Ultrasonics Helps Imaging Service Find Air Leaks, Electrical Disturbances

The combination of rising energy costs, federal and state emissions regulations, and tight production schedules has turned growing numbers of facility managers to outside service providers for such tasks as periodic compressed-air surveys and inspections for electrical disturbances. American Thermal Imaging (ATI), Red Wing, MN, specializes in ultrasonic, infrared and compressed-air analyses for commercial and industrial applications. Co-owners Gregory Wollan and Ken Walsh serve a nationwide clientele, including Xcel Energy, one of the largest energy suppliers in the country, as well as school systems, healthcare and printing facilities.

ATI inspects client systems for inherent flaws, air leaks and electrical disturbances, and issues survey reports with repair recommendations. A survey often indicates that facilities are wasting large volumes of compressed air. Wollan cites a wood-product manufacturer who had an annual cost of more than $17,000 to run one, 75-hp screw-type compressor. Ultrasonic testing of the equipment revealed that the leak rate was more than 21% of its total production. (The leak rate is the ratio of compressed air lost in the system to the amount of time the compressor has to run to produce the total air used.) "We saved them in excess of $7,000 per year in energy costs," he says.

ATI begins a compressed-air survey by gaining as much information on the companies' process as possible. Equipment that records system behavior and energy consumption is then installed in the air system. The company uses data loggers with and testing appliances such as a current transformer (CT) that goes around the compressor's incoming wire. "This tells us what the total run time of the compressor is," says Wollan, "and what the amp draw is on the compressor motor. It also give us stop/start times on the compressor motor at different times of day and under different loads. Then we repeat the process when the plant is not running, adding pressure transducers to the line to chart pressure drops. We note the stop/start pattern, which gives a representation of leak rate."

Pinpointing leaks often brings the Micron infrared imager into play. "The infrared detects heat, and we use it on compressed-air surveys if there is overheating in the compressor or overheating in any part of the electro-mechanical end of things," says Wollan. He'll then use an Ultraprobe 2000 ultrasonic scanner, made by UE Systems, Inc., Elmsford, NY, to check for air leaks.

Airborne ultrasound instruments, often referred to as "ultrasonic translators," provide information two ways: qualitatively through their ability to "hear" ultrasounds through a noise-isolating headphone, and quantitatively via incremental readings on a meter/display panel.

While the ability to gauge intensity and view sonic patterns is important, it is equally important to hear the ultrasounds produced by various equipment. These instruments confirm a diagnosis on the spot because they can discriminate among various equipment sounds. An electronic process called "heterodyning" converts the ultrasounds sensed by the instrument into the audible range so users can hear and recognize them. The location of a leak or of a particular sound in a machine can be

pinpointed as a result of this high-frequency, shortwave characteristic. Because ultrasound wavelengths are many times smaller than audible wavelengths, the ultrasonic instrument is more conducive to locating and isolating the source of problems in loud plant environments &#151- a major reason for its effectiveness.
Using headphones and ultrasonic scanners, a two- to four-member ATI team will then walk a facility searching for compressed-air leaks. An inspector moves the instrument around, pointing toward pneumatic pumps, pipes and fittings, picking up leaks, which may be as far as 50 ft. away. To be consistent, the team begins at the compressor/supply side and works its way to the use side. "The men create a series of inspection zones which help organize their approach and prevent the possibility of overlooking a section and missing some leaks," says Wollan. "The team moves from one zone to the next in a planned, organized manner. We categorize each leak, tag them and designate each for repair." Wollan stresses that all leaks should be tested after they have been repaired because sometimes when they are fixed new leaks may be created inadvertently.
Next the ATI crew moves on to the piping and distribution system to find out how much pressure is lost, checking driers, receivers and filters. The team then goes to the end-use area to find out how much supply is necessary to run all of the equipment that the facility wants to run and whether there are systems with peak-period loads. Finally ATI produces a report with information and recommendations to make the system more energy-efficient.
Wollan says the ultrasonic detector can locate leaks that other test equipment cannot. Recently hired to image a healthcare facility's older panels and breakers, Wollan's team was unable to pick up a distinctive heat signature in the breakers using the infrared camera. "So we turned the task over to our ultrasonic leak detector," he says, "and we were able to hear arcing behind the breakers and isolate the problem."
Arcing, tracking and corona all produce some form of ionization, which disturbs air molecules. The technician listens for the specific sound pattern of each type of emission through headphones while he observes the intensity of a signal on the ultrasonic instrument's meter. Normally, electrical equipment should be silent, though some may produce a constant 60-cycle hum or some steady mechanical noise. On the other hand, electrical disturbances produce erratic, sizzling frying, uneven and popping sounds. Wollan stresses that while the ultrasonic survey cannot be substituted for an infrared test, it's an invaluable addition to the testing process because the two technologies, while different, "work hand-in-hand."
Visit the UE Systems [1] website.
For more information, email info@uesystems.com [2].

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