



Volume 2, No. 5 – Fall 2003

....a dialogue for California's water conservation community

*Developed with funding and support from U.S. Bureau of Reclamation*

---

**Sponsored by the California Urban Water Conservation Council**

**Executive Director: Mary Ann Dickinson**

**Newsletter Editor: John Koeller**

---

## **This issue.....all about DUAL-FLUSH toilet fixtures**

### **What is a dual-flush toilet fixture?**

The dual-flush concept is simple.....a full 1.6-gallon flush for solids, and a reduced volume flush (usually 0.8 to 1.1 gallons) for liquids only. While this may seem to be another logical and feasible approach to water efficiency, it does create somewhat of a mechanical challenge to the toilet fixture manufacturer. Two flush options for the user means additional linkages and flush valve complexities within the toilet tank. However, many manufacturers have risen to the challenge and are (or will soon be) producing dual-flush products.

### **Where is dual-flush in North America?**

Dual-flush toilet fixtures have a fairly long history outside of North America, but it is only in the last six years that they have been actively marketed here<sup>1</sup>. Caroma Industries Ltd. entered the U.S. market in 1998 (and exhibited at AWWA's Conserv 99 in Monterey) with a small presence and a narrow line of product offerings. Subsequently, exposure to the dual-flush concept spread and the water conservation specialists

---

<sup>1</sup> Kohler Company has offered a dual-flush toilet for the upscale niche market for several years; the Power Lite™ line of Kohler toilets (the Trocadero®, and the San Raphael™) flush at 1.6-gpf/6.0-lpf and 1.1-gpf/4.2-lpf and employs an electrically operated 0.2-hp pump to aid in evacuation of the waste. This requires that a electrical service be available at the fixture.

commissioned a series of studies and field trials to closely examine the customer acceptance and water savings accruing to these new types of fixtures.

### **Do dual-flush fixtures save water?**

Dual-flush toilet fixtures are proven (through field studies) to be more water-efficient than standard 1.6-gallons per flush (gpf) fixtures. To date, five independent studies have been completed and published, each of which deals to some degree with this question.

Those five studies were conducted by:

- Canada Mortgage and Housing Corporation (CMHC) and Veritec Consulting, Inc., 2002
- Seattle Public Utilities, the U.S. E.P.A. and Aquacraft, Inc., 2000
- East Bay Municipal Utility District, the U.S. E.P.A. and Aquacraft, Inc., 2003
- U.S. Department of Energy and Pacific Northwest National Laboratories, 2001
- Jordan Valley Water Conservancy District, 2003

A summary of the findings of and links to the first three of those studies is found in the following document:

[http://www.cuwcc.org/Uploads/product/Dual\\_Flush\\_Fixture\\_Studies.pdf](http://www.cuwcc.org/Uploads/product/Dual_Flush_Fixture_Studies.pdf)

The excellent Jordan Valley report compares the dual-flush toilet to the Niagara Flapperless and a conventional 1.6-gpf fixture; it is contained within the following document:

[http://www.cuwcc.org/Uploads/product/Jordan\\_Valley\\_ULFT\\_Study.pdf](http://www.cuwcc.org/Uploads/product/Jordan_Valley_ULFT_Study.pdf)

All five studies installed and measured the performance of the Caroma Caravelle dual-flush toilet fixture.<sup>2</sup> Key questions addressed in these studies were:

- What is the ratio of “short” (liquid-only) flushes to “full” (liquid and solid waste) flushes?
- Are dual-flush fixtures flushed more or less frequently than conventional fixtures?
- What is the weighted average flush volume of dual-flush fixtures?

Overall, the studies found the following:

- The weighted average flush volume of a dual-flush fixture ranged from 1.1 to 1.3-gpf. This represents a 20 to 30 percent improvement in flush volume over the conventional 1.6-gpf fixtures.
- The ratio of “short” to “long” flushes was:

<input type="checkbox"/> Commercial office building	1.7 to 1.0
<input type="checkbox"/> Commercial restaurant	1.3 to 1.0
<input type="checkbox"/> Residential - single family	0.8-1.9 to 1.0
<input type="checkbox"/> Residential - multi-family	4.0 to 1.0

---

<sup>2</sup> No other gravity-fed dual-flush fixtures were available in North America at that time.

There was no significant change in the per capita flush frequency when a dual-flush fixture was compared with either an inefficient (3.5-gpf and above) or an efficient conventional (1.6-gpf) fixture.

### **Wash-down Vs. Siphonic Bowls...What's the difference?**

Caroma dual-flush toilet fixtures are of the wash-down type; that is, they employ a waste evacuation method wherein the water “pushes” the waste and follows it out of the bowl. This contrasts with the siphonic method commonly seen in North America where a siphon action is created in the trapway that “pulls” the waste from the bowl; the waste trails most of the water from the bowl.

Because it does not need to create a siphon action, the wash-down bowl is generally characterized by a much larger trapway diameter; thus, wash-down bowls seldom clog. On the other hand, wash-down toilet fixtures generally leave much less water in the bowl after the flush and, as such, the water surface area (the “water spot”) is smaller than in the conventional toilet fixture. It is common knowledge that North American consumers do not like a small “water spot”, instead favoring the larger surface areas that we are all accustomed to.

