RESEARCH HIGHLIGHT

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Multi-Residential High Efficiency Clothes Washer Pilot Project

INTRODUCTION

To assist in developing its Water Efficiency Plan, the City of Toronto undertook a number of pilot projects to assess the suitability of specific water efficiency measures. One such pilot looked at the efficiencies of front-loading (horizontal-axis) clothes washing machines. Manufacturers have claimed a minimum 40 per cent reduction in overall water consumption, and 65 per cent reduction in energy consumption.

It is estimated that water used for clothes washing accounts for about 22 per cent of the total indoor water use of a typical single-family residence. A similar estimate for multi-family residential buildings was not available when the project was undertaken. However, the payback for a front-load washing machine presumably would be high, given a large number of users per machine compared to one in a single-family dwelling.

Toronto's Works and Emergency Services Department approached the Toronto Housing Company (now the Toronto Community Housing Corporation) to participate in the pilot project, along with Maytag Appliances, Enbridge Consumers Gas, Procter & Gamble (detergent manufacturer) and Harco Company, a commercial appliances distributor.

At the time the pilot project was undertaken in 1999, the Housing Company owned and managed over 220 subsidized housing projects. Over half were high- and mid-rise apartments, with seniors comprising close to two-thirds of the tenant population, and the other two categories being families with children and other adults.

Coin-operated facilities were found at most locations. Typically, one clothes washer and a dryer were available for every 40 suites in adult buildings, and for every 20 in family buildings. Most were top-loading washers, although a few front-loaders had been installed to facilitate tenants in wheelchairs.

The City incurred a total project cost of $73,100, with approximately $52,600 spent on the purchase of new washers, and about $20,500 spent on promotion, tenant education and data acquisition.

METHODOLOGY

Washers

Six sites—with a total of 945 suites and 1,626 tenants—were selected for the pilot project based on size and tenant profiles, to provide a broad range of usage pattern. Each site had a centrally located coin-operated laundry facility with 39 washers. Three of the six already had one front-load washer. Several laundries had attached washrooms, but all had separate water supply lines for the washers.

Based on a favourable operating history of front-loaders already installed at various sites to facilitate wheelchair access, Toronto Housing selected machines for the pilot project from the same manufacturer. Wash cost remained unchanged, except at one location where it was increased from $0.50 to $1.00 per load.

Total hot and cold water use in each of the six laundry rooms was monitored on a continuous basis for an eight-week period before, and an eight-week period after the washers were changed. In each laundry room, a pair of meters—one for the hot water supply and one for cold water—monitored water usage, including water from the laundry tub taps. Many tenants, for instance, used water from these taps to top up the water level in top-loading washers.

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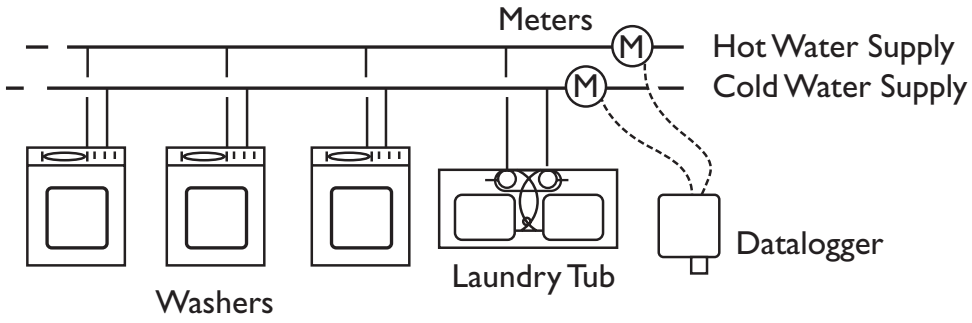
Figure 1 Laundry room schematic



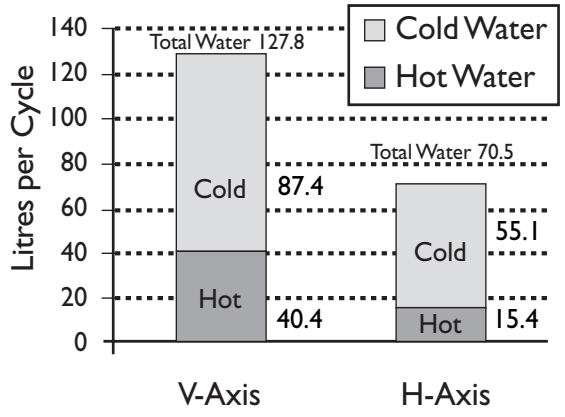
All of the clothes washers—both old and new—in the project pilot had a computerized control-board that integrated with a laundry software package called Accu-Trac. In addition to counting the number of wash cycles, this program provides usage history and diagnostic information to assist in optimizing operation of the equipment.

Tenant communication

A communications plan was developed and implemented to inform tenants at the six sites about the project, encourage proper use of the machines, and stimulate acceptance of the new technology.

