How Can We Better Track Our Water?

**QUESTION:** Because our area expects another drought, my utility is trying to conserve water. I've been asked to calculate how much “lost” water is billable and to find ways to conserve, but I don't know where to start. Can you point me in the right direction?

**ANSWER:** Your area doesn't need to be in a drought situation to want to conserve water. If water is lost before it gets to a customer, you're paying for moving the water from its source, treating it, and piping it through the distribution system, with no revenue from the customer to offset these costs. It's just good business to make sure the water your facility produces gets to the people who are to pay for it, with little or no waste.

**WATER AUDITS**

Similar to an income tax audit, a water audit compares what comes in with what goes out to see if input and outflow balance. Instead of money, however, water audits compare flow from the source with flow from the tap. AWWA and the International Water Association call this comparison the “water balance.” Any discrepancy between the two flows is defined as wasteful loss.

Wasteful loss can occur for various reasons. “Apparent” water loss is a loss attributable to such things as an inaccurate water meter or a billing discrepancy, not a physical loss of water. “Real” losses, generally resulting from leakage and water theft, occur when water physically leaves the system. “Unbilled authorized consumption” includes activities such as firefighting, main flushing, and other uses for which metering is difficult or impossible. All of these losses combined are called “nonrevenue” water. But how do you know where your water is going?

The best way to differentiate these losses is to know your system. Know where your water comes from and how the flow is measured. Because of volume of use, some facilities have more than one source; others may use multiple sources only in times of emergency. Identify all your facility's sources. Every measuring device—from the most basic weir to the most sophisticated digital metering system—has a level of uncertainty associated with it. If you don't know a device's level of uncertainty, the manufacturer's literature generally will provide this information, or you can test the device for accuracy. Determine the flow into your facility, according to your measuring devices, and compare that number with your influent flowmeter reading.

Review your treatment and water storage system step by step and determine how much, if any, water is lost from one step to the next. Is some of the water recycled? Where does the recycle stream re-enter the process? How much water leaves the treatment plant in residuals? How much water is lost through evaporation? Again, know the accuracy of your measuring devices. Up to this point, wasteful loss should be fairly minimal. If it isn't, track down the root cause, put it on your punch list, and get it fixed.

**A LITTLE RESEARCH**

Next, take a look at your customer records. From billing information, determine what volume of water each customer uses and total all customer volume readings across the system. Also determine the type, age, and last accuracy testing of customer meters. What is the difference in volume between the water that leaves the plant and that which is used by your customers? That's the amount of your system's nonrevenue water. While you have the customer records handy, check for noticeable discrepancies in water use across residential meters—say, one customer uses a substantially different (more or less) amount of water than his next-door neighbor—to identify points for further investigation of apparent and real losses.

Has your system kept track of the volume of water used to flush lines or only the number of miles of lines that were flushed? You may have to estimate the water associated with unbilled unauthorized consumption. That means guess, even though a level of uncertainty is associated with doing so. Make a note of the assumptions you made on the way to coming up with your estimate—for example, “Three house fires in 2007 each took about an hour to extinguish, using about 2,500 gpm each, or a total of 450,000 gal.” Use actual data if possible.

**REAL LOSSES**

This can be the hardest part of the water audit. Big breaks on transmission and distribution mains are generally dramatic events, with a leak duration preceding the break measured in days, catastrophic failure, and rapid repair. What about small leaks around valves or small areas of pipeline corrosion that cause no noticeable volume change? There's no standard approach to detecting and fixing these leaks, but here are some ideas to help you form a strategy that works for your facility:

- Sound the distribution system to pinpoint leak noises and then repair the leaks—the most common technique in North America.
- Map noise.
- Correlate leak noise, which compares the speed of sound across fittings.
- Log acoustics.
- Test reservoir drops.
- Meter night flows.
- Manage and reduce pressure.
- Identify the oldest part of your distribution system, and start your investigation there.

In case studies appearing in the AWWA Research Foundation's *Evaluating Water Loss and Planning Loss Reduction Strategies,*
some utilities report real losses of up to 50 percent. Much of the leakage described came from customer service line connections from the main to the property and from the property line into the house. You may be tempted to think, “Part of this isn’t our problem!”

EVERYONE’S PROBLEM

There are too many definitions for customer billing, liability issues, and responsibility for repairs to discuss in this column. And, after all, I’m not a lawyer; I don’t even play one on TV. But look at it this way: Although you work for a water facility, you’re a customer too. Most people can’t afford to waste money, and they don’t appreciate finding out that a utility is allowing part of their water to leak out of a pipe. Figure out where the money’s going, fix the apparent and real water losses, and you’ll be off to a good start on helping your utility—and your customers.

RESOURCES

- WaterWiser portion of the AWWA Web site:
  - Apparent and Real Losses, www.awwa.org/resources/content.cfm?ItemNumber=587
  - Water Audit Methodology, www.awwa.org/resources/content.cfm?ItemNumber=588
  - Free Water Audit Software, www.awwa.org/resources/content.cfm?ItemNumber=590