

# Tech revolution ends up in the toilet

July 9 2012, By Dana Hall

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It's one of the most critical pieces of technology in your home. And though most consumers don't think of their humble toilet as a tech product, researchers and engineers at global companies are racing to improve designs so toilets consume far less water.

Recent [droughts](#), a growing [global population](#) and concerns about the impact of [climate change](#) on the world's [water](#) resources have led to a surge of interest in water conservation as well as efforts to "reinvent the [toilet](#)" to convert human waste into fertilizer and fuel.

Americans use vast quantities of water—on average, 350 gallons a day. Toilets and bathrooms are the main source of [water use](#) in the home, with toilets accounting for roughly 25 percent of indoor water use.

Many older toilets use from 3.5 gallons to as much as 7 gallons per flush, or gpf. With the average person flushing at least five times a day, that quickly adds up. A 1.6 gpf toilet, which became the industry standard in the 1990s, uses about 2,900 gallons a year. Switching to a 1.28 gpf high-efficiency toilet, or HET, cuts that to 2,300 gallons a year.

The basic parts of a toilet include the tank, the bowl and the "trapway," or snakelike tube on the side of the toilet that the water flushes through. Standard toilets use what's known as a "gravity" flush.

Some HETs use "pressure assist" technologies, where a pressurized air tank helps push water down the drain. But those systems suffered a setback late last month, when the U.S. [Consumer Product Safety](#)

[Commission](#) announced a voluntary recall of the Flushmate III Pressure-Assisted flushing system after reports of tank lids shattering. The company, based in Michigan, received 304 reports of the units in toilets bursting, resulting in property damage and 14 impact or laceration injuries.

Toto, a Japanese company, makes a toilet that it claims has the most functions: a model with a heated seat that lifts automatically, an air freshening and deodorizing function and auto cleansing.

But Toto says its most significant advancement is a one-gallon-per-flush gravity toilet, an industry first. The toilet features Toto's Double Cyclone flushing system that the company claims "marries flawless performance and exceptional bowl cleansing action to ultra high-efficiency water-savings, creating a clean, green flushing system that saves money, water, and time." The model, which costs about \$600, should hit the U.S. market this fall.

"The challenge is to master the physics of moving water and waste through the bowl," said David Krakoff, senior vice president of sales at Toto USA. "Our technologies have focused on different siphon designs, and the mastery of using different angles and water paths to create the flushing force in the bowl. The Double Cyclone has two "jets" that propel the water with a circular vortex action."

Caroma, based in Australia, invented what's known as "dual flush technology" 30 years ago. Those toilets come with two buttons—one for bowel movements, one for urine. The "heavy flush" dispenses 1.28 gallons of water, while the low-flush option uses just 0.8 gallons, making it one of the most water-efficient flushes on the market. Though not as common in the United States, dual flush toilets have been mandated in Australia and New Zealand since 1992.

"Australia is the driest continent in the world, and water is a real scarcity there," said Doug Sproule of Caroma USA. "We first introduced dual flush in North America in the 1990s, and its becoming more popular in places that are looking to save water, from Los Angeles to Pasadena and Redwood City. We've also installed them in a lot of hotels in California."

The Bill & Melinda Gates Foundation, which largely focuses on global health issues, notes that worldwide, 2.6 million people don't have a safe, affordable way to go to the bathroom, leading to widespread sanitation, hygiene and health issues. Last July, in Rwanda, the foundation called for a bold strategy to "reinvent the toilet" and announced \$42 million in grants aimed to spur innovations in the capture and storage of human waste, including waterless toilet that don't rely on sewer connections and ways to turn waste into reusable energy and fertilizer.

Graywater-a term for reused water-is the next frontier. Some toilets on the market use graywater from the wash basin or sink to refill the toilet tank, but consumers first need to replumb their home for indoor graywater use.

Composting and dry toilets, which typically use no water at all, are also increasingly available. Home Depot sells a waterless composting toilet for \$1,299. Loowatt is a U.K.-based startup that converts waste into natural gas and fertilizer. The company is setting up pilot systems in sub-Saharan Africa and the United Kingdom and hopes to be on the public market in 2013.

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