With the present-day emphasis on increasing production while lowering overhead, manufacturers and service providers often turn to outside sources for their predictive and preventive maintenance needs. In Alberta, Canada, Yvan A. Lejeune is an example of how these relationships can work. Lejeune's clients include oil and gas producers, food and beverage processors, distilleries, mining and forestry firms, and a variety of service providers.

He delivers all services associated with ultrasonics and vibration analysis, including bearing and valve analysis, dynamic balancing, laser machinery alignment, field repairs, and performance and mechanical analysis of engines, steam turbines, and compressors.

"Chiefly, I'm hired for my expertise and high-tech equipment," said Lejeune. "For a majority of clients we are consultants. In addition, we provide routine inspections of machinery, make repairs, do installations, and solve problems that evolve with machinery in the diagnosis, correction, and repair stages. One of our biggest selling points is that we keep thorough and accurate records of the condition of all equipment, tracking them over time."

In conjunction with headphones, the ultrasonic instrument isolates bearing noise from competing machine noises. A data collector can be interfaced with the instrument and the signal can be viewed as an FFT.

Troubleshooting with ultrasonics and vibration analysis

Lejeune uses ultrasonics in conjunction with vibration analysis to pinpoint the exact source of many problems. However, while ultrasonics is a technology with a variety of applications, according to Lejeune, vibration analysis alone is applied mostly to rotating machinery.

One of the most common uses of both technologies is to determine the degradation of bearings. In most situations, a facility is not even aware it is having a problem with worn bearings. But routine analyses on a quarterly basis reveal the problems.
Lejeune said two of the most frequently asked customer questions are: “Is the bearing damaged and in need of replacement, or is it simply a matter of lubrication?” and “How often and how much grease should we use in an electric motor?”

“My answer always is that it depends on the rpm of the machine and its usage,” he explained. “The average customer goes out every three months and gives his motors four shots of grease whether they need it or not. But overlubricating bearings can be even more harmful than underlubricating them. Ultrasonics is the only way of truly determining if the grease has gotten to the bearing safely and economically.”

Lejeune uses ultrasonics in combination with vibration analysis to check for bearing problems. “Vibration analysis alone is not a reliable test to determine bearing damage,” he explained. “Ultrasonics has capabilities outside the range of a standard vibration transducer.”

Equipped with headphones, Lejeune uses his portable ultrasonic instrument (an Ultraprobe 2000 manufactured by UE Systems, Inc.) fitted with a probe to acclimate himself to sounds. An ultrasonic instrument quickly and accurately pinpoints bearing degradation, leaks, or other irregularities that are inaudible to the human ear. By touching the test area with his instrument, Lejeune hears a bearing problem as a grinding sound and observes the intensity on the instrument’s ballistic meter. The closer his instrument is to the bearing housing, the more accurate the reading. Since ultrasonics is a localized signal, a bearing noise can be isolated from competing machine noises. Frequency tuning enables the user to tune in to the resonant frequency of the test subject while dramatically reducing background noise interference.

For further analysis, Lejeune then interfaces the ultrasonic instrument with his data collector, bringing the signal in and viewing it as an FFT. Next, he takes calculated bearing frequencies and superimposes them across the vibration spectrum to determine whether there is a defective bearing or a simple lubrication problem that he can deal with immediately.

Lejeune also uses ultrasonics to conduct valve analyses on large reciprocating compressors and engines. “The ultrasonic signal is brought into a dedicated analyzer set up with a trigger pulse that synchronizes the top dead center of a selected cylinder, either on an engine or

compressor, to fire the ultrasonic trace at that position," he explained. "This enables us to examine the trace and determine whether we have a valve that's malfunctioning, leaking, slamming too hard, or staying open too long or not long enough."

Outsourcing pays off

A plant engineer at a major distillery in Alberta reported measurable improvements since Lejeune started a machine analysis program there five years ago.

Production of vodka quality spirit increased from 63 percent to 94 percent by the end of fiscal year 1996 due to fewer equipment failures. Process downtime dropped 55 percent due to reduced maintenance requirements. Call-ins were down 35 percent, and equipment repaired by outside contractors showed improved reliability due to the company's quality acceptance program. The company also noted improved communications between the production and maintenance departments, according to Lejeune.

Finally, as a result of the program's success in Alberta, all five of the distillery's sister plants in the United States and Canada started their own predictive machine analysis programs.

"Clearly, well-managed predictive/preventive maintenance programs are beneficial to a company's bottom line," Lejeune concluded. "But when time and staff are in critically short supply to make these programs work, outsourcing makes good financial sense." **MT**

Information supplied by Alan S. Bandes, vice president, UE Systems, Inc., Elmsford, NY 10523; (800) 223-1325.