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Re: Displacement Bag Testing Report

Veritec Consulting Inc. is an independent consulting engineering company that specializes in advancing water efficiency. One service that Veritec offers is product testing and evaluation, i.e., to determine whether a product is practical and viable, and whether the use of a product will result in significant water savings.

Purpose of Testing:

The purpose of this testing was to compare a number of different displacement devices to gain a general understanding about the effectiveness and usefulness of these devices.

A variety of different devices were tested, they include:

- Toilet Dam
- Tank Tummy (bag filled with water)
- Toilet Hippo Bag
- Dry Planet Bag
- Homemade Pop Bottle

Introduction:

Toilet displacement bags have been a popular way to modify the flush-volume of residential toilets for many years. Most homeowners are familiar with the concept of putting a brick or pop bottle into the tank of your toilet. By displacing the amount of water that is put into the tank it is possible to reduce the total flush volume of the flush. In theory this is an excellent idea, but since no real testing has been done to verify a) how much water is being saved with different devices and b) how the devices work in various toilets, it is impossible to make any assumptions about the devices until testing has been completed.

Testing Procedure:

5 different displacement devices were tested and while some devices were meant to work in ALL different types of toilets there are certain devices that only work in specific toilets (e.g. toilets containing ballcocks, 13-L toilets). Various factors were assessed during testing, including: ease of use, average flush-volume reduction, effect on flush performance, and possibility of tank trim complications. The charts below (Page 2) summarize the products and our findings for each device.

The Hippo Water-Saver



(for Ball-cock toilets only)
Toilets tested:
Kohler Sterling - 6L
American Standard New Marina - 13L
American Standard Plebe - 13L

The Hippo Water-Saver is a bag that folds into a flat bottomed box-shape. The Hippo is designed only for ball-cock toilets because it fits underneath the ballcock in the tank. It works reducing the range of motion of the ballcock by retaining a certain amount of water within the bag and reducing the amount of time the tank takes to fill.

During the testing of this device it became very evident that this device was extremely problematic. It caused every single toilet to leak (flapper got stuck in the open position) and was virtually impossible to use without causing some trim conflict. Since the device would not work without interfering with the trim we discontinued testing of this device at that point. During the testing we even tried cutting the bag to make it smaller in hopes that it would fit into the tank better but it did not seem to help.



The Toilet Dam



The toilet dam device is essentially a method of blocking off a section of the toilet tank and creating, in essence, a smaller tank. By blocking off one side of the side you reduce the volume of water that it takes to fill the tank.

The dam is a flexible rubber device that forms a seal against the sides of the tank. If there are any bumps or flaws in the inside of the tank this device will not seal tightly against the tank walls.

However, because this device is held in place it poses less of a risk of interfering with the internal mechanisms of the toilet. The results of the testing are shown below.

Toilets	Toto Drake	American Standard New Marina	Foremost 5207	American Standard Plebe
Original flush volume (L)	5.7	11.6	6	11.8
Reduced flush volume (device installed) (L)	4.4	9.1	5	9.8
Difference, per flush (L)	1.3	2.5	1	2



The Toilet Tank Bank



The Toilet Tank Bank is a displacement device that is filled with water and then hung from the edge of the tank. This device is quite large and bulky and did not fit very well into all the toilets we tested. Also – it was observed that the device was not fully submerged in various toilet models and was quite ineffective at reducing the flush volume (e.g. Toto Drake). This device is not adjustable to accommodate different tank types and may not be effective on many toilets. It was also necessary to fine-tune the placement of the device so that it did not interfere with the flapper.

Toilets	Toto Drake	American Standard New Marina	Foremost 5207	American Standard Plebe
Original flush volume (L)	5.7	11.6	6	11.8
Reduced flush volume (device installed) (L)	5.5	9.7	4.9	9.2
Difference, per flush (L)	0.2	1.9	1.1	2.6



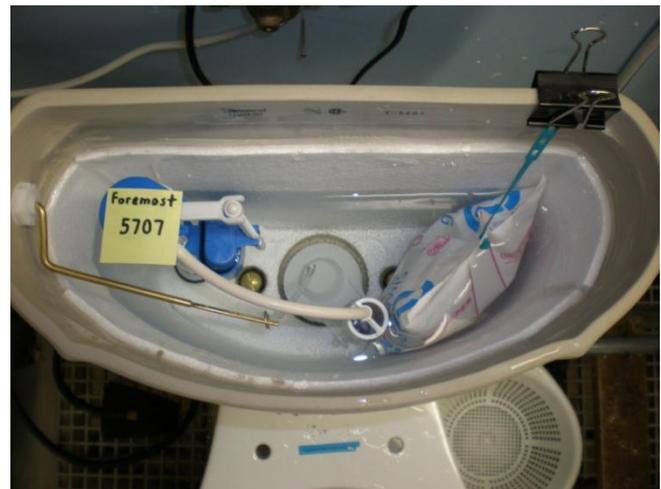
The Save-a-Flush Bag



The Save-a-Flush is essentially a toilet tank displacement device. When dry (such as during shipping) the Save-a-Flush bag is relatively flat and weighs only a few grams. The bag contains a dry, granular substance - a type of gel that expands when placed in water. The Save-a-Flush bag claims to save 1 litre of water per flush. To install the device the bag must be hung by a clip from the edge of the tank. The Save-a-Flush bag does not fit easily into all toilets and needed to be carefully monitored to ensure it was not interfering with the trim.

The results of the testing are below:

Toilets	Foremost 5207	American Standard New Marina	Foremost 8207	American Standard Plebe
Original flush volume (L)	5.9	11.1	6.5	11
Reduced flush volume (device installed) (L)	4.8	10.3	5.3	9
Difference, per flush (L)	1.1	0.8	1.2	2



The home-made Pop Bottle device



The pop-bottle is a home-made device made from a 2-litre pop bottle. The device is filled with 2-litres of water (also – rocks or pebbles can be put into the bottle to ensure the device is heavy enough to stay in place). By simply displacing how much water is being put into the tank, it is possible to reduce the average flush-volume. The pop bottle can be cut so that it fits into various sized tanks. The plastic pop bottle material is quite thin and soft so it’s possible that the device would collapