# Ultrasound Testing Helps Cable Manufacturer Detect Early Bearing Failure

"Our goal is to predict bearing failure before it adversely affects the quality of our product," says Jackie Walker, a 17-year veteran and associate supervisor, preventive maintenance, at the Belden Electronics division in Tomkinsville, KY. "Ultrasonics technology in conjunction with vibration analysis are the troubleshooting tools we use to help us achieve this goal."

*Belden Electronics maintenance crew members use ultrasonic probes to inspect a 150hp extruder main drive motor output bearing (top) and idler capstan bearings (below), at the company's cable-manufacturing facility in Tomkinsville, KY.*

Parent company Belden, Inc., has manufactured wire since the early 1900s. Its 225,000-sq.-ft. Tomkinsville plant was built in the early 1980s and primarily manufactures coaxial television cable and computer flat cable used for commercial and residential mini-dishes and in dBs systems. A key element to the manufacturing process are core extrusion lines, which either are copper-clad steel wire or copper wire-coated with foam.

"To make sure the machinery is running properly, we check each one of our extruder drive motors monthly for bearing failure," says Walker. "Originally, a vibration analysis program was our sole means of running these tests. Two years ago, we discovered ultrasonics." Walker explains that vibration analysis is more reliable on high-speed bearings, but that Belden uses slow-speed bearings.

"Because ultrasound is a more accurate way of checking slower-speed bearings, we opted for a two-pronged approach," says Walker. "Now we can compare our vibration analysis readings of our core lines with our ultrasound data."

Ultrasound inspection is used extensively in industry to provide early warning of bearing failure, detect lack of lubrication and prevent over lubrication. According to Alan Bandes, vice president of UE Systems, Inc., an Elmsford, NY-based maker of ultrasonic instruments, because ultrasound is a high-frequency, short-wave signal, it is possible to filter out stray, confusing background noises and focus on the specific item to be inspected.

He adds that mechanical movements produce a wide spectrum of sound. By focusing on a narrow band of high frequencies, an ultrasonic instrument (such as UE Systems' Ultraprobe 2000, says Bandes) detects subtle changes in amplitude and sound quality. It then heterodynes these normally imperceptible sounds down into the audible range where they are observed on a meter for trending and comparison purposes and heard through headphones. An 8dB gain over baseline, for example, indicates pre-failure or lack of lubrication. A 12dB increase establishes the very beginning of bearing failure. A 16dB gain indicates advanced failure condition, while a 35 to 50dB gain warns of catastrophic failure.

Walker's two-man crew uses two basic methods for monitoring bearings with its ultrasonic detector: comparative and historical. To establish a baseline, inspectors point the handheld instrument with its probe attachment along the entire length of the extrusion lines comparing similar bearings for potential differences in amplitude and sound quality. Occasionally an inspector removes covers and shields to get the

ultrasonic instrument as close as possible to the bearing.
To do this, the inspector makes a reference point on a bearing housing or uses the grease fitting. He adjusts the sensitivity of the instrument and notes the meter at the back of the pistol for an intensity reference level. Then he compares this base reading to other similar bearings. A failing bearing will show an increase of 12dB or higher and will sound rough. Lack of lubrication will sound smooth but will show an 8dB gain. Once the inspector tests a series of bearings and sets a base line, he records the data and compares this to vibration-analysis data and to future readings for historical trending and analysis. Walker says it takes his crew about two hours to inspect the bearings along each core extrusion line, so the entire inspection can be completed in one day.
Walker's crew also has success using an ultrasonic instrument to identify faulty breakers in Belden's load centers. "Our facility has 30 very large breakers," he says. "When you hear an arcing sound you know the breaker's going bad."

When an electrical disturbance, such as arcing, tracking (baby arcing) or corona occurs, the electricity ionizes air molecules, which produces a distinct high-frequency sound pattern. The ionization breaks down the surrounding air into nitrogen and ozone which can produce nitric acid that eventually can destroy the metal elements of a connection or insulator. An ultrasonic detector senses these subtle changes in the high-frequency signature of a component and can pinpoint potential sources of failure before they cause costly damage.
As in the bearing application, an inspector examines each breaker, scanning a designated area with the ultrasonic instrument's sensitivity level set to high. As a discharge sound is heard, he moves the instrument equipped with probe in the direction of the loudest sound. "We had one 225-amp breaker that tripped out on us," says Walker. "Ultrasonics spotted the problem before we had a major failure."
Walker is reluctant to place a dollar amount on what Belden Electronics saves by using ultrasound technology since he has used ultrasonics for less than two years. But he says there is no doubt that the strategy maintains uptime on the machines, eliminates unscheduled downtime and, most importantly, ensures that Belden Electronics delivers a top-quality product.
"This is only the beginning," he predicts. "Last fall, we had an outside compressed-air power provider conduct an ultrasound survey at our plant. It identified roughly $25,000 worth of compressed-air leaks. We made the necessary repairs and plan to order a follow-up survey soon," says Walker. "We're reaping the benefits of ultrasonics technology and learning more about its valuable applications every day."
**UE Systems, Inc.,** 14-T Hayes St., Elmsford, NY 10523; 800-223-1325.