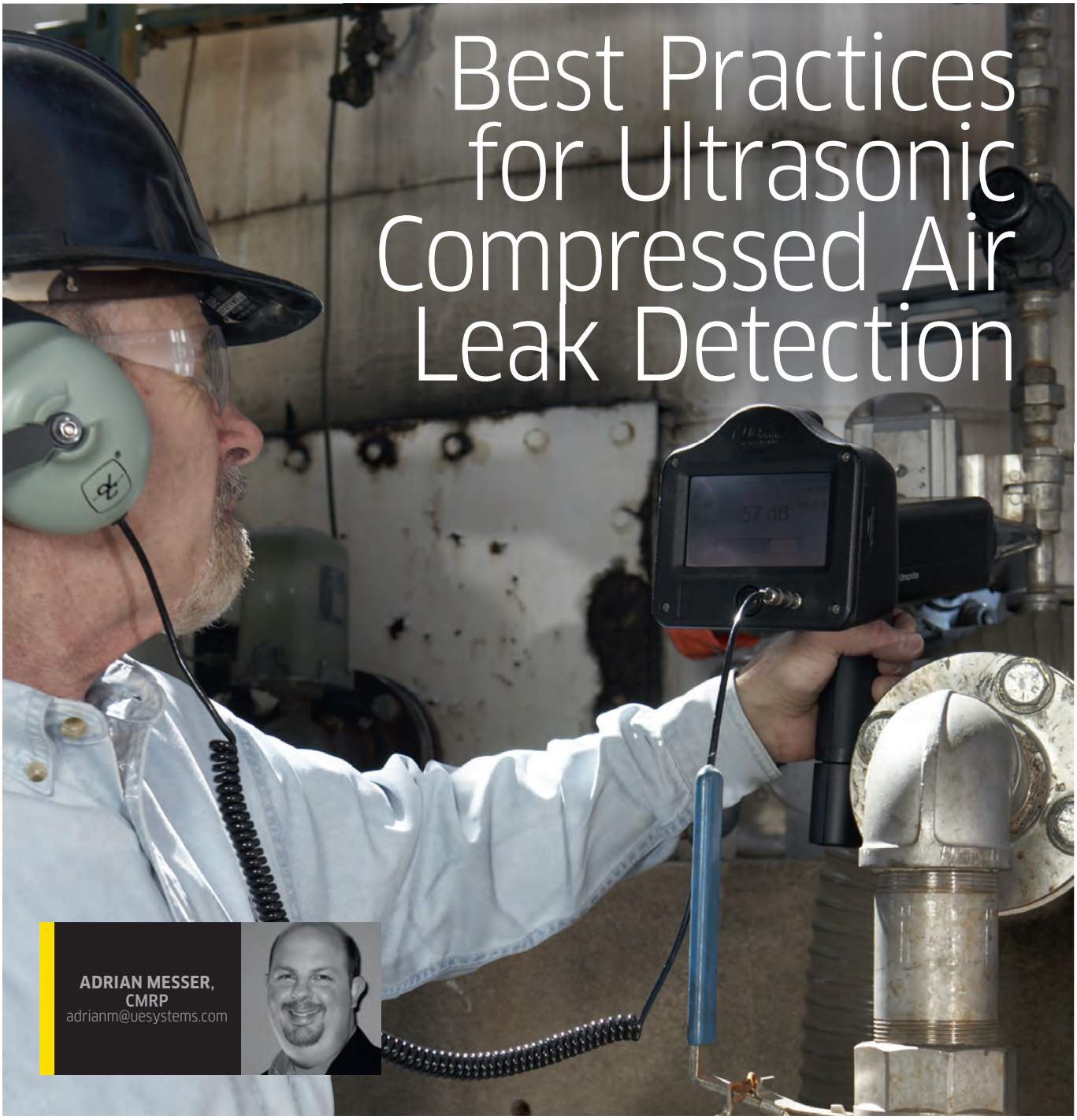
Best Practices for Ultrasonic Compressed Air Leak Detection



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Contrary to what some might think, compressed air is not free. In fact, for what it takes to produce it, the compressed air that is generated is often considered the most expensive utility in a typical manufacturing facility. To further add to the problem, the US Department of Energy notes that more than 50% of all compressed air systems have energy efficiency problems. Air Compressor experts have also estimated that as much as 30% of the compressed air generated is lost via leaks in the compressed air system.

OFTEN, WHEN a compressed air system struggles to meet the current demands on the system, spare compressors are rented and used as back-ups, or time and effort is placed in installing an additional compressor to the existing system. Both strategies are expensive, and depending on the size of the compressors needed, could cost hundreds of thousands of dollars.

Since compressed air systems inherently have leaks, regardless of piping, use, and design, implementing a compressed air leak management

programme can be an economical and effective way to improve the efficiency of any compressed air system. Such a programme is designed to identify and repair compressed air leaks before they become a large problem and it can save time, money, and energy.

For airborne ultrasound, compressed air & compressed gas leak detection remains the most widely used application. Locating compressed air and gas leaks with ultrasound, and then making the necessary repairs, can have tremendous payback in the dollars lost due to these leaks.

Recent advancements in compressed air leak detection and reporting allow for the quantification of the money lost from these compressed air leaks. An effective ultrasonic compressed air leak survey will focus on seven key factors:

- Evaluation
- Detection
- Identification
- Tracking
- Repair
- Verification
- Re-Evaluation

By implementing these steps, a typical manufacturing plant could reduce its energy waste by roughly 10 to 20 percent.

