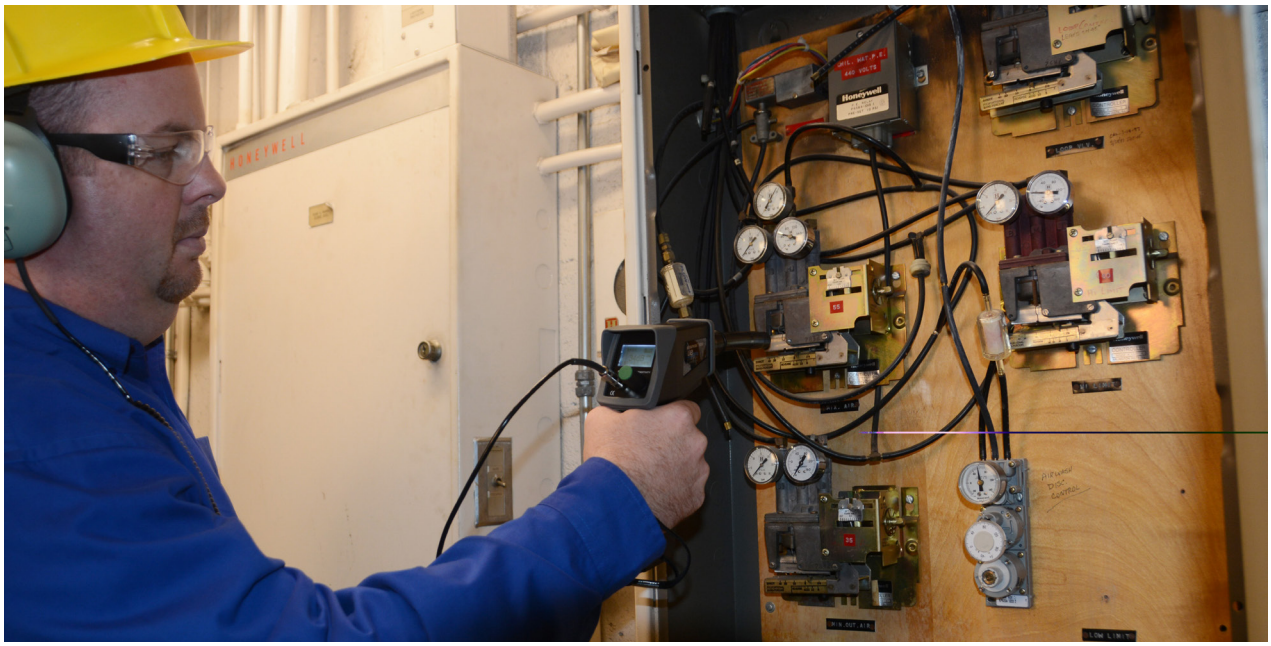
Using Ultrasound to Enhance Energy Efficiency

UE Systems



One of today's greatest challenges for maintenance & reliability teams is to improve energy efficiency - high energy prices and global competition dictate a need to reduce energy waste and improve system efficiencies whenever possible. A major contributor to energy waste is leaks: both in compressed air systems and steam traps. Ultrasound inspection instruments can easily detect these leaks, leading to potential energy savings.

DETECTING COMPRESSED AIR LEAKS WITH ULTRASOUND

Contrary to what some might think, compressed air is not free. In fact, it is estimated that more than 50 % of all compressed air systems have energy efficiency problems that should be corrected. These losses can be quite costly. Around 30 % of all industrial compressed air is usually lost to leaks, resulting in huge losses. A leak that is just 1cm can cost a plant upwards of €15.000 per year if it goes undetected.

In order to understand and evaluate what compressed air leakage is costing you, be sure to follow this 7-step process:

1. Evaluation: Look for leaks and identify misuse or poor applications for compressed air.
2. Detection: Use ultrasound technology to pinpoint where you're leaking compressed air.
3. Identification: Make sure you tag all areas where leaks are located.
4. Tracking: Keep records of repairs and cost savings.
5. Repair: Fix leaks as soon as they are found.
6. Verification: Make sure that these leaks are fixed and the system's performance has improved.
7. Re-evaluation: Continue to re-inspect your compressed air system.

Simply by implementing these steps into their reliability programs, every plant could reduce its energy waste by 10 to 20 %.

LEAK DETECTION WITH ULTRASOUND: HOW DOES IT WORK

Ultrasound instruments detect the turbulent flow produced as the compressed air moves from the high-pressure side to the low-pressure side of a leak.

As any gas (air, oxygen, nitrogen, etc.) passes through a leak orifice, it generates a turbulent flow with detectable high frequency components.

By scanning the test area with an ultrasound inspection instrument, a leak can be heard through the headset as a rushing sound or noted on the display/meter. The closer the instrument is to the leak, the louder the rushing sound and the higher the reading.

