

Knowing a Water System's "Personality" Helps Determine Potential Problems of Water Loss

The winter of 2018-19 has been an up-and-down of temperatures with above normal moisture in most parts of Kansas. My work as a KRWA Circuit Rider involves many hours of effort doing water loss surveys. The field conditions have resembled swamps with surface water everywhere and a week later, a frozen-hard landscape and bitter cold temperatures. Identifying surfacing leaks is extremely challenging given the snow and ice and then thawing that has been the norm this winter.

Doing a water loss survey involves working with several levels of operations including the water system checking its water well production meters on a daily basis. Continuous monitoring of the SCADA systems by some cities and RWDs is at one end of the spectrum compared to those that delay meter reading entirely during winter months and just bill customers based on an average use of some prior months. And while there are water systems that have installed automated meter reading, most have not.

The water system that I am a user of has an average daily use of 14,000 to 22,000 gallons. If the wells suddenly are producing more than 22,000 gallons, it is an almost certainty that there is a leak in the town's distribution system. And generally that leak can be located that day. This town is a small system with mostly residential users and several agricultural (livestock and fertilizer) customers in the mix of approximately 100 service connections. Most other water systems are larger and can be somewhat more complicated; water systems have what I refer to as a system personality. Frequently, in those systems, it is more difficult to identify a leak until it impacts pressure issues in the system, and a customer or customers complain.

A recent incident water loss effort took place in a water district that purchases water from a city; that district has some 500-plus miles of pipeline. It has a SCADA system to monitor the district's five storage tanks. The district staff received an alarm that one of the standpipes was failing to fill. In fact the water level was lowering at 1 a.m. Normally, that's the time of day when that tank would be refilled and the booster station pumping to that tank would be off. That's the "system personality" that I referred to earlier. However, that wasn't the case when the call came for help; it was apparent that there was a leak in that section of the district.

Water Loss Reporting										
Small City, Kansas - 2018 (Actual Record)										
Date	Raw Water Diverted	Water Purchased	Water Sold to Other Suppliers	Water Sold Bulk & Other	Water Sold Residential	Metered Free	Unaccounted For Water	Percent Loss	Loss in GPM	
January-18	1133	0	0	0	434	0	699	61.7%	15.7	
February-18	962	0	0	0	434	0	528	54.9%	13.1	
March-18	1050	0	0	0	434	0	616	58.7%	13.8	
Qtr Avg	1048	0	0	0	434	0	614	58.4%	14.2	
Comments:	We do not read meters in January or February so we use the average water sold residential from October 2017 through March 2018									
April-18	1032	0	0	0	388	0	644	62.4%	14.9	
May-18	1241	0	0	0	591	0	650	52.4%	14.6	
June-18	1156	0	0	0	541	0	615	53.2%	14.2	
Qtr Avg	1143	0	0	0	507	0	636	56.0%	14.6	
Comments:										
July-18	1207	0	0	0	553	0	654	54.2%	14.7	
August-18	1088	0	0	0	395	0	693	63.7%	15.5	
September-18	2036	0	0	0	347	0	1689	83.0%	39.1	
Qtr Avg	1444	0	0	0	432	0	1012	66.9%	23.1	
Comments:	Leak repaired in September, GPM loss not determined									
October-18	1079	0	0	0	457	0	622	57.6%	13.9	
November-18	916	0	0	0	457	0	459	50.1%	10.6	
December-18	1068	0	0	0	457	0	611	57.2%	13.7	
Qtr Avg	1021	0	0	0	457	0	564	55.0%	12.7	
Comments:	We do not read meters in October, November or December so we use the average water sold residential from January 2018 through September 2018.									
Annual Totals	13968	0	0	0	5488	0	8480	1	194	

This "water loss record" is the actual use for a very small city in northwest Kansas. The template for this report is available for download from the KRWA website at www.krwa.net under "Online Resources".



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Repairs starting on the 80 gpm leak that was located at the end of a farm field.

I assisted the operator in conducting a water loss survey. As mentioned, we knew it was not a situation of incorrect meter reading. The operator and I both realized it was a leak that was causing the tank to not refill. There had been an immediate change in pumping and the continual loss of water from the standpipe. The section of the RWD served by the tank that was losing ground, so to speak, serves one other small community and numerous farmsteads. The operator and I decided to split this section into two zones for the leak survey. The pump station was operating continuously, pumping 80 gallons per minute into that section of the much larger rural water district.

We closed valves and listened for flowing water. We soon narrowed the higher flow going towards the standpipe. There were only three farmsteads on the downstream piping. We concentrated on what was a 2-mile section of pipeline. We would need to walk the very muddy farm fields to find what we were certain would be a “boil hole” where the leak would be surfacing. All the snowmelt and running water added to the challenge of locating the leak. But we did find it after several hours of slip-sliding on foot.

