Water Efficiency: The Next Generation

by Scott Chaplin
Rocky Mountain Institute © 1998

The National Plumbing Standards passed by Congress in 1992 marked a turning point for U.S. manufacturers of toilets, faucets and showerheads. With these new standards, the days of 3.5 to 7 gallon-per-flush toilets and 4-12 gallon-per-minute showerheads were numbered. Implementation of these standards meant that an average household could reduce its per-capita indoor water use from over 70 gallons per day to approximately 50. While the 1992 standards represented a tremendous improvement, there are many new (and some not-so-new) technologies that allow homeowners and builders to save even more water without sacrificing performance.

Toilets: How Low Can You Go?

The 1992 Plumbing Standards called for 1.6-gallon (6-liter)-per-flush toilets. Unfortunately, some of the toilets now on the market don't perform well, so many Americans are under the impression that this standard is too low. That is somewhat analogous to buying an old Yugo and concluding that all small cars perform poorly. Performance studies of the 1.6-gallon-per-flush toilet have found that many models perform as well as, and for some models better than, the older 3.5-gallon-per-flush models.

In many countries it is common to find toilets that consume less than a gallon per flush. In Australia, for example, the "6/3-liter cistern" has become the new required standard in most areas. This toilet utilizes a dual-flush mechanism that discharges 6 liters (approximately 1.6 gallons) for a full flush and just 3 liters for a half flush (for liquids only). Why use 1.6 gallons of treated drinking water to flush away a couple of pints of liquid waste? On average, the 6/3 toilet consumes about 3.6 liters per flush, a little less than a gallon, and represents an 80-percent reduction over the average 5-gallon-per-flush American toilet, and a 40-percent reduction compared to the 1.6-gallon-per-flush standard. In Germany, many 6-liter toilets have a flush valve that can be shut off as soon as wastes are cleared. For residential uses, the 3.8-liter-per-flush Swedish-made Ifo Cascade performs very well.

Showerheads: Better Sprays, Better Plumbing, Less Water

Improvements to showerheads have more to do with quality than quantity. Our current standard of 2.5 gallons per minute represents a dramatic improvement over the fixtures that were sold in the 1970s, some of which delivered up to 10 gallons per minute. What has improved recently, however, is the quality and variety of the low-flow sprays. There are now more than 30 different high-efficiency showerheads available in the United States. The improved sprays lead to more satisfied users, and thus higher retention rates for utility showerhead replacement programs. The spray preference among consumers varies widely from soft and pulsating to sharp and spiny. Many conservation programs have only offered consumers one type of spray. Those who like it will usually leave their new showerheads in place, while those who don't are likely to remove them quickly.

A new device called the Hydra enables installers to demonstrate six different showerhead sprays at once, thus potentially increasing the retention rate once the showerheads are installed by giving consumers a choice. Easier-to-use throttling valves may yield

increased savings if consumers find it easier to turn down the flow while soaping up. In the future, we may see a greater acceptance of 1.0- and 1.5-gallon-per-minute showerheads as consumers become more accustomed to using less water.

Faucets: Less Water, Easier, and More Fun

For many applications, such as hand washing, our current standard for faucet flows of 2.5 gallons per minute may be far more than adequate and flows of less than 0.5 gallon per minute may be sufficient. As with showerheads, retention of devices is a most important consideration. Many low-flow faucets on the market today are aerators, which add air to the water stream in order to make a small stream of water feel bulkier.

A new type of faucet functions without aeration and delivers a stream of water which can only be described as the "crème de la crème" of faucet flows. These so-called laminar-flow faucets produce dozens of very close parallel streams of water. A clear, wide, solid-looking stream of water leaves the faucet and flows silently to the bottom of the sink where it flattens out, without a splash, into a thin sheet of water that spreads evenly in all directions. As the sink fills, a wall of water such as Moses must have seen (except smaller) first encircles the stream; moments later the falling water appears to be no more than a glass tube arising from the surface of the pooled water. The problem with laminar flow faucets is not that users will be unhappy with them and take them out, but rather that they are so much fun people may leave them running longer! Fortunately, these same spashless, spreading properties of laminar flow mean these faucets can rinse an object more quickly and effectively.

Perhaps at least as important as the flow rate is turning off the tap. How many of us learned to brush our teeth, shave, or clean the bathroom with the water running the entire time? Sure, it's nice to hear the sound of flowing water in the morning, but think of the fish. What may be on the horizon is a home version of the pedal-control faucet, now available for certain commercial applications. The temperature could be adjusted by a simple knob on the faucet itself, but the flow could be controlled by stepping on a foot pedal. Such a device would help avoid wasteful flows of water while pausing in a task, and make it easier to use both hands while holding and washing a child's hands or doing other kitchen work.