Using the characteristics of Ultrasound, locating leaks is fast and easy because of:

- Directionality of sound waves makes locating the source easy.
- Intensity of signal: the closer you get, the more sound you detect.
- Fixed frequency, making it effective to locate even in a loud factory environment.

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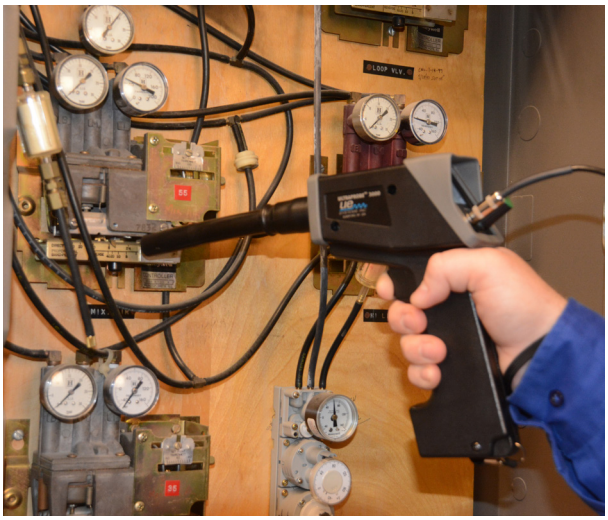
REPORTING & DOCUMENTING COMPRESSED AIR LEAK SURVEYS

Using an ultrasound inspection instrument, one can implement an air leak detection survey. Compressed air leaks are bound to crop up at some point, but by having a system in place that is designed to identify them before they become a large problem, you can save time, money and energy.

Besides repairing the leaks, the success of the survey largely relies on proper reporting and documentation. Reports can be created easily using software like Ultratrend DMS from UE Systems, or a mobile app as the LeakSurvey app.

The cost of the compressed air leaks is based on the decibel level once the leak has been located; the cost per



» The cost of the compressed air leaks is based on the decibel level once the leak has been located; the cost per kilowatt hour of electricity; and the pressure at the leak site

kilowatt hour of electricity; and the pressure at the leak site. Several independent studies compared an ultrasound leak survey report with the actual energy savings, and it has been found that an ultrasound leak survey is within 20 % of the actual savings - when done correctly, an ultrasound compressed air leak survey can have tremendous payback in a short period of time.

The following are the four major components of implementing a compressed air leak detection survey:

1. Create a route for inspection based around the design of your air piping system. Make sure to find and tag all leaks. Keep an eye out for misuse, such as valves that are left wide open.

2. Design the best possible route for inspection. Start from the compressor/ supply side and work toward the use side each time to maintain consistency. Take a sketch or diagram of your system to help you identify all the components of the system. Break your path into a series of zones that can make your inspection route more organized and easier to track.

3. Follow the same route each time so that you don't miss any components during your inspection. Use ultrasound to catch small leaks before they become larger issues.

4. Tag your identified leaks and report your results to management, highlighting your cost and energy savings.

INSPECTING STEAM TRAPS WITH ULTRASOUND

Steam leaks are also among the most wasteful, and therefore, expensive issues found in a plant. In fact, leaking steam traps can increase operating expenses by as much as 33 %. For this reason, energy conservation programs should start with a steam trap survey. Even the smallest steam trap leak can cost up to €7000 per year.

Testing steam traps with ultrasound is a structure-borne or contact application. Physical contact between the steam trap and the ultrasound instrument is necessary, to "hear" how the steam trap is performing. If using an ultrasound instrument that has frequency tuning, adjust the frequency to the recommending setting of 25kHz. Regardless of the type of trap, the placement of the contact probe or stethoscope module attachment on the ultrasound instrument will always be at the discharge orifice of the trap. Turbulence is created on the outlet side of the steam trap when it releases condensate. Therefore, placement of the contact probe will always be at the discharge orifice side. Once contact has been made, adjust the sensitivity/ volume on the instrument until the sound of the trap can be heard.

REPORTING STEAM TRAP INSPECTIONS

Findings from a steam trap survey can also be documented with UE Systems Ultratrend DMS software, or the SteamTrap Survey app for mobile devices. The report will outline the potential economic loses due to the faulty steam traps. In order to generate a Steam Loss Report, the inspector will need to know the following information for each steam trap: Type of Trap, Orifice Size, Inlet Temperature, Outlet Temperature, Operating Condition (OK, Leaking, Blowing, Plugged, Not In Service), and how much it is costing to generate 1000 kg. of steam. If you are using UE Systems' Ultraprobe 10000 or Ultraprobe 15000 instruments, you can enter this information onboard the instrument as the steam trap survey is taking place.