

Technologies help detect unaccounted for water loss

Over the years, techniques in leak detection have advanced from being very low tech such as a telephone receiver and a 20-penny nail that an operator would hold against a valve wrench to today's computer correlated equipment. In the days of the Roman Empire all a person could do was walk the aqueduct and look for the spot where the water was dripping. We still walk waterlines today but there are other tools that can also be used. Leak detection technology includes acoustic leak detectors, helium gas detection, thermal infrared imaging, correlators and loggers – just to name a few. Alarm monitoring and annunciation equipment is used in various industries to detect and protect against water supply related problems.



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Each of these technologies has a place in the effort to detect and locate water leaks. A water system must be diligent in controlling unaccounted for water loss. With the cost of chemicals, electric power, repair parts, design and construction costs increasing, the amount charged for water can only go the same direction. Many system operators spend hours each week trying to locate unaccounted for water. The search includes a review of the billing processes, testing of residential and master meters for accuracy and the checking of line pressures to be sure that everything is in order.

Tracking prior work orders on repairs might also provide clues for a location to begin looking for that leak. In addition to trucks, maps, mud boots, radios and phones, an operator will need to take along their leak locating equipment. When choosing which

acoustic leak detector did not have sound amplification of any type nor did it have any type of visual read out. Today's acoustic detectors not only have filter settings to block out background noise, some models have memory measurement to provide the



Methods for detecting leaks in water distribution systems may involve using sonic leak detection equipment, which identifies the sound of water escaping a pipe. Pictured above, KRWA Tech Greg Duryea uses an ultrasonic listening device to detect noise on a pipeline

device to use, an operator needs to know just what that device will do.

Acoustic leak detectors

An acoustic leak detector amplifies the sound caused by water escaping from a pipeline. There have been many changes to this type of detector. The first

operator with a visual readout of what she/he is listening to. In the 1980s, acoustic detectors added digital readouts that allowed for the separation of sound and frequency. This type of device can be used to listen on valves, pipe or by probing the ground. It is small, compact and lightweight and can be used nearly anywhere.

Data loggers

Another option to assist in leak detection is the data logger. This small, lightweight device can be installed in almost any location on the pipeline or appurtenances. Loggers are programmable units that in most cases will be bi-directional and radio controlled and can also be read from a remote location without having to be removed

from the monitoring location. Data loggers can be placed on valves, hydrants, meter setters or any location that is connected to the line being checked for leakage. With a data logger, an operator is able to determine if water is escaping from a pipeline, but the logger does not actually locate the

leak. It can be used as a single unit and can also be used in conjunction with an acoustic detector. Typically these units are programmed to turn on early in the morning such as 2 a.m. If there is a leak in the area of the data logger the print out will show the frequency and volume level. The data is downloaded into a small command unit and from there to a computer. The data can be placed on a map of the distribution system to help determine which area has the suspected leak. This type of logger will provide results within 24 hours. These loggers can be used in city and rural areas. However sound does not carry far on PVC so these units are still limited on distance for leak detection.

Leak correlators

Another device used for water loss detection is the leak correlator. A correlator is a computer-based device that can collect sound vibrations through pipe or valves rather than through the ground by using microphones in two or more locations. Most correlator units consist of three or more components. The first component will be the computer. It will be used by the operator to input data such as the size, length and type of pipeline. The second and third components are microphones that will be attached to valves, hydrants or meter setters. At the time a vibration is noted by the microphones, the correlator will measure the time it takes the sound to travel to both microphones. This time is correlated into a distance from each point and is then plotted on a graph created from this data. If all of the data entered into the correlator is correct, this type of leak detector can give a location of a water leak down to within six inches or less. The correlator works on real time information and can produce a location within



This set of "data loggers" is but one of many devices KRWA uses to help locate water loss. The small cone shaped units are placed on valves, meter setters or any other part of the distribution system to detect system noise. Typically the units are programmed to turn on at 2 a.m. and then shut off at 3 a.m. The information from each unit is then downloaded into the Commander for analysis. Suspected leakage can then be investigated.

a very short time. It is unaffected by most traffic noise and when all information that has been entered into it is correct, the location is provided with great accuracy.

