Ultrasonic Technology in Power Plants

by CTRL Systems, Inc.

An ultrasonic detection device is an excellent tool as a power plant's first line of defense in predictive/preventive maintenance. With the CTRL UL101 (UL101), technicians are able to quickly locate problems in a wide range of components, equipment, and systems, enabling them to make informed decisions as to what further actions are needed to solve the problems.

Ultrasonic technology is a natural complement to vibration analysis and thermography. In many power plants, technicians use ultrasound when they first suspect a problem – for example with bearings – then verify what they have heard with portable vibration analysis. Likewise, ultrasonic technology can help to confirm if a bearing or gear problem exists when there is an early change in vibration analysis readings, or when thermography picks up a hot spot in a circuit breaker or switchgear. And, according to plant operators surveyed, ultrasonic devices are often able to better pinpoint the location of the problem in electrical equipment.

But, unlike infrared or vibration analysis, acoustic ultrasonic technology is as easy to learn as it is to use. Vibration analysis can require upwards of two years of training to become proficient in its use, whereas many plant technicians can learn the basics of how to use the UL101 ultrasonic detector in as little as an hour, and become proficient in its use through normal operation in only a matter of a few short days to a week. The short learning curve of ultrasonic technology means that if a technician should retire or change positions, almost anyone with knowledge about the components or equipment under test can quickly step in – and take over the testing.

It's fast: ultrasonic technology allows the technician to gather information rapidly. In power plants, ultrasonic technology is unique in its ability to detect and pinpoint leaks in air and steam systems, condensers, boiler tubes, and water walls – something infrared and vibration analysis cannot do. Ultrasonic technology's proven ability to pinpoint leaks translates directly into improved efficiency of systems, as it allows the technician to take corrective action to prevent reduced pressure, which can adversely impact the effectiveness of all systems that rely on maintaining proper pressure for efficient operation.

A specific example of ultrasound's ability is in pinpointing condenser tube leaks. Differences in the tubes are easy to discern if air is escaping. Leaks are easily pinpointed, so the problem can be resolved (tubes cut and capped to stop the leak). When talking about how much faster condenser tube leaks can be found and repaired, one user remarked, "the time savings has been incredible with ultrasound." Ultrasonic technology is also used on a regular basis at many power plants to detect boiler tube and water wall leaks.

Ultrasonic technology's leak detection capabilities are not found in vibration analysis or infrared, yet its use in conjunction with these more widely used predictive maintenance technologies is of a complementary nature. For example, in the case of bearings, vibration analysis is often inadequate. At the point when vibration analysis is just beginning to show signs of something happening, ultrasound can not only "tell" the operator if the bearings are over- or under-lubricated or are out of round, ultrasound can pinpoint which bearings need immediate attention. In fact, ultrasound can often detect a bearing problem long before the problem is identified through vibration analysis, or infrared – before costly damage or catastrophic failure occurs.

Determining inadequate or improper lubrication is one of ultrasonic technology's strengths. A two-year study of ultrasound at one nuclear facility focused on its use in monitoring the condition of bearings on cooling tower fan motor bearings, which are grease lubricated. Each time a bearing was identified as bad by ultrasonic analysis, maintenance work proved that the bearing was indeed bad. With the cost of fan motors between two to four thousand dollars, and the labor involved in the same ballpark, one prevented failure paid for the cost of the device. During times of peak demand, failure of the fan motors could mean less ability to meet customers' needs.

Ultrasonic technology is used in many coal plants to check the roller bearings on conveyor systems. With the length of a conveyor system easily a mile long, a technician is able to quickly check bearings. One user said, "ultrasonic technology is a much better tool than vibration analysis for these types of bearings," while another user stated that ultrasonic technology is a "quicker method to investigate suspect bearings."

Being able to check a wide range of components, equipments, and systems is just one reason why ultrasonic technology has an advantage over fixed systems. It's portable means that, unlike fixed monitoring technologies, ultrasonic technology can be used to check bearings in equipment throughout the facility. Light weight and durable, a technician can use ultrasound to check bearings, gears, check valves, and other critical components in any rotating equipment in the facility quickly and easily - in as little as a few seconds.

High energy costs have spotlighted a facility's need to reduce wasted energy wherever possible. The Department of Energy[1] estimates that a facility expends 15% of its energy dollars on compressed air. Just one ¼" compressed air leak can cost anywhere from $6,000 to $10,000 per year. Leaks you didn't know existed are quickly found. Considering that multiple leaks are found in any one facility, the savings realized from locating and fixing the leaks can save a facilities thousands of dollars. In addition to the money wasted, one operator remarked that leaks in the compressed air system, "could bring down the plant."

Most facilities have steam traps or steam lines, which are even more costly to operate from an energy perspective than compressed air. Equipment and systems that rely on steam to operate effectively suffer when leaks go undetected and un-repaired. Ultrasonic technology easily detects leaks in steam traps and steam lines, being called "more reliable" and a "more positive indicator than infrared" as to the condition of the steam trap, and adding "great savings" through its use. One failed steam trap can cost thousands of dollars per year. Ultrasound can detect a failed trap in a matter of a few seconds.

It's easy to see why ultrasonic technology has become a part of a large portion of power plants today. Whether used as a part of a regular preventive/predictive maintenance program, or for special applications beyond the reach of other technologies, the reasons for using ultrasonic technology are clear. Portable. Durable. Easy to use. Quick Learning Curve. And a recognized return on your investment – often in one use or within one month of use.

The CTRL UL101 is manufactured by CTRL Systems, Inc. For more information, contact CTRL at 1.410.876.5676 or e-mail info@ctrlsys.com.

[1] Office of Industrial Technology/U.S. Department of Energy: http://www.oit.doe.gov/bestpractices/pdfs/compressed_air3.pdf and, Compressed Air Challenge: http://www.knowpressure.org