Residential water usage continues to decline

Household water usage is declining slowly but steadily, a trend that is expected to continue for at least the next 15 years. This is good news in light of the challenges some areas face in managing this essential resource. At the same time, it presents a challenge to water utilities, which must adapt their systems and rates to reduced consumption trends, in order to cover fixed costs and maintain reliable service.

A 2010 study by the Water Research Foundation concluded that "a pervasive decline in household consumption has been determined at the national and regional levels." As reported in *Journal AWWA*, the study, which tracked trends in household water use in North America over the past 30 years, found that *"a household in the 2008 billing year used 11,678 gallons less water annually (13%) than an identical household did in 1978."*

This finding is supported by the experience of American Water, which serves approximately 15 million people in more than 30 states and parts of Canada. In its 2010 annual report, the company reported a declining trend in residential water usage for all of its regulated states, in the range of 0.5–2% annually over the last 10 years.

Monthly analyses of residential sales across its largest state subsidiaries from 2001 to 2010 reveal an annual decrease of 1–2% (based on gallons/customer/month). These subsidiaries service a wide range of household demographics in climates that span from arid to water-rich, providing a broad base by which to assess water usage trends.

The results held true when American Water limited its analysis to winter-only consumption in service areas in the northern portions of the United States. Because varying weather conditions in summer months can cause large fluctuations in outdoor water needs (lawn and garden watering, for instance, increases during hot, dry periods and is lower in cooler, wetter summers), it is particularly useful to study winter-only trends, when outdoor water usage is at a minimum.

The consistency of findings in both the Water Research Foundation study and American Water's own research indicates that several strong underlying factors are driving indoor residential usage patterns.

Driving the decline

According to the Water Research Foundation, the primary forces behind this drop are the increased use of water-efficient appliances and a decrease in the number of occupants per household. Others factors to consider are price elasticity, a growing conservation ethic among consumers, and conservation programs implemented by utilities and other organizations.

Technological advances continue to improve the water efficiency of household appliances, driven by government mandates. For example, toilets manufactured after 1994 use 1.6 gallons, or less, per flush, compared to the 3.5 to 7 gallons used by older ones.

Dishwashers manufactured after 2009 and clothes washers after 2010 are held to water efficiency requirements that could reduce usage by 54% and 30%, respectively. What's more, fixtures and appliances that surpass these requirements are increasingly prevalent in the marketplace, thanks to consumer demand.

These improvements correspond to a 35% decrease in water usage by a typical residential household in a new home constructed in 2011, compared to the same household in a non-retrofitted home built before 1994.

Non-essential outdoor water usage — from irrigation to car washing and swimming pools — is more responsive to water and sewer rate increases than indoor water usage, which is primarily for consumption and hygiene. However, there is some price elasticity there as well, as households are more vigilant about fixing leaks under higher rates. A recent industry study investigating the sensitivity of residential water demand to water price found that a 10% increase in price led to a 3.3% decline in customer demand.

Whether as a cost-cutting measure, or because of growing environmental awareness, consumers are increasingly conscientious about conserving household water. Utilities, too, have been educating their customers about the importance of preserving the world's water supply.

Benefits of reduced usage

A decline in per-household water usage is crucial to meet the water needs of a growing population. The water industry also reaps certain benefits from this trend. Less water use means less need to divert water from supply sources, leaving more for passing flows, or drought reserve. It leads to reduced power consumption, chemical usage and waste disposal, which not only lowers operating costs, but also provides environmental benefits, such as reduced carbon footprint and

waste streams.

At times of declining customer usage, operators can seize the opportunity to optimize management of existing water supplies, treatment facilities and pump stations. For systems that rely on multiple sources of supply, this may translate into operational cost savings by minimizing use of water from higher-cost sources.

Other opportunities include more efficient and effective pumping and treatment. More available storage means operators can schedule more pumping at off-peak times, thus reducing electricity demand charges. Less demand also means less strain on certain process equipment, allowing operators to stretch out scheduled maintenance.

Utility planners need to base capital projects on the most current information and consider downsizing or postponing supply development projects when customer demand projections reflect an anticipated decline in usage. At the same time, they must continue to factor in peak-day demand, which, driven by hot, dry weather spells and other short-term events, may or may not follow the same declining trend as average-day consumption.

Because it is peak-day demand that determines capital infrastructure needs such as treatment and pumping capacity, it is essential that utilities understand their own peak usage patterns.

Challenges for water utilities

The downside for the water utility industry is that reduced usage creates a revenue decline, while a number of fixed costs continue to rise. These costs range from water utility capital needs — infrastructure renewal, reliability and regulatory projects, for instance — to operating costs such as plant maintenance, customer services needs, IT support and security.

Despite financial challenges presented by the declining usage trend, water utilities are wise not just to accept it but to embrace it, if simply because it's the right thing to do.

Investor-owned water utilities also need to work with regulators for a more progressive rate structure, so that revenues are not entirely dependent on fluctuations in sales. Revenue balancing, where rates provide for surcharges or refunds based on fluctuations in sales, is one tool to consider. Another is to increase the fixed charge on the customers' utility bill to recover a greater portion of the utility's fixed costs, thereby reducing exposure to sales volatility.

For utilities operating on a basis of decoupled revenue streams, water saved through conservation can be viewed as more cost-effective than adding capacity via expansion of water delivery infrastructure.

Based on the average life expectancy of appliances, it is estimated that the replacement of old fixtures with new, more efficient models will continue to affect water usage trends for another 10 to 15 years. Other drivers are likely to continue into the foreseeable future.

Looking ahead, water utility managers and operators will need to adapt their business planning to accommodate the historic declining trend of 1–2% annually, while also watching for signs of its leveling off.

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