As one of the City’s most significant landlords, Ottawa Community Housing (OCH) is the largest housing provider in Ottawa, and the second largest in Ontario, Canada. Its array of public housing, valued at approximately $2 billion, provides 14,783 homes for about 32,000 seniors, parents, children, singles and persons with special needs. This role in the community offers OCH a unique bond with the city, and as stewards of it, an ongoing commitment to improving operations.

The Cost of Water

“Ottawa is subject to the highest water costs in the country,” said Dan Dicaire, Energy and Sustainability Officer at OCH, who has a degree in Chemical engineering and a Masters in thermal energy and solar power usage, “and it is the fastest growing utility expense. In many cases we were literally flushing money down the drain since bulk metering communities makes it terribly hard to identify leaks or waste in a multi-unit setting.”

According to the U.S. EPA, residential use accounts for about three-fourths of the total urban water demand, with indoor use accounting for roughly 60 percent, and of this, toilets (at 13 liters per flush, 3.5 gallons per flush) use nearly 40 percent. Toilets, showers and faucets combined represent two-thirds of all indoor water use. And while estimates vary, the prime area to target is the bathroom, where nearly 65% of all indoor water use occurs (source: Government of Canada).

Dicaire’s task and commitment to sustainability involved understanding and developing a “Green Plan”.

“My job was to make our communities more sustainable. That meant looking at the $23 million spent on utilities – water accounting for 43% of that cost.”

--Dan Dicaire, Energy and Sustainability Officer, OCH

What followed was a calculated journey toward efficiency and optimum performance – one that stands out as an example for other communities seeking a viable sustainability solution.

Performance

OCH saw the problem in one word: Performance. “We were looking for performance – not sacrificing it, but enhancing it while practicing sustainability. It didn’t matter what the brand name of toilet was; we wanted a solution that would do what it said it would do,” said Dicaire. “We looked at MaP testing, but decided to conduct the testing ourselves. Even when we were certain of our choice, we tested again to be sure.”

OCH chose the Flushmate® 504 Series System (3.8 Lpf / 1.0 gpf). “It delivered the most consistent performance of everything we tested, pure and simple.”

Case Study

With over $2 billion in public housing, Ottawa Community Housing knows the real impact of water use reduction on its sustainability plan – and the most effective products to get there.

Ottawa Community Housing Sustainability Plan

- Near 50% reduction in water costs
- 33% Decrease in maintenance calls
- ROI of less than two years
- Complete recycling program

Flushmate® 504 Series

Ottawa Community Housing

Sustainability Plan

Near 50% reduction in water costs
33% Decrease in maintenance calls
ROI of less than two years
Complete recycling program

Flushmate® 504 Series System

(3.8 Lpf / 1.0 gpf) “It delivered the most consistent performance of everything we tested, pure and simple.”
Flushmate manufactures systems that are installed in pressure-assist toilets to provide higher performance and efficiency. "It’s not a retrofit product" explains Paul DeBoo, Product Manager at Flushmate. "A Flushmate cannot be placed into any toilet. Pressure-assist toilets are made differently than gravity-fed toilets, and that’s what Dan was testing – it’s the pressure that delivers the performance that OCH was looking for,” DeBoo said. "We’re always delighted when our products are tested rigorously, because we do the same and know how they perform.”

Guy Parieau, Project/Asset Manager for OCH controlled project logistics, and believes in the “trust but verify” approach. "We documented our installations extremely well.” Parieau notes that planning was an enormous task, but worth the effort. "This is a project that involves 32,000 to 35,000 residents. We wanted it done right the first time, so testing and specifications prior to roll-out were a must.”

Parieau is referring to OCH’s testing of four models of high-efficiency, low volume toilets. “We didn’t mention manufacturers in the spec,” he says. "We wrote the spec for performance, and while strong candidates emerged from the testing, we went with the Flushmate 504 Series for our toilets because they performed consistently better.”

Initial calculations showed potential water savings of up to 40% by replacing 20L (5 gallon) toilets with pressure-assist systems. After implementing and monitoring for six months, estimates were confirmed (Table 1). After a six month monitoring period, expectations of a near 50% water savings were confirmed. (Figure 1)

As aggressive as that sounds, Dicaire felt confident because they would be reducing the water flow in most fixtures by 30-50%. Their estimated payback period? About one year based on a projected $325 cost per unit. “The savings would then be enjoyed for perpetuity,” he said. “Changing the toilets at the Wurtemburg represented a savings of $25,000 as of the end of August of 2010,” he continued. “We knew we are on the right track.”

The Verification Testing Process Included:
- Consumption ratings
- Extraction capabilities (MaP Scores)
- Impact on existing plumbing infrastructure
- Field evaluations to address maintenance call concerns

Test Case 1: The Wurtemburg, 115 Units
With a 2010 grant, OCH’s work began for a community retrofit at the Wurtemburg housing development.