HOW TO USE ULTRASOUND FOR A COMPRESSED AIR LEAK SURVEY

1. Select an ultrasound instrument

For ultrasonic leak detection, an ultrasound instrument that has frequency tuning capability is recommended, and the suggested frequency setting is 40kHz. For ultrasound instruments that are on a fixed frequency, or where frequency tuning is not a feature, 38kHz is usually the frequency setting that the instrument is fixed at.

There are different sources of high frequency sound that these ultrasound instruments detect. For compressed air and compressed gas leak detection, the source of the ultrasound is turbulence.

Turbulence is created when a compressed gas inside of a pipe or vessel exits to low pressure or atmosphere through a tiny crack or orifice. Turbulence is also created when there is air in-leakage, or vacuum leaks. With vacuum leaks, since most of the turbulence is on the inside of the leak, there is not as much ultrasound present; therefore, vacuum leaks are more difficult to find with ultrasound, but can still be possible if enough turbulent ultrasonic noise is present.

2. The "Gross to Fine" method

Once an ultrasound instrument has been selected, the planning of the compressed air survey can begin. One thing to keep in mind while scanning for compressed air leaks out in the facility is the fact that high frequency sound is very low energy.

Because it is low energy, the sound will not travel through solid surfaces, but rather bounce and reflect off of solid surfaces. That is why it is important to scan in all directions with the ultrasound instrument, while adjusting the sensitivity. This will help to pinpoint the location of the compressed air leak.

Once the general area of the compressed air leak has been located, most ultrasound instruments will come with a focusing probe that can be slipped over the end of the airborne scanning module on the instrument to more finely narrow the field of view to more precisely identify the location of the leak. This method of compressed air leak detection using ultrasound is commonly referred to as the "Gross to Fine" method.

3. Creating an inspection route

The logistics of the leak detection route should now be considered. It is recommended to perform a walk through prior to the inspection. The inspector should use this as an opportunity to determine the specific zones or areas where the compressed air is being used. Blueprints of the compressed air piping are also a handy resource when conducting the initial walk through. Make note of any safety hazards and any areas where accessibility to the test area may difficult, or may require the use of ladders, extra PPE, or access to locked areas. Also make note of any obvious signs of compressed air misuse, potential areas of leakage, and improper piping installations. Making note of any areas of potential leakage or misuse of compressed air (such as using air to move parts/product, air knives, etc.) will help to take away any confusion of what the inspector is finding and becoming more aware of where competing ultrasonic noise is coming from. Part of the goal of the compressed air leak survey could be to identify areas where compressed air is being misused, and look for alternatives that could perform the same function without having to use costly compressed air.

Considerations must also be made to determine the type of leaks that are to be detected with ultrasound such as pressure leaks in compressed air or compressed gas systems, vacuum leaks, or refrigerant leaks. After the initial walk through, select one area or zone to test at a time.

For consistency, it is recommended to begin at the compressor, or supply side, and then move to the distribution lines, and then areas where the compressed air is being used. As the compressed air leaks are found with the ultrasound instrument, a tagging system should be in place to tag the leak at its site. The tag should have places to record the leak number, the pressure, type of compressed gas, a brief description of the leak location, and decibel level of the leak that was indicated on the ultrasound

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savings of the compressed air leaks. When done correctly, an ultrasound compressed air leak survey can have tremendous payback in a short period of time. Once the leaks have been repaired of course.

Conclusion

Compressed air is an expensive utility whose maintenance and cost is generally taken for granted. A successful compressed air leak survey depends on having the right ultrasound instrument for the needs of the survey, proper training of personnel who will perform the survey, planning how the survey will be performed by doing an initial walk through, documenting the leaks and the associated costs, and initiating repairs once the leaks have been identified. Through proper documentation and reporting, an ultrasonic compressed air leak survey can show tremendous payback and energy savings without a significant capital expenditure. ■

WHEN DONE CORRECTLY, AN ULTRASOUND COMPRESSED AIR LEAK SURVEY CAN HAVE TREMENDOUS PAYBACK IN A SHORT PERIOD OF TIME.

instrument once the leak location was confirmed. An estimated cost of the leak may also be helpful in creating awareness of the expense of compressed air or compressed gas leaks.

4. Documentation and reporting

Besides repairing the compressed air leaks, the success of the compressed air leak survey largely relies on the reporting and documentation of our findings. For documentation purposes, there is a Leak Survey App by UE Systems, available for iOS and Android. The app allows the inspector to easily document the compressed air and compressed gas leaks, along with the associated costs.

When reporting the cost and CFM (cubic feet per minute) loss of compressed air or compressed gas leaks, it is important to remember that it is an estimated cost. The cost of a leak 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.

Ideally, the pressure at the leak site is best. For example, the compressed air may start at the compressor at 120psi, but where the air is actually being used it may be regulated down to 75psi. Look for the nearest pressure gauge, or if someone from the plant is available when the leak survey is being conducted, have someone who is familiar with the compressed air system.

For specialty gasses, such as helium, nitrogen, or argon, the cost of the leak is based on the decibel level reading at the confirmed leak location, pressure, and the cost of the gas as in a dollar amount per thousand cubic feet.

Several independent studies have been done comparing an ultrasound leak survey report to actual energy savings, and it has been found that an ultrasound leak survey is within 20% of the actual