The need for records

A great tool for identifying a problem with water loss is to monitor and record daily pumping and then total that pumping by month. Some water systems in Kansas,

Examples of misunderstandings of “water loss” . . .

Recently an operator of a small water supply system of approximately 250 meters contacted KRWA about “water leaks”. The governing body was concerned that ten percent of the water was not being billed or metered; that is, there was ten percent unaccounted water from “water leaks” in the distribution system. The governing body wanted the operator to locate and repair “the leaks”.

In Kansas the ten percent number is actually low-to-average when compared to all other water supply systems. The operator had been monitoring the system’s pipelines over the years and no “leaks” were known. The ten percent figure calculates out to 2.5 GPM which is a small flow. The flow could be from ten small leaks of 0.25 GPM or less, or 20 small leaks of 0.12 GPM and leaking faucets. Reducing the ten percent figure is challenging.

KRWA and the operator developed some additional monitoring to help determine possible areas where a “leak” or low-reading meters may be. This monitoring will evaluate a river crossing and a few high usage meters. At this time KRWA does not believe there is any significant “leak” in the distribution system.

Second example –

When providing technical assistance on the operation of a surface water treatment plant, KRWA found that the city had very low unaccounted for water, or as some say low “water loss”, of only one to two percent. Upon questioning KRWA determined that the amount of water reported as sold to the citizens was the amount of water pumped from the plant to the distribution. The operator stated, “That’s the water we sell to the public”. Yes, that is the water the system sells to the public – it is just not the quantity they sell to the public. It was much easier task to complete the DWR report as the city did not have to add up the water sales of all the individual meters.

Third example –

Another example is a city that operates a surface water treatment plant and sells water to its citizens and to two RWDs. They thought they had an unaccounted for water percentage in the range of 20 percent. The city sold a significant amount of water (60 percent of total sales) to the two RWDs. The city thought the 20 percent figure of their unaccounted for water was correct and acceptable.

However, when the water sales to the RWDs were removed, the unaccounted water was nearly 38 percent. This unaccounted, un-billed water became a very significant financial issue to the city when the RWDs went elsewhere for water supply.

especially small systems with no full-time operator or bookkeeper, are otherwise handicapped without such records. Keeping a water use report spreadsheet that KRWA has available for download from its website at www.krwa.net is my favorite to identify a “leak signature”. As can be seen in the spreadsheet (disregarding the quarters where customer meters are not read due to winter conditions) a constant leak in this actual system appears to be around 15 gallons per minute. An inconsistency in the percent of loss would have indicated the likelihood of incorrect metering or meter register reporting. It’s not always appropriate to just assume there’s a water leak; sometimes the problem is in reporting.

Many system operators, particularly in smaller towns, perform multiple tasks. Water use is not at the forefront of their daily work or worries. Staying ahead of leaks however, requires an awareness of daily, weekly and monthly production and sales. The cost of technology to help monitor systems is becoming more and more affordable. With investment, water use can even be monitored in real time. But technology is not going to necessarily make the system operate more efficiently. It takes people who are dedicated and who understand the operation of the water system’s “personality”. My point is that operators, clerks

Whether manually or electronically tabulated, someone still needs to utilize that data to determine if there’s a problem or not.

and bookkeepers who presently do not do a complete job in tracking water production or use should not expect some automated system to provide necessarily quick-fix answers to locating leaks. Whether manually or electronically tabulated, someone still needs to utilize that data to determine if there’s a problem or not.

Annual conference

The KRWA Annual Conference & Exhibition is coming up in Wichita, March 26 - 28. The conference offers an array of sessions where information

is exchanged that can be put to immediate use by water and wastewater systems. And KRWA’s conference will also again have the largest display of products and services available under one roof. The KRWA conference has the reputation and history of being among the top conferences in the U.S. I encourage readers and others to attend. I’m confident you will not be disappointed.

Doug Guenther has worked as a Technical Assistant for KRWA for 23 years. Doug worked for the City of Oakley in the Water and Electric Department for eight years. He has also worked several years for an industry supplier. Doug is a Class II Certified Water Operator.



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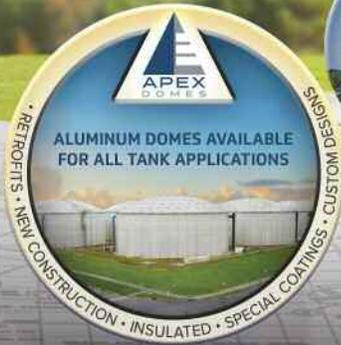
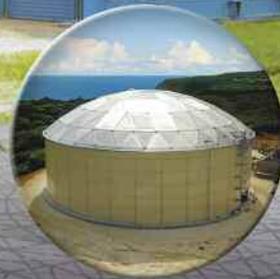
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