Fluids are always looking for a way out of a system. Whenever they find one, you end up with a leak. Whether it's major or minor in scope, it's sure to be a drain on your efficiencies and profits.

There's both science and art when it comes to leak detection in industry. It's science because leak detection is an engineering issue that requires very sophisticated tools and systems. It's an art because successful leak detection is a matter of training, experience and management emphasis.

One of the country's leading experts in all of this is Alan Bandes of UE Systems, based in Elmsford, NY. In a recent "Tech Tips Newsletter," he notes that a good leak detection program in any company or any plant should involve walkarounds. "If you don't perform a walk-around prior to performing a survey, "there will be a lot of potential unexpected problems regarding accessibility, equipment used and route planning.Maintenance management should encourage inspectors to perform a walk-around for the sake of efficiency and effectiveness," he says.

What Bandes and other experts are warning against is too much reliance on automation–*and not enough on management programs and planned surveys by trained maintenance personnel* . As Allan Rienstra, of SDT North America, in Cobourg, Ontario, puts it, "The foundation of any leak management program is training. Ultrasound leak inspection is simple science, but like

anything there are tricks to the trade that need to be learned."That's why SDT and UE , as well as others in the business offer extensive training to their customers and prospects. "Other ways to keep up," adds Rienstra, "include attending industry conferences and reviewing consumer-based web sites." Bandes' newsletter is available on the Internet, as is SDT's monthly Ultrawave Technology Report.

Some tech trends

While training and management emphasis are crucial for a successful leak detection program, there are some clear technology developments that maintenance experts need to watch in coming years.

"The technology is moving toward enhancing existing products with specialized features to improve leak detection activities," says UE's Bandes. "Ultrasound is used predominantly in the mid- to grossranges of leak detection where leak rates range from 1 x 10-3 std cc/sec on up. To assist on the fringes of detection, new specialized probes have been produced such as UE's Close Focus Module which enhances low-level emissions making leaks near the low-end threshold more detectable."

What about leak detection in areas where accessibility is difficult?

"New flexible probes have been developed that can be bent and manipulated at odd angles," Bandes explains. That includes leaks in distant spots, like pressurized cables in ceilings. "Parabolic microphones," he notes, "are used to pinpoint these leaks at greater distances than with standard scanning modules."

What about special situations that require permanent or fixed monitoring?

According to Bandes, the industry is supplying remote mountable transducers that can be set for alarming if leaks either occur or exceed set threshold levels. Some of these specialized remote sensors are configured to detect leaks in valves with a 4-20 mA or 0-10V DC.Heterodyned output can be configured to send information to a control panel where the information can be viewed or recorded," adds the UE executive.

Other companies in the business such as Monarch Instrument, of Amherst, NJ, SPM, in Marlborough, CT, and Whisper Ultrasonic Leak Detector, of East Syracuse, NY, also offer products for leak detection programs–and are constantly developing new ones for ever-more accurate and sensitive devices for leak detection.

Greenhouse gas quotas

SDT's Rienstra notes other trends."There's a changed point of view in manufacturing regarding compressed air leak detection," he says. "Compressed air leak management was predominantly done for energy efficiency because of the high cost of energy required to compress air. Average systems have between 30 and 35% leakage, if there is no program in place.A leak management program targets leak rates under 10%."

As Rienstra noted in his article in the December 2006 UTILITIES MANAGER supplement to MAINTENANCE TECHNOLOGY, manufacturers are still after those energy savings (the challenge), but there is also a win because less energy consumption means fewer greenhouse gas emissions. In some countries companies have a greenhouse gas emission quota. If they are able to operate under that quota, they can save on emissions and even sell their leftover quota to others (the opportunity).

Agreeing with Bandes, Rienstra notes that there are two aspects here for maintenance management to consider: training and "the gadgets" (the art and the science). "We are all gadget-driven, he says. "Flexible wand sensors, parabolic dishes with laser pointers and extended distance sensors help make the leak inspector more efficient and provide him with extra levels of safety."

