

INTELLIGENT SENSORS ENABLE COMPANIES TO START A PREDICTIVE MAINTENANCE PROGRAM WITHOUT EXPERT VIBRATION KNOWLEDGE

By Matt Manwiller, ifm efector

Historically, expert knowledge of vibration analysis was required to start and maintain a vibration-based predictive maintenance program. This article describes how using intelligent sensors can alleviate the need for vibration experts.

TRADITIONAL PROCESS: USING VIBRATION EXPERTS

Starting a vibration-based predictive maintenance program is costly and requires expert knowledge of vibration. Typically, a company can choose to hire a vibration analyst or use an outside contractor. Whatever the choice, expert services will be required for startup and long-term analysis.

Traditionally, the critical machines are selected by management. The critical components of each machine are identified, and the expert is called upon to determine the locations where the handheld data collectors will be attached.

The vibration expert begins the analysis process by examining the machine details, including machine speed, bearing geometry, gear or pulley ratios, etc. The expert will use this information to determine the critical frequencies to be monitored. A recording is made of the vibration level for each machine

component being monitored to establish a baseline.

An analysis may be done to ensure that the amplitudes are within acceptable levels. The program develops into a regular routine with readings taken from each machine component in 3 axes every 30, 60 or 90 days. The analyst reviews each reading, comparing it to the previous readings. The data is trended and the analyst makes a decision about the condition of the machine, alerting maintenance if the vibration levels are deemed too high.

This process continues indefinitely, with machine components being repaired or replaced as necessary. The data collecting and analysis can be done in house or by an outside contractor.

SIMPLIFIED PROCESS: USING INTELLIGENT SENSORS ALLOWS PREDICTIVE MAINTENANCE

Using intelligent sensors can alleviate the need for a vibration expert or team of analysts. The sensor can confirm the proper mounting location, determine the critical frequencies, record a baseline amplitude, establish alarm limits, trend the data, and signal maintenance to a potential problem. The machines to be monitored are still identified by manage-

ment, and the critical components of each machine are still determined. From this point, the process is quite different.

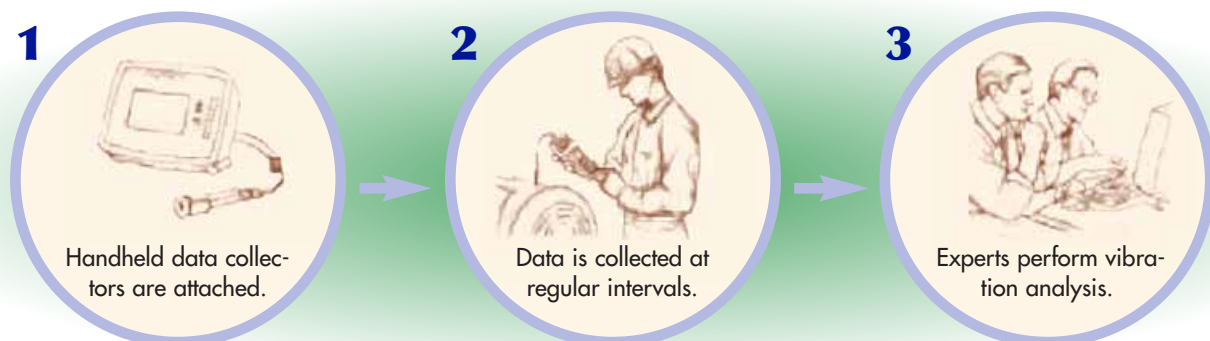
An intelligent sensor on a magnetic base is placed on a machine by maintenance personnel. The intelligent sensor has a function which can estimate the transmission value of a known force. The housing of the component is impacted with a known force, and the sensor determines whether or not there is sufficient transmission of vibration from the component through the machine housing to the sensor.

The sensor can be moved around with the magnetic attachment until a location is found that will provide sufficient vibration transmission.

Intelligent sensors can monitor multiple machine components. This feature allows the sensor to be located so the maximum number of components can be monitored with one sensor. Once the ideal location is found, maintenance personnel can continue the installation by permanently mounting the sensor and installing cable for power and discrete outputs.

The next step in the process is finding machine component information. The intelligent sensor has a parameter

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intelligent sensors

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setup process where the machine speed, any gear or pulley ratios, and the component being monitored are entered or selected. If the component is a rolling element bearing, the user can select the bearing from an integrated bearing database. If the bearing is not listed, maintenance personnel can obtain the geometric information or bearing frequency data from the bearing manufacturer and enter it manually.

The intelligent sensor uses this information to determine the critical frequencies to monitor.

Once programmed, the sensor records the amplitude levels for each machine component. The sensor then sets alarm limits based on this baseline. Typical limits are six and 10 times the baseline amplitude. The maintenance personnel's work is now complete. When the sensor sees an increase in amplitude to a level above the alarm limits, the sensor will activate discrete outputs, alerting maintenance personnel to a potential machine problem.



Impulse test with magnet



Input parameters



Install sensor



Tech baseline

PREDICTIVE MAINTENANCE PROGRAM: ESTABLISHED THROUGH INTELLIGENT SENSORS

Maintenance personnel can now determine the cause of the problem by connecting the intelligent sensor to a laptop. The laptop will display which machine component being monitored is producing the fault. The required maintenance can then be scheduled. Once the faulty machine component has been repaired or replaced, the sensor output

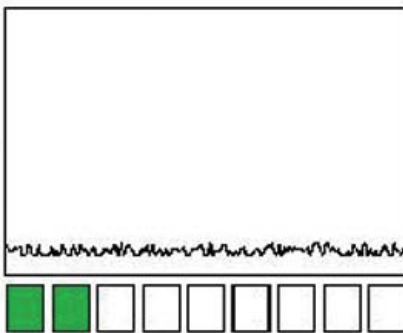
will return to an inactive state.

In this scenario, the intelligent sensor has performed all of the work that typically requires a vibration analyst. The sensor confirmed the proper mounting location, determined the critical frequencies, recorded a baseline amplitude, established alarm limits, trended the data, and signaled maintenance to a potential problem. These are all functions typically performed by the vibration analyst.

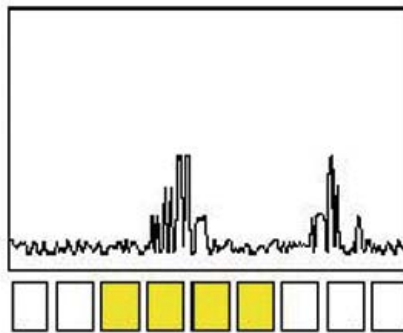
Intelligent sensor's "traffic light" bar graph display indicates operating condition of bearing or shaft.

CONCLUSION

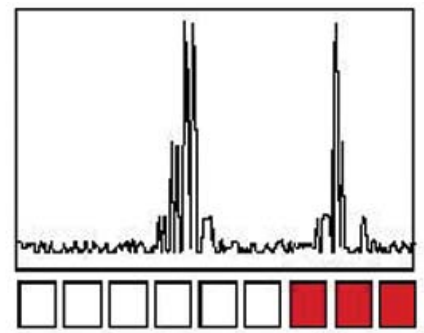
As described in this white paper, intelligent sensors now make it possible for companies with little or no vibration experience to begin a predictive maintenance program without hiring a vibration analyst or outside contractor.



Operating condition OK



Early warning of bearing wear or shaft unbalance



Critical alarm indicating bearing damage or extreme shaft unbalance