A related disadvantage of the wash-down bowl is the tendency toward “streaking” or “skid marks” on the side of the bowl, caused, in part, by the smaller water surface area. Cleaning a wash-down bowl with a bowl brush may be required more frequently than most North Americans wish.

Comparing practices in North America with those in Europe (where wash-down bowls dominate), many have characterized these differences as follows: “Americans expect to see a plunger next to their toilets while Europeans expect to see a brush.”

### **What's new in the dual-flush marketplace?**

Most major manufacturers have been producing dual-flush toilet fixtures and marketing them in Europe, Asia, Australia and/or other areas outside of North America. Over the past six years, however, these and other manufacturers began to focus on developing the technology for North America. By 2003, several manufacturers had completed development of dual-flush fixtures for the North American customer and were in the process of certification testing.

Caroma entered the U.S. marketplace in 1998. For the ensuing years, it has had virtual sole possession of the dual-flush fixture market.<sup>3</sup> Beginning in 2002, water conservation specialists began aggressively lobbying plumbing manufacturers to consider adding dual-flush fixtures to their product line. Many responded positively to this and other influences. As a result, new fixture offerings are anticipated from the following manufacturers by March 2004:

- Mansfield Plumbing Products
- Vitra USA
- Vortens
- Mancesa

---

<sup>3</sup> Except for the offerings of Kohler Company, which are unique products requiring electrical service at the toilet fixture and commanding a high price.

At least four new manufacturers will bring their product to market in early 2004. Characteristics of the dual-flush product from each manufacturer are as follows:

	Dual-flush Product Trade Name(s)	Bowl Type	Place of Origin	Rated flush volumes	
				Gpf	Lpf
Caroma USA	Caravelle, Tasman	Wash-down gravity	Australia	1.6 – 0.8	6.0 - 3.0
Mansfield Plumbing Products	Eco-Quantum	Siphonic pressure-assist	USA & China	1.6 – 1.0	6.0 – 3.8
Vitra USA	N. A.	Wash-down gravity	Turkey	1.6 – 0.8	6.0 - 3.0
Vortens	Vienna	Siphonic gravity	Mexico	1.6 – 1.0	6.0 – 3.8
Mancesa	N. A.	Siphonic gravity	Colombia	1.6 – 1.0	6.0 – 3.8

Websites where further marketing and specification research may be conducted are as follows:

Caroma USA: <http://www.CaromaUSA.com/>

Mansfield Plumbing: [http://www.mansfieldplumbing.com/pr\\_09262003.asp](http://www.mansfieldplumbing.com/pr_09262003.asp)

Vitra USA: [http://www.vitra-bathrooms.com/index\\_usa.asp](http://www.vitra-bathrooms.com/index_usa.asp)

Vortens:  
<http://148.245.247.50:81/vortens/productDetails.jsp?prold=42&prodType=product&catName=Residential&scatName=Toilets>

Other manufacturers are watching events in the marketplace and, in some cases, also developing dual-flush fixtures for later introduction.

Finally, for a view of a few of the dual-flush fixtures offered in other distant markets (but NOT offered in North America), check these websites:

Kohler in Austral-Asia:  
[http://www.au.kohlerco.com/onlinecatalog/detail.jsp?item=149311&prod\\_num=1171A%2F11172A%2F11152A](http://www.au.kohlerco.com/onlinecatalog/detail.jsp?item=149311&prod_num=1171A%2F11172A%2F11152A)

Kohler in Germany:  
[http://www.kohlerco.de/onlinecatalog/detail.jsp?item=134610&prod\\_num=19077/19078](http://www.kohlerco.de/onlinecatalog/detail.jsp?item=134610&prod_num=19077/19078)

American Standard in Asia:  
[http://www.americanstandard.co.th/english/printer/toilet/close\\_tf2305.htm](http://www.americanstandard.co.th/english/printer/toilet/close_tf2305.htm)

American Standard in France:

[http://www.idealstandard.fr/action.lasso?-database=ideal\\_cer&-response=%2ffiche.lasso&-layout=all&-maxRecords=50&-skipRecords=0&-token.line=cer&-search&-op=eq&article=K4026](http://www.idealstandard.fr/action.lasso?-database=ideal_cer&-response=%2ffiche.lasso&-layout=all&-maxRecords=50&-skipRecords=0&-token.line=cer&-search&-op=eq&article=K4026)

American Standard in the U.K.:

[http://www2.zestmedia.com/bluebook/products/5\\_1\\_20.asp](http://www2.zestmedia.com/bluebook/products/5_1_20.asp)

**....and, finally, an extra – PRESSURE-ASSIST vs. GRAVITY-FED:**

Read the debate between the proponent of pressure-assist toilets and the advocate of gravity-fed toilets as covered in PM Engineer Magazine:

[http://www.pmengineer.com/CDA/ArticleInformation/features/BNP\\_Features\\_Item/0,2732,112143,00.html](http://www.pmengineer.com/CDA/ArticleInformation/features/BNP_Features_Item/0,2732,112143,00.html)