Title: Wireless and Wired Flow Sensors and Dedicated Submeters used to manage Large Residential Estates and improve Irrigation Efficiency.

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Abstract:

Using wired and wireless flow sensors and dedicated submeters, we have saved on average 35 % water savings for residential estates and have dramatically improved irrigation efficiency. The purpose of this paper is to present findings for a 2 year study of using flow sensors and submeters. Each property has a water history that has been compared to the last 2 years of irrigation management using flow sensors and dedicated submeters. Readings are taking from the submeter monthly and the flow sensor is a real time device that reports the water usage through the internet. Major conclusions are to continue to implement flow sensors and preferably wireless flow sensors into the technology for conducting irrigation management and maintaining efficient irrigation practices.

Blue Watchdog Systems manages irrigation systems for large estates in San Diego, California. For over 2 years we have successfully saved water for our clients using flow sensors combined Residential Estates with flow sensors and irrigation submeters. For this study we chose estates that vary in size from 1 acre to 11 acres and also have irrigation systems that are 14 zones to 330 zones. 8 estates managed with flow sensors and submeters. One site was managed using a wireless flow sensor and a submeter. For comparison purposes one site was managed without a flow sensor and without a submeter. The results from this 2 year period have been substantially in favor of using flow sensors and submeters. Wireless flow sensors have added even more benefits to this approach to managing irrigation systems. Estates managed with a flow sensor and submeter average savings is 35%. The savings is based on a comparison to site historical water usage of at least 5 years. The site without a flow sensor or a submeter did not save any water relatitve to its past water usage.

You cannot manage what you cannot measure. Effectively managing irrigation systems relies on the combination of two key components: a flow sensor and a dedicated irrigation submeter.

The following are **benefits from the use of flow sensors**:
1. system design awareness- establishes baseline flow per station.

2. Leak detection- during operation detect the sensor detect breaks in the sprinkler system. Also detects mainline breaks when irrigation system is not operating.
3. Quicker site inspections- all zones are running at baseline flows, then only inspect for breaks with the zones that have alarms.

The following are additional **benefits of a wireless flow sensor**:
1. installation costs are significantly cheaper as there is not the need to run the wire across a landscape or under driveways.
2. Wireless flow sensors can replace two devices (submeter and standard flow sensors) if they are able to detect low flows.
3. There is no risk of wires getting cut by other trades.

The following are **benefits from dedicated irrigation submeters**:
1. Exact water usage –define water savings and usage through periodic readings to stay within water budgets.
2. Leak detection at very low flows- quickly determine that the irrigation system does not have any leaks using a water meter's leak indicator. Do not have to turn off house water to do this check since it is separated.
3. Defines indoor vs. outdoor use – understand exactly how much water is used outside versus inside and also help quickly identify leaks that may be inside home such as toilet leaks.

Flow Sensor and submeter detected the following events during the 2 year study:
1. Garbarge Truck hit sprinkler in driveway (2 times- he was pretty determined).
2. Telephone service broke riser by street
3. Lawnmower broke sprinkler heads in turf
4. Tree Service broke sprinkler shrub risers
5. Valve cracked and created mainline leak
6. Broken or clogged nozzles
7. Cracked irrigation pipe due to root intrusion

Conclusion:
Tracking water use is a key service to the clients that would like to save water. It is also a critical performance measure for any landscape. This paper has highlighted some of the successes using the should continue to address the need for economical solutions for clients. Wireless flow sensors is a step in the right direction.