Rienstra adds that leak calculators reflect another growing technical trend. His company will be releasing one this year that allows users to plug in the decibel level of a found leak. The calculator will then process all the data required to assign a dollar value to that leak.

Systematic approach and training

Of course, not all leaks are the same in terms of detection and control. Is it a specialized gas, compressed air, steam? What type of system or systems are to be monitored?

"What are the acceptable leak rates?" asks Bandes. "The first thing to do is to establish a

baseline. Know what is going on with the system right now," he advises. "Is the system performing as required? Companies should set a workable goal. For example, if compressed air leaks are the issue, review the use of compressed air; are there alternative technologies that can replace the use of air in some areas? Who will perform the leak survey? Above all," he cautions,"these inspectors should have training, so training should be on the check-off list."

Consider, too, the cost of a typical leak and how many you project in your plant: 10, 100, 1000? Walk through the system with a diagram or create a map of the system during the walk-through process. Ask what type of equipment will be needed: sophisticated or basic ultrasonic instruments? "The answers," Bandes explains, "will be determined by the complexity of the system."

A method of recording and reporting leak survey results, including costavoidance figures, should also be created. In addition, there should be a method of follow-up to assure the leaks are repaired properly. "Routes should be created that are manageable. Leak detection does not stop at the survey," warns Bandes. "It should be routinely incorporated into maintenance planning."

Educating employees can be a particularly cost-effective way to cut down on leaks. Explain to them the importance of your leak detection program and why they should report leaks when they notice them. Explain that the misuse (of air) can be very costly, and train them in the proper use of it.

Don't feel as though you have to reinvent the wheel, either.When it comes to educating personnel on leak detection, you'll find that there are numerous resources available through manufacturers of machinery, ultrasonic equipment suppliers and consultants. The U.S. Department of Energy also has information on its Web site for download.

Biggest leak detection mistakes

While leak detection seems a simple enough task, there are pitfalls. "The biggest mistake I see is venturing into a leak detection program without any strategy or written goals," warns Rienstra. "Without team leaders," he continues, "without training, without a guideline for how they will present their successes to upper management, any leak detection program is doomed to failure."

According to Rienstra, as far as techniques go, far too often an inspector does his/her job and leaks are found and tagged, but there is no strategy in place to make sure things get fixed. If the goal is energy savings and greenhouse gas reduction, then the leak has to be fixed to save. "A found leak never saved a penny," he says.

Bandes of UE adds, "The most common mistakes are lack of planning, lack of communication and insufficient training. Any program, whether it is leak detection or predictive maintenance, requires the support of management." Don't just start a program without planning it thoroughly. Bandes suggests the that you heed the following checklist:

- Communicate with management and those who will be part of the program.
- Explain the program, the methods and the goals.
- Think through strategies of detection and route creation, reporting and recording results.
- Have some plan for follow-up on repairs and carefully choose the instruments to be used in relation to the type of system to be inspected.

Remember that without the training of inspection personnel, your whole program can fail. To be successful, personnel need to know the effective methods for locating leaks, as well as how to work with competing ultrasounds in loud environments.

The science and the art

The science of leak detection gets more and more accurate and sophisticated every year. "Manufacturers are always looking for ways to increase the threshold of sensitivity (find smaller and smaller leaks). Probably the most important development aside from that would be software that maps out the inspection process and allows for accountability from the inspector to the repair," says Rienstra. In other words, more and more automation is on the horizon for leak detection.

And, he adds, all leak detection is basically "dollar driven."He notes, for exampler, that energy in California costs close to five times what it costs in other parts of the country. "You think compressed air leaks aren't issues in that competitive state?"

The *art* of leak detection, however, is best summed up in the need for training and management emphasis and involvement. Bandes reminds us how vital it is to communicate with management. Leak detection and control have always been important engineering and

production issues. These days, though, it is also too costly an issue (and an increasingly significant social issue as well).Any program to stop leaks is now too important to try to implement without management involvement, strategy, planning and (one more time) TRAINING.

No leak detection program will ever be perfect, but you can get closer and closer to perfect by concentrating on both the science and the art of it.

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