Retrofitting Residential Fixtures – Ultra Low Flow Toilet Programs

Applicability

Water use by toilets is typically the largest source of indoor residential water demand, averaging 26.7 percent of indoor water use (Vickers, 2001). The residential toilet replacement program seeks to replace higher flush volume toilets with ultra-low flush toilets that use 1.6 gallons per flush or less in order to decrease water use. These toilets can either be installed directly by the utility, a contractor for the utility, or by the resident or housing management.

This BMP is intended for a water system (“utility”) that has at least 20 percent of its homes and apartment units in its service area constructed prior to 1995, and for which there has not been an active retrofit program to replace high flush volume toilets with 1.6 gallons per flush toilets, or Ultra Low Flow Toilets (ULFT). This BMP is often implemented in conjunction with the Retrofitting Residential Fixtures – Showerhead, Aerator, and Toilet Flapper Program BMP.

Description

ULFT replacement programs are an effective method of achieving water efficiency in the residential sector. ULFTs are toilets that use 1.6 gallons per flush (gpf) or less including dual flush toilets that can flush either 1.6 gpf or 0.8 to 1 gpf. Federal requirements prohibit installation of new toilets using more than 1.6 gpf. Under this BMP, the utility would develop and implement a program to replace existing toilets using 3.5 gpf or more in single-family and multi-family residences.

According to Vickers, successful toilet rebate and replacement programs must include:

- Identification of potential participants, potential water savings, program benefits and costs, schedule, and program budget and human resource requirements.
- Program outreach and marketing strategies targeted to specific customer groups and subgroups.
- Attractive financial incentives – a rebate, water bill credit, or fixture giveaway, for example.
- Installation guidance (e.g. printed instructions, call-in technical assistance, referrals to certified plumbers) or assistance (e.g. direct installation service, particularly for the elderly and disabled).
- Purchasing information about 1.6 gpf toilets, such as a description of types available for various applications, along with the names and model numbers of fixtures reported to be reliable in consumer surveys and technical studies.
- Rebate application forms.
- A convenient inspection process.
- Timely rebate processing and payment.
- Evaluation and reporting of program results.

Implementation

The ULFT replacement programs should offer free toilets or rebates for toilet replacement. If offering rebates, the utility needs to provide a list of eligible toilet models (i.e. WaterSense models). Incentives and promotion of the program should be sufficient to retrofit at least five percent of eligible homes per year. In addition, ULFT models that are used in retrofit programs should maintain 2 gpf or less, regardless of what replacement flapper is used.

Identify the number of single-family and multi-family residences constructed prior to 1995. If there is no data of single-family homes existing at the end of 1994 readily available, U.S. Census data can be used. For the most accurate estimate of single-family and multi-family residents, census data from 1990 and 2000, which includes the number of housing units by type, can be used. This data can be used to estimate single-family units at the end of 1994, assuming linear growth. Refer to calculation box in the Retrofitting Residential Fixtures - Showerhead, Aerator and Toilet Flapper Programs BMP to estimate residences.

Schedule

In the first 12 months: Plan a program including customer involvement as needed. Identify plumbing contractors or retrofit companies who may be interested in bidding on this program if applicable. Develop a plan for educating homeowners, apartment owners and managers, plumbers and realtors about the program. Solicit bids if using outside contractors and initiate the program. Include inspections by utility personnel or a third party to verify installation. In order to effectively implement this program, five percent of eligible single-family homes and five percent of eligible multi-family units should be retrofitted every year.

In the second year and after: Each year, target five percent of identified eligible single-family homes and multi-family units to be retrofitted. Continue the program until 50 percent of eligible single-family homes and multi-family units are retrofitted in order to achieve reasonable water efficiency benefits.

Scope

Annually, the ULFT replacement program should replace at least five percent of the estimated number of eligible toilets within the service area.

In order to accomplish this BMP, the utility should:

- Develop and implement a plan to distribute or directly install high quality ULFTs to eligible single-family and multi-family units;
- Implement the distribution or installation programs to achieve ULFT retrofits on at least five percent of eligible single-family units and five percent of the multi-family
units each year. Utilities with more than 100,000 eligible connections should retrofit at least 5,000 eligible homes and units each year.

- Within 10 years of implementing the program, retrofit at least 50 percent of eligible single-family homes and multi-family units with ULFTs. For utilities with more than 100,000 eligible connections, at least 50,000 eligible homes and units should be retrofitted within 10 years.

**Documentation**

To track this BMP, the utility should collect the following information:

- The eligible number of single-family residences and multi-family units in the service area.
- The average number of toilets per single-family residence; the average number of toilets per multi-family unit.
- The average persons per household for single-family residences; the average persons per household for multi-family units.
- The number of ULFT installations credited to the replacement program, by year, including brand and model of toilets installed.
- A description of the ULFT replacement program, if applicable.
- The estimated cost per ULFT replacement, if applicable.
- The estimated water savings per ULFT replacement.

**Determination of Water Savings**

<table>
<thead>
<tr>
<th>Average Daily Savings = SF x ((10.5 x Hs)/Ts) + MF x ((10.5 xHm)/Tm)</th>
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<tbody>
<tr>
<td>SF = Number of SF toilets retrofitted</td>
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<tr>
<td>MF = Number of MF toilets retrofitted</td>
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<tr>
<td>Hs = Number of people in average single family household</td>
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<tr>
<td>Ts = Average number of toilets per SF house</td>
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<tr>
<td>Tm = Average number of toilet per MF unit</td>
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For Single-family homes:
10.5 = gallons saved per capita per day if all toilets replaced in each household
Dual flush ULFTs increases savings by 25 percent

For Multi-Family Units:
10.5 = gallons saved per capita per day if all toilets replaced in each unit
Dual flush ULFTs increase savings by 25 percent
Cost-effectiveness

The rebates to the customers for installation of ULFT toilets are the most significant costs of this program. If the rebate cost for the toilet is set too low, only those customers already planning to retrofit will do so. If the rebate is set too high, the utility will be overpaying for customers to retrofit. Most utilities have found a rebate to work effectively if set between $70 and $100. Some utilities find it is more effective to provide the toilets free of charge to their customers. Toilets can be purchased from wholesalers by the truckload for $50 to $70. There may be additional costs for storage and distribution of the toilets.

Administration of the program can be conducted by utility staff or contracted out. There will be labor costs for application processing and inspections to verify installation, to determine if the tank is properly set and to discourage fraud. Inspection costs will be lower per toilet per multi-family retrofit due to the higher volume of toilets per application, but generally, labor costs range from $10 to $40 per toilet. Marketing and outreach range from $5 to $20 per toilet. Administrative and overhead costs range from 10 percent to 20 percent of labor costs. If this program is combined with the showerhead, aerator, and flapper retrofit BMP, there will be efficiencies in these costs.

To calculate the total cost per unit, total all costs and divide by the number of units being retrofitted.

For comments or questions regarding the Retrofitting Residential Ultra Low Flow Toilets BMP, please contact the water efficiency specialist of the Water Supply Planning Branch at 919-707-9009.

References:

- Tampa Bay Water Potable Water Conservation BMPs, January 2010.