By Tony Kimmi, KRWA Technical Assistant

Steps to Finding and Correcting Water Loss

Water leaks and high water loss can be a water operator's worse nightmare. If a water system has old pipelines and those are installed in rocky conditions, it can be almost impossible to locate the leaks.

So here's the situation. Members of governing bodies and operators, managers, office staff realize there is a problem with "water loss". Frequently, many people will immediately conclude that there are leaks in the distribution system. There may be leaks in the distribution system, but there are some other possible contributors to water loss that need to be addressed first. In my opinion, the first step in determining whether there is actual water loss is to test the master meter or meters. If the master meters for the incoming water test accurate, then it is a good practice to do a random test of a few residential meters in the distribution system.

It is rare that a master meter is found to be over-registering, although I have encountered such results recently. Suburban Water Company in Leavenworth County recently had an 8-inch meter that was over-registering by almost 20 percent. This meter was the point of interconnection between Suburban Water Company and the Board of Public Utilities, Kansas City, KS. Suburban purchases a portion of its water supply from BPU. After it was replaced the meter was still off by 20 percent. Next we removed the meter from the chamber housing; we immediately saw what the problem was. There was a rubber gasket, 24 inches in diameter, inside the chamber. Such gaskets are used to on the installation of concrete waterlines. The gasket was lodged in the 8-inch meter, causing turbulence and causing the meter to over-register. How did a 24-inch rubber gasket get into this 8-inch meter? Nobody knows. After the gasket was removed, the meter tested fine. Rather than over-register as in this example, it is otherwise quite common for master meters to under-register.

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Meters and valves

Residential meters can have a major effect on unaccounted for water. It is also rare for residential water meters to over-register. A good rule of thumb for replacing customer meters is every ten years or one million gallons. However, regardless of age or use, water quality is a more significant factor in determining when to replace water meters. I don't want anyone to take this out of context. No, KRWA is not advising that all water meters should be replaced every ten years. There are numerous factors that effect accuracy. The best thing to do is to pull a sampling of those meters and test them. KRWA can provide assistance at no cost to do that.

Another place to look for water loss is to listen to check valves to ensure they are working properly. If check valves are not closing fully, water may be leaking back into the wells or back into the clearwell. In these situations water is not actually lost but it will show up as a loss when it comes to calculating production/purchase vs. sales. In one such instance, KRWA staff found a check valve failing at a master meter that was used as a point

of sale/purchase between two systems. The check valve on the supplying line at the meter did not fully close – and that master meter did not register water flowing back to the selling system. The problem was identified. It was soon agreed by the seller that the smaller purchasing RWD had paid for substantial amounts of water that had actually be metered two times. A credit of $54,000 was presented to the purchasing system. In that case, most people had also assumed the problem was leaking pipelines.

Searching for actual water loss

So, here is perhaps a rural water system with 500 connections and 450 miles of pipeline. The master meters appear to be accurate; residential meters have been checked; the bookkeeping seems to be in order. So there may be actual water line leakage. Where to begin?

The best method is to close some mainline valves located at strategic points in the system, and then slowly open the valves and listen for water movement through the valves with sonic leak detection equipment. Here's where "operable" mainline valves are worth their weight in gold. It works in RWDs or in municipal systems. "Running valves" can eliminate a lot of walking and driving of the pipelines. Some of the sonic equipment is so sensitive that a drop of rain on a fire hydrant will sound like a sonic bomb. No, please don't bang metal against the valve wrench or fire hydrant when the other worker has the sonic equipment earphones on.

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Josh Van Tyal, Operator for Suburban Water Company, watches as Tony Kimmi listens to the dual 12-inch check valve for possible backflow. This installation is at interconnection between Suburban Water and BPU, Kansas City.

Listening to valves on rural water and municipal water lines is typically performed late at night or during periods when the water use is at a minimum. This work can be accomplished during daytime by turning off residential meters, so consumer usage is not a factor on flow in that particular section of the system. The valves are usually turned off for a period of approximately ten minutes, and then slowly reopened. If there is a loss on that line, the sound of water moving through the valve that is only slightly opened can generally be readily detected. The length of the time the line purges and the loudness of the sound will indicate the degree of leakage from that point to the next fully closed valve. The sound of water moving through a system becomes something of sixth sense for experienced workers.

In this test at Suburban Water Company, the flow rate will be variable as this section of the system is supplied directly by pressure from the Board of Public Utilities, Kansas City, Kansas. This KRWA test meter is certified up to 400 gpm. KRWA also has non-intrusive meters to check larger meters operating at much higher flow rates.

On larger leaks that are not surfacing, I suggest closing all valves that connect looped lines. This can cause customers to experience low pressure or possibly be without service for the time that the leak detection is being conducted. No operator wants to see customers without water, but in some situations, you have to do what you have to do in order to try to pinpoint the leak.

Once the lower pressure or no water areas have been identified, the looped valves can be reopened. I suggest flushing all the areas that experienced low pressure. Then an operator can focus of walking and driving the pipelines.

Cattails and other issues

Cattails are an indicator of a possible leak. These types of plants like moist to wet soil, and if a leak has been there for a while, cattails might possibly be growing there.

Tall, green grass is another good indicator, especially in dry weather conditions. On some leaks that I have found the grass was as much as three feet taller in the area of the water line leak.

There are several ways to help reduce potential water leaks as well. One is to install pressure reducing valves to better control operation of the system if pressure is too high in segments of the system. Such control valves allow an operator to adjust the pressure downward which reduces stress on the pipelines. Generally such devices should have been installed in the original design; we know they frequently were not.

Another way to reduce stress on pipelines is to install variable frequency drives (VFD's) on the well pumps or pumping stations. VFDs allow the operator to adjust the pumping to a lower rate. VFDs also reduce the amount of water hammer in the lines. There is also a cost saving factor in the amount of electricity required to operate the pumps. Applications are unique to the situation.

Excessive water loss generally has a tremendous financial impact on a water system. Production costs including chemicals, electricity, labor, etc. all have to be paid for. And for systems that are purchasing water, e.g., for $4 or $5 per thousand gallons, a 30 percent water loss immediately adds huge costs that have to be covered by ratepayers. There's no getting around it. It's far better to work to reduce water loss and costs than to increase rates to pay for inefficient operations.

I encourage readers to attend the 2015 Annual Conference & Exhibition, March 24 – 26 in Wichita. The KRWA conference offers a host of training sessions that address all facets of the manager, operation and maintenance of public water systems. The products and services displayed in EXPO Hall at the KRWA conference can help public water and wastewater systems be effective and efficient. I hope you will make the investment to attend.

Tony Kimmi has worked as a Tech Assistance for KRWA since October 2009. He has extensive experience in the operation of construction equipment. He is certified with gas chlorinator repair and assists many systems with ongoing water quality monitoring and leak detection work.