KRWA has a device of this type and has used it to locate water leaks for a number of rural water districts and cities. Recently KRWA used a correlator

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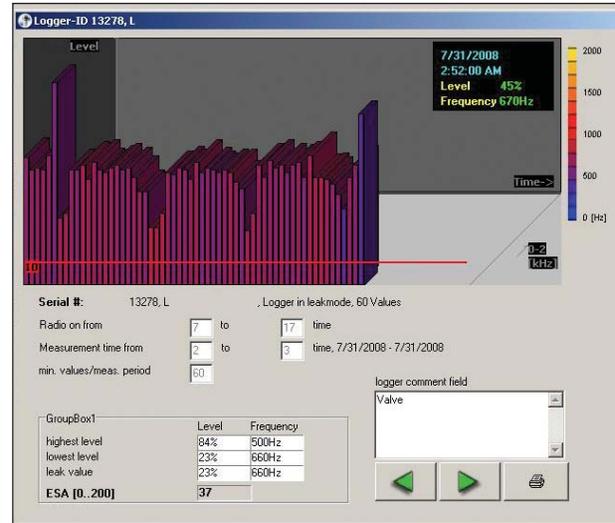
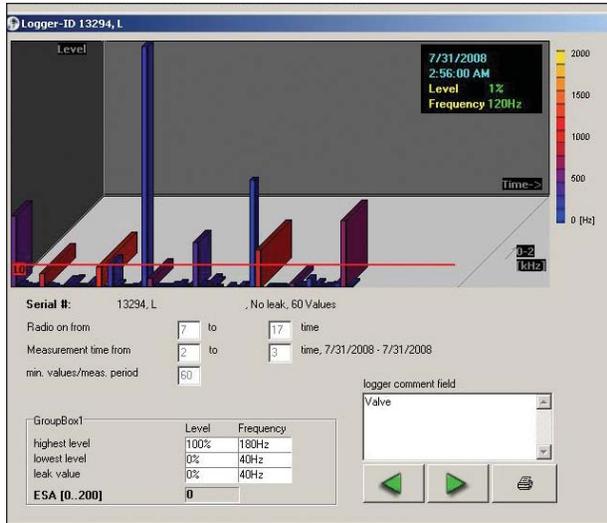
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The screen shot to the left shows a 'No Leak' mode; the 'spikes' are likely surface traffic on the street. The screen capture on the right-hand graphic indicates a suspected leak. The elevated noise level is consistent and is graphed on the leak correlator.

in the city of Gardner and pinpointed the leak within an inch. The annual cost of the water loss through this one leak would be \$7,060 dollars for Gardner.

Ultrasonic leak detection

The newer technology for water loss detection is the ultrasonic leak detector. The

ultrasonic technology converts the high frequency leak sound to a lower range where the sound of the leak can be heard through a set of headphones and traced to the location of the leak.

Ultrasonic leak detectors are somewhat new to the industry. In order to be successful, this method of leak detection must be

performed in an area that is completely quiet. This factor greatly reduces the common use of ultrasonic leak detection.

The volume of the leak's sound is dependent on the amount of pressure in the water system. The higher the pressure, the easier it will be to hear the leak. Ultrasonic leak detectors can also be used to



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detect other types of leaks, such as gas leaks, including CFCs, HFCs, nitrogen, CO₂, steam, etc.

Helium leak detection

Helium leak detection is a very popular way to perform nondestructive locating in some areas. Helium leak detectors, which use helium as a search gas, are used to pinpoint the source of a leak. These leak detectors are utilized in many different products and industries other than water including medical implant devices, automobile air bags, radiators, and air conditioners. Helium leak detectors are available in automatic, semi-automatic, and manual testing systems.

Helium is used as a detector because it provides better test sensitivity and is inexpensive and inert. Helium leak detectors are often used in steam turbine and condenser air leakage testing, chemical and plastics production,

heat exchangers and underground pipelines. In most cases, the water is drained from the pipe and the helium is pumped into the pipeline. The detector is then used to locate the leak. After helium

equipment available to assist in efforts to reduce unaccounted for water loss. Remember, unaccounted for water loss represents revenue loss. I encourage all water operators and

Kansas Rural Water can provide assistance in locating a system's water leaks. KRWA has some of the latest leak detection equipment available to assist in efforts to reduce unaccounted for water loss. Remember, unaccounted for water loss represents revenue loss.

gas is pumped into the system and the leak is found, the helium leak detector can measure the rate of the leak. The leak rate is displayed in numeric and bar graph data on a touch screen on some models.

Kansas Rural Water can provide assistance in locating a system's water leaks. KRWA has some of the latest leak detection

owners to monitor the KRWA Web site at www.krwa.net for training sessions that deal with water loss to learn more about the various technologies available.



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