

5 STEPS TO REVENUE ENHANCEMENT

By Steve Carson & Gene Dahle

Water loss prevention through effective leak detection

Our drinking water infrastructure is aging while municipal budgets shrink or at best remain the same: The U.S. Environmental Protection Agency estimates that if operation, maintenance, and capital investment remain at current levels, the potential funding shortage for drinking water and wastewater infrastructure could exceed \$500 billion by 2020.

Mostly out of sight, aging water distribution systems lose 1.7 trillion gal of water per year at an annual national cost of \$2.6 billion, according to the U.S. Geological Survey. In general, 10% to 20% of unaccounted for water loss is normal, but if a utility is losing more than 20%, steps should be taken to identify the problem.

Fortunately, innovative technologies and management practices can reduce unaccounted for water loss and enhance municipal revenues.

Water departments can select from a variety of water leak detection tools to meet their needs and budgets, including:

- Acoustic listening devices, from geophones to powerful digital amplifiers with high-quality headphones;
- Correlators, which pinpoint the leak's location from the leak sounds at water pipeline valves, hydrants or meters;
- Leak noise loggers, which can record the leak sounds in the middle of the night when usage noises and ambient noises are the quietest; and
- Inside-the-pipe sensors and hydrophones that are tethered or freely flowing and can transmit their location by radio.

So, what is the most suitable solution for a city's distribution system or water district to find the leaks? It depends on a variety of factors, including:

- 1. Types of pipe suspected of leaking.** Metal pipe makes it easier to find leaks than PVC or HDPE pipe. Metal pipe transmits leak sounds for hundreds (even thousands) of feet.
- 2. Age of the pipe.** Old pipe (50 to 100 years or more) usually leaks more than newer pipe (10 to 20 years old or less).
- 3. Miles of pipe and the number of hydrants, valves and services in the system.** These system appurtenances are where we always listen first.
- 4. Pipe diameters.** Leak sounds travel much better down the pipe walls of smaller pipe—4-, 6- or 8-in.-diameter—than they do down the walls of very large pipe—36-, 48- and 60-in.-diameter.
- 5. Your budget.** A good leak detector listening device may cost between \$1,500 and \$6,000, depending on whether it is a “survey” leak detector or a “ground mic” leak detector. A new correlator will cost from \$15,000 to \$40,000, and a logger system can start at \$15,000 and go up to hundreds of thousands of dollars.



A Snapshots of cut pipe from an excavation in Sausalito, Calif.

Leak Detection Guide

A rural county in Texas with 300 miles of PVC pipe and valves that are 1,000 to 5,000 ft apart has a distinctly different leak detection problem than an older suburb of Chicago with mostly residential connections with iron pipe and valves at every corner.

A water department that has had an “active” leak detection program for 20 to 30 years will have more of these tools than a department that only summons a leak detection professional when city water is surfacing. It all depends on your city's cost of water and how much water you are losing. Finding and repairing leaks saves treated water, reduces pumping costs and minimizes property damage.

With all of that in mind, the following are steps water departments and water districts can take when considering starting or expanding a leak detection program:

STEP 1: OWN A WATER LEAK 'SURVEY' DEVICE

Always have your own water leak “survey” device for listening at hydrants, valves and meters. These are often leak detectors with contact rods for listening at meters and hydrants or amplifiers and sensors with magnets and long cables for listening at valves.

STEP 2: INVEST IN A CORRELATOR

For old, urban areas with cast iron or ductile iron pipe and plenty of valves and a water loss of 10% to 20% or higher, investing in a correlator may be a good idea. Correlators work great on metal pipe, A/C pipe and even concrete pipe, but the transducers (sensors) need to be attached tightly at the valves in the street to find small leaks. Attaching the transducers on hydrant barrels or on valve keys is fine for main breaks, but not for finding small leaks.

STEP 3: TAILOR EXPECTATIONS

Expectations for success with a correlator on PVC pipe and other plastic lines (poly services) should be low. Correlators have had some success with low-frequency transducers or hydrophones in PVC pipe that is smaller than 8 in. in diameter. Success of PVC for correlators happens on larger leaks (5 to 10 gal per minute [gpm] or more) with good pressure (60 to 100 psi or higher). The large-diameter PVC and HDPE pipeline (24 in. and larger) hardly transmit leak sounds down their walls at all—maybe only 50 ft or less.

If the water pipe is deeper than 5 to 6 ft, small leaks (1 to 2 gpm) will not be heard on the street surface with any manufacturer's ground mic water leak detector. Big leaks—10 to 20 gpm or more—with good water pressure in pipes under asphalt or concrete with hard-pack soils and rock can be heard as deep as 10 to 12 ft on some occasions.



B Street excavation



C Utilizing a repair clamp



D Conducting a final check

STEP 4: LOCATION MATTERS

If you are in a southern state or a coastal area with pipe only 3 to 4 ft deep, a good acoustic listening device may be all that you need. Listen directly over the pipe. A ground mic often takes many hours.

STEP 5: TRIED AND TESTED

If you invest in a correlator, do not retire all of your acoustic listening devices. Using human ears to confirm that it really is a leak (and not a flowing service line, which every correlator will pinpoint) is still a reliable means of avoiding a "dry hole." Most water leak surveys are still done with acoustic listening devices, although leak noise loggers are improving and their sales are growing. A real leak has the same characteristic hissing noise all of the time. If you are not sure, listen to the leak again later or the next day.

Most water leak detection professionals confirm their correlator pinpoints by either doing a second correlation—from a second set of valves or from a valve and a short, metal service—or by marking the leak spot and then listening with their ground mic leak detector for 10 to 15 ft on both sides of the spot.

Confirming your correlator pinpoints like this can raise your success rate above 90%.

Major water departments with active leak detection programs and successes in reducing water loss are testing and deploying loggers in order to find even the smallest leaks in the middle of the night. Flow Metrix Inc. introduced the ZCorr digital correlating loggers in May 2001, and there now are thousands of ZCorr systems in the U.S. There are six different companies offering either correlating loggers or radio-read,

permanently deployed leak noise loggers.

Large cities with old, large-diameter pipe that is leaking need the services of the companies with inside-the-pipe sensors that are tethered on a cable or freely flowing. These services can find more leaks and smaller leaks than even the best leak detection professional with a correlator. There is no easier way to find a small leak than positioning the sensor (hydrophone) only inches away from the leak. **WWD**

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