Graywater Systems: Water Recycling at Home

Graywater systems funnel drain water from sinks, showers, and washing machines for reuse, such as watering landscapes or flushing toilets. With the recent passage of a statewide standard for the use of graywater in California, this technology may soon be moving from obscurity to the mainstream. Several new companies have arisen in California in the past year and there are now over a dozen manufacturers of graywater equipment in the United States.

A recent study of graywater use in subsurface irrigation conducted by the City of Los Angeles found that there was no significant increase in dangerous bacteria from the use of graywater and that "the background variation of these [dangerous] bacteria in the soil environment—from domestic and wild animals—overwhelms the contributions from human sources through the graywater distribution system." Furthermore, the study claims that graywater reuse can reduce a home's total water consumption by 50 percent—not bad for a technology that is still far from its prime. As graywater systems become more popular, system prices are likely to come down even while system sophistication increases.

Recycle Your Toilet, Compost Your Wastes

For certain applications—especially remote areas, sites where septic systems can't be installed, or homes that are difficult to plumb—composting toilets may provide the best option. These toilets need no sewer hook-up, septic system, or plumbing, and can eliminate the need for the 28 percent of indoor residential water consumption normally used by flush toilets. For parks, rest areas, and camps they can provide a vastly superior alternative to smelly latrines. Over 20,000 composting toilets have been installed in the United States, and there are roughly a dozen manufacturers in North America.

As promising as these toilets may sound, though, even the best composting toilets aren't for everybody yet. They are much larger than conventional toilets and require some periodic maintenance.

Water Meters: Every Drop Counts

Water meters, where they exist, have often been relegated to dark corners of basements, behind shrubbery, or hidden under metal plates. Not only that, but you may need a handbook just to figure out how to read them. Water customers often receive bills only quarterly, so an increase in water consumption due to a leaky pipe or toilet may not be noticed for a long time.

This is changing, however. In some parts of the country, customers are billed monthly and receive feedback on their bills comparing their current use with that of previous years. Special meters just for showers are now available which provide immediate feedback on water use. In some parts of Germany, water meters are located in visible spots inside the home, can be easily read, and measure hot and cold water separately.

Landscapes: Go Natural

Can you name five trees that are native to your climate? Four bushes? Three flowers? They number in the thousands.

Take a trip to the countryside and count the number of sprinkler systems in the wild woods and meadows. You won't find one.

Redesigning your landscape with native plants can be more than just a fun learning experience; in the long run you may find it also reduces yard work, saves money and water, makes for a more beautiful yard, and provides new homes for many songbirds and other wildlife. Currently, about half of the water consumed in the residential sector is used for landscaping. Saving even half this amount could provide water for numerous dry creeks and fish, not to mention reducing the need for substantial energy and chemical inputs used to pump and treat the water in the first place.

Rainwater Collection Systems: A Splash from the Past

Once common throughout the world, rainwater collection systems can supply significant quantities of water, even in dry regions.

In certain parts of Hawaii, the Virgin Islands, Australia, and even Texas, rainwater collection systems provide the entire water supply for many homes. Such systems can be useful even in areas that are not hard pressed for water. When used in conjunction with a

graywater system, rainwater can flush salts from the soil. Washing with rainwater, which is naturally soft, can reduce the need for detergent and leave your hair feeling silky. Finally, rainwater collection systems can reduce stormwater runoff that sometimes causes sewers to overflow. For this reason, residents of Hamburg, Germany receive rebates for installing rainwater collection systems.

Rainwater cisterns were very common in homes built in the United States through the early 1900s. Check your basement—you may already have one!

Depending on the catchment area, the storage capacity available, and the annual rainfall, rainwater collection systems can provide for most if not all of your non-potable water needs, and in some cases your potable needs too. Be careful, though: collecting rainwater violates water rights laws in some areas.

Conclusion: The Bigger Questions

The ideas mentioned here may be just the beginning. Even greater savings may be available in the industrial and agricultural sectors. What we may see in the near future are not simply discussions of how to save water, but of why, and of what to do with saved water. Do you want to save water just so that more condos can be built in your neighborhood? How can we ensure that water we save in our homes and businesses benefits the environment? These questions are in the realm of the final frontier of water efficiency—we must boldly go where few have gone before, and directly address issues of growth, sustainability, carrying capacity, and quality of life.