal hot spots. The camera is operated at a safe distance from the electrical equipment. In addition to detecting electrical defects and reducing the risk of electrical fires, the technology has improved worker safety during monitoring.

Factory-Floor Grease Analysis

Machine failures can often be traced to lubricant contamination or other lubricant-related problems. Consequently, lubrication management and analysis have become key components of most predictive-maintenance programs.

Analyzing oil samples on the factory floor has long been a standard maintenance practice. But similar testing for grease, which lubricates about 80 percent of bearing applications, has only recently become feasible. Traditionally, grease samples were forwarded to a third party for analysis at a cost of $120 or more per sample.

Now, however, inexpensive, reliable grease analysis kits are on the market. One recently introduced kit contains separate tests for three grease characteristics: consistency, oil bleeding, and contamination. Users can take grease samples and immediately assess them for signs of deterioration. Further analysis is required only for samples that fail the testing. This technology can reduce overall lube analysis costs and give plants instant feedback on lubricant practices and plantwide grease quality.

Determining a Root Cause

Second-level technologies are generally not part of route-based monitoring activities, but are called upon as needed or during planned shutdown periods. These technologies include stroboscopes, boroscopes, and endoscopes.

Stroboscopes freeze the motion of operating belts, fans, gears, and other rotating components, allowing for visual inspection. When excessive vibration is detected during monitoring rounds, stroboscopes can help determine the vibration’s cause.

Endoscopes enable users to check the visual condition of machines and components that are not easily accessible, such as bearings, gearboxes, and compressors. In one recent example, the technology proved a dramatic time-saver for a pulp and paper manufacturer, allowing inspection of drying cylinder bearings without machine disassembly. These bearings require periodic inspection to check for wear on bearing rollers, raceways, and cages.

Previously, the inspection required considerable time and effort. A crane was needed to lift the housing in order to access the bearings. Housing seals were also removed. Disturbing the seals increased the risk of leakage after the inspection was completed.

Seeking a better method, the manufacturer switched to an advanced video endoscope, a palm-size instrument attached to a 40-inch-long insertion tube with a built-in camera. The instrument permits inspections without machine disassembly. After draining oil from the housing, the endoscope’s tube is inserted through the housing’s oil gauge hole. Users can display still and video images of machine components on the instrument’s LCD screen and record them for later analysis. The process has slashed inspection time and allowed the manufacturer to perform more frequent inspections of key bearing components.

Your plant’s predictive-maintenance program will probably require both first- and second-level monitoring technologies. Deployed strategically, they can prove highly effective in cutting failure rates and improving machine performance.