

Water, Water, Every Where, Nor Any Drop to Drink

Paraic Lally's aim isn't to be a harbinger of doom, but he can see the impending challenges when it comes to the issue of global water shortages. "The world's water supply remains the same, but the population has tripled, and the demand for water has increased by six," says the VP of business development for Greyter Water Systems (GWS) in Toronto. "By 2050 at least 60 countries will be feeling the water shortage, and in five years, 36 US states will experience water shortages."



Typical commercial greywater system.

There is a solution, however. About 65% of the water we use every day – on average about 100 gallons – goes down the drain from our showers, baths and toilets. Considering water rates are expected to increase 10% annually, there's ample motivation for recycling water. But Lally says conserving water is about more than cost – increased water use, especially in urban settings, means very expensive maintenance and the addition of water impacts infrastructure as well as the energy used to transport the water.

GWS specializes in water recycling – rainwater, greywater and storm water. From a plumbing perspective, rainwater is relatively simple to recycle because it's collected from the roof, is relatively clean and often the only requirement is to transport it to the point of use. Storm water often contains more impurities, but in many cities, including the GTA, it's

often already stored in a central tank and the only requirement is to filter and chlorinate the water to supply toilets. Greywater can be the most challenging of the three because of the need to plumb the building on the collection and supply sides, Lally explains.

The company's greywater systems have been installed in high rises, commercial buildings, hotels, fire halls and even residential multi-unit buildings.

Many Ontario municipalities, particularly very urban ones like the City of Toronto, require mid- and high-rise buildings to have storm retention tanks. These tanks hold anywhere from 40,000 to 100,000 gallons of water that have been collected to prevent excess flow of the city's storm sewers during a heavy rainfall. These tanks have been designed to prevent peak water flow from entering the storm sewage system, and are big enough to handle even torrential rains.

Due to limited infrastructure and potential water shortages, though, municipalities – like Markham, and Toronto – are now looking at ways to encourage commercial and multi-residential properties to re-use water. The logical thing is to recycle some of the water from the retention tank for use in toilets. Irrigation and cooling towers are other options, Lally adds.

At a new LEED-designated high-rise office building in Markham – Aviva's head office – the goal was to try it out. Greyter Water installed a smaller second tank of 400-gallon capacity, which draws off rain water from the storm retention tank, chlorinates it to eliminate bacteria and reuses the water in the toilets. As Lally explains, it's wasteful to treat the large storm retention tank to chlorinate so the smaller tank allows for water to be drawn off, treated, and re-used.

The smaller tank can come with a pump, or in the case of Aviva, be connected to a third-party pump. In municipalities that do not already have a storm water collection requirement, commercial or high rise residential buildings would need to install a storm retention tank in addition to the re-use system. One advantage of greywater in this situation is that the constant supply of water from showers means that the storage needs for reuse in toilets can be small, enough for a daily supply.

Once the building is plumbed in, it's relatively inexpensive to install the equipment – about \$50,000 in a mid-size 100-unit building, and with installation another \$15,000. The biggest cost is often the plumbing, Lally adds.



These systems are easier to incorporate into new buildings than trying to retrofit old buildings. All too often, though, high rises are built the same they always have been because of the cost of the additional plumbing. If you're roughing-in a building to allow for water re-use down the road, you'd need to incorporate two separate lines, one to feed non-potable fixtures – toilets, irrigation, e.g. – and one for drinking water.

Currently, condos are typically built with eight units per floor with bathrooms located back to back – there would be four plumbing runs top to bottom and the layout would handle both drain and supply. In order to retrofit an existing high rise, or to build new, there needs to be double the pipes so regular drain water (greywater) is separate from toilets (black water). And that is often cost prohibitive, Lally points out.

“Down the road, there's potential to treat both the greywater and black water because the technology is already there to take either water and recycle it without changing the plumbing,” Lally says. “But this is unlikely unless we face extreme shortages. The problem is the ‘ick’ factor – people recoil at the thought of drinking water that's been through the toilet.”

Even now, people can have a concern about greywater in their toilet, Lally says. That's why you often see water in toilets dyed blue in commercial buildings – it's recycled water that appears clean.

How receptive to water recycling is the industry?

Chris Thompson, Co-founder and CTO for GWS, says receptivity depends a lot on early adopters.

“There's a group of people out there motivated by sustainability and it's a group that's growing.”

“Every day we work with architects, designers and contractors who are drawn to the affordability of our solutions but they are also very motivated by the environmental savings relating to managing water more efficiently,” says Thompson. “They want to be leaders.”

While most people's decisions are still driven largely by money, “there's a group of people out there motivated by sustainability and it's a group that's growing,” he adds, “especially in areas where water supply is seriously low. People begin to understand that water doesn't flow endlessly from the tap.”

Municipalities with low water resources are so committed to finding ways to use water better – reduced consumption as well as recycling – they're coming up with both regulations and incentives to ensure better decision-making.

In areas where the supply is not immediately threatened – like Toronto – there's less incentive to find solutions. Especially when there's no immediate financial benefit, like for condo developers who turn over the building to a condo board, after it's developed and built.

However, limited water infrastructure is becoming a major challenge in Toronto and with the prohibitive cost of adding new infrastructure, the city has mandated that new buildings won't get approved unless they have the capacity to at least deal with the storm water issue, and in particular the flooding of the city's storm sewers.

What percentage of efficiency can be realized by switching to a greywater system?

Currently, in the US, a water efficiency scale is being developed that roughly corresponds to the HERS energy scale, and Thompson thinks we'll start seeing combinations of both HERS and WERS (Water Efficiency Rating Scale) in new construction.

“Water is a bit more challenging [than energy] because there are more variables,” he says. Since most interior household water is used in the bathroom, installing low flow toilets and efficient showerheads can lead to big reduction in consumption levels. Reusing shower and bath water for toilet flushing can reduce a household's water consumption by a further 20-25%. GWS will soon launch a single family residential greywater system to meet this need.

What's the biggest challenge we face in the fight to lower water consumption?

“Looking short term,” Thompson says. “If you want two-year payback,

greywater won't do it. But if you're okay with something that will increase over time, and last the life of the building, then greywater recycling makes sound financial sense."

Less than 1% of buildings currently have some kind of water re-use system. Thompson says this mirrors the energy situation of 20 years ago – nobody was interested in putting money into it. And now virtually everyone is aware of the need to reduce. "I think that's the way water efficiency will go, especially now that some locales are in a desperate situation," he says.

Multi-use residential buildings represent the highest potential for

water saving because so many people are flushing so many toilets. But there's a disconnect between the builder and the end user, who has more interest in keeping utility bills down. That changes when a developer builds rental and intends to remain as landlord.

It's going to be up to municipalities to take the lead on creating incentives for water efficiency, Thompson says. In San Francisco, for example, buildings over 40,000 square feet are required to be greywater ready. "But that's California and there's a desperation there because they have no water. In a situation like that, it's extremely easy to make the case for plugging in a system."

In Toronto, retention tanks or 50% flow reduction are mandatory, and if a developer re-uses water they qualify for development charge reductions. "Developers tend to go for the cheapest reuse options, commonly irrigation first. If that doesn't work, maybe a cooling tower, and then greywater. Commercial and institutional clients often want to make a 'sustainability statement' and go for toilets," Lally says.

The bottom line is it doesn't make any sense to flush good potable water down the drain. **BB**

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