The tenants involved in the project were low- and middle-income families, some of whom had English as their first language and others who did not. A brochure which served as the main communication piece was distributed to all participants and was complimented by a poster in each laundry room. The brochure indicated that, upon request, it would be translated into any one of 12 languages, but there were no requests for this. The starter kit that was distributed to tenants also included two booklets, one providing laundry tips and the other with instructions on how to use the detergent included in the kit; a list of retailers selling the detergent; and an instructional manual for the front-load washers.

Figure 2 Comparison of washer water use per cycle



At the end of the pilot phase, an independent research firm conducted a telephone survey with some of the participants to assess user satisfaction. A total of 121 interviews were completed.

FINDINGS

Water reduction

- Total water consumption dropped significantly with the front-load washers, going from 22,100 L/d to 12,400 L/d—a 44 per cent reduction.
- Hot water consumption decreased by 61 per cent from 6,800 L/d to 2,700 L/d.
- In the top-loading washers, the initial eight weeks of monitoring the old washers revealed that hot water typically comprised 30 per cent of laundry use, although the proportion was as high as 50 per cent for some washers.
- On a per suite basis, total water consumption dropped from 30.5 L/d to 16.6 L/d, or 64 per cent, and hot water decreased from 9.2 L/d to 3.4 L/d, or 37 per cent.
- On a per cycle basis, the total water consumption dropped by 45 per cent from 127.8 litres to 70.5 litres, and hot water consumption decreased by 62 per cent from 40.4 litres to 15.4 litres.

Figure 2 shows the average water use per cycle for top- and front-load washers, and Figure 3 provides an overall summary of results for the washers, comparing before and after the washers were changed from top-loading (pre-change out) to front-loading (post-change out).

Figure 3 Summary of results

Description	Pre-Change Out	Post-Change Out	Reduction
Laundry water use vs. total site use (per cent)	4.5	2.4	47%
Average laundry water use (litres/day/suite)	30.5	16.6	46%
Average cycle counts (cycles/day/suite) *	0.19	0.17	6%
Average machine use (litres/cycle)	128	71	45%
Hot water portion (litres/cycle)	40.4	15.4	62%
Laundry water cost ($/year/suite) **	$10.46	$5.70	46%
Water heating cost ($/year/suite) ***	$6.45	$2.39	63%

* Excluding 2 buildings for which pre-change out cycle counts are not available

** Assuming water and sewer cost of $0.94/m^3

*** Assuming 70% efficient gas-fired heating system and gas cost of $0.30/m^3

Energy usage

While water usage was the primary focus of the study, the project report includes estimated energy savings, based on the fact that 80 to 95 per cent of washer energy is used to heat water. Energy savings from reduced hot water heating, including system losses, were estimated to be as follows:

- on a gross volume basis, 99,200 kWh/year
- on a per suite basis, 140 kWh/suite/cycle
- on a per cycle basis, 1.66 kWh/cycle.

Other studies have shown that reductions in electrical energy for mechanical functions (agitation, pumping) can be expected to save another 5 per cent, or 0.05 to 0.10 kWh/cycle.

Tenant satisfaction

All of the households contacted through the survey had used the new machines. The front-loaders had changed tenants' washing habits in a number of ways:

- 9 in 10 were placing more clothes in the machines.
- 4 in 10 were using less detergent.
- 1 in 10 were washing different types of items with the new washers, such as bulky or delicate items.

For the most part, clothes appeared to be as clean or, in half the cases, cleaner than before.

There were few problems with loading the machines or ease of understanding the operating instructions.

Overall satisfaction with the new machines was very strong. Virtually all were very or somewhat satisfied, with over two-thirds stating they were very satisfied. The reasons for satisfaction were varied, but for the most part, it was directly related to usage. Among the top mentions were:

- cleans better;
- able to wash/dry more clothes;
- faster to do the laundry; and
- good spin cycles.

Although most were very enthusiastic, some were concerned about not having enough water in the machines and a few thought the price was poor per load.

When asked directly about the benefits of the new machines, operational mentions topped the list, distantly followed by mentions about environmental benefits and price. Operationally, the machines cleaned clothes better, more clothes could be washed per load—so it took fewer loads to do a lot of laundry and therefore less time overall to wash and dry—and it was easier to load and unload clothes. When asked about environmental benefits, tenants noted water savings (68 per cent) more than energy savings (53 per cent).

CONCLUSIONS

The pilot project proved successful in verifying the manufacturer's claim regarding water and energy savings, and in determining tenants' acceptance of front-load washers. For the Toronto Housing Company, annual water and energy savings amounted to about $170 per machine, or a total of $6,640 for the machines at all six sites. The incremental cost per washer was $500, giving a simple and attractive payback period of 2.9 years.

The results of the project pilot are contributing to Toronto's Water Efficiency Plan and to designing an implementation program for front-load washer installation or replacement for both single- and multi-family residential sectors.

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Research Report: *Multi-Residential High Efficiency Clothes Washer Pilot Project, 2001*
Available at www.toronto.ca/watereff

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Housing Research at CMHC

Under Part IX of the ***National Housing Act***, the Government of Canada provides funds to CMHC to conduct research into the social, economic and technical aspects of housing and related fields, and to undertake the publishing and distribution of the results of this research.

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