The Wurtemberg test retrofit included the following:
- Replace 20L (5 Gallon) and 13L (3.5 Gallon) toilets with models that use 3.8 Lpf (1.0 gpf) or less
- Replace kitchen and bathroom basin aerators
- Replace shower heads with high pressure / low flow
- Replace all bulbs with CFL (9 to 11 per unit)
**Test Case 2: The 1365 Bank Building**

To confirm the Wurtemburg results, the OCH team installed and tested four different manufacturers’ toilets simultaneously in the 1365 Bank Street building. Models chosen were based on performance and water savings expectations from prior research. Consumption was monitored for six months (Figure 2).

The Bank pilot tested the following models:
- 6.0 Lpf (1.6 gpf), 600g MaP rated, Gravity-fed
- 3.0 Lpf (0.8 gpf), 600g MaP rated, Vacuum-assist
- 3.8 Lpf (1.0 gpf), 800g MaP rated, Pressure-assist
- 4.8 Lpf (1.28 gpf), 1000g MaP rated, Gravity-fed

The data (Figure 2) shows a 46% drop in consumption. “The toilet we chose – the pressure-assist round bowl – performed better than the other system,” Dicaire says.

**Low Volume Concerns Eased**

One of the concerns when water volume is decreased is blockage. To help overcome resident concerns, the OCH team tracked maintenance calls for both test sites through their work order system. “The number of toilet calls were tracked and tabulated per year for each community,” Dicaire says. “There were no increases in blocked-toilet calls as a result of the retrofit. In fact, after a year, Wurtemburg had reduced maintenance calls for blocked toilets by 33%, and the water savings hit the mark.”

Another initial concern was drain line carry, but based on the testing, the OCH team did not have problems. “We did not experience any issues with drain line carry,” says Dicaire, who noted that high rise buildings also tend to have shorter distances of piping between toilets and waste pipes, and short distances between the building and the city sewage system.

DeBoo adds: “The pressure delivered during the flush enhances the drain line carry at these lower volumes. Higher flow rates from pressure-assist creates a ‘pushing’ action, which helps move things along in the drain.”

Studies in the Flushmate lab in New Hudson, MI (which is an ASSME certified facility) have demonstrated the advantages of using pressure for flushing with low water volumes.

A complete water flow test of all plumbing fixtures and accessories on a random selection of 10% of units from each floor in all buildings (including high-rise, low-rise and townhouses) was conducted prior to installation.

Parieau also points out, that despite confidence in the products selected, it was important to have verification of flow rates after the change-out as well. “That’s not typical or necessary of a contractor installing toilets,” he added, “but it was detail that was important for us to know.”
Training
Making sure OCH knew how to maintain the system was critical to ensuring long-term water savings. Before the complete roll-out, Flushmate Senior Lab Field Technician, Bryan Nigg, insisted on training for maintenance crew and installers. Nigg held a Q & A and four hands-on sessions to review Flushmate’s unique operational characteristics. Parieau said, “He interfaced directly with the contractors. It was perfect.”

The on-site sessions helped the contractors troubleshoot problems during an install – things like: a kinked supply hose or common system adjustments. The guidance helped expedite the contractors’ work and made a positive impact on the efficiency of the transition.

Completing the Cycle
The OCH team also wanted sustainable solution for disposing of all the old toilets. “Sure, it is inert material, and we can put it in a landfill without greenhouse gases,” Dicaire says, “but you’d be surprised what a toilet seat is made of.” Instead of opting for the landfill, OCH found a local recycler who would handle the plastic and metal parts, then crush the toilets and use the material as road aggregate. The recycler actually created a facility to process the vitreous china, and each day a bin was filled and taken away.

The End Result
Based on the data from test installations, the entire team was convinced that the savings goal could be achieved without any performance issues (Figure 4). The decision to move forward on a complete change-out was easy.

“Our projection was to save 50% in water,” Dicaire says. “I’d say we did better than expected.”

<table>
<thead>
<tr>
<th>Community</th>
<th>Average Pre Retrofit Consumption (m³/billing period)</th>
<th>Average Post Retrofit Consumption (m³/billing period)</th>
<th>% Reduction</th>
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<tbody>
<tr>
<td>Caldwell Towns</td>
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<td>Kilborn</td>
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<td>1000</td>
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<td><strong>Phase 1 Average</strong></td>
<td><strong>4411</strong></td>
<td><strong>2033</strong></td>
<td><strong>53.99%</strong></td>
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</tbody>
</table>

Ottawa Community Housing
Flushmate® 504 Series Systems

“There were a lot of people involved and all of them made this project a success. But without the right products, none of this would have been possible.”

– Dan Dicaire, Energy and Sustainability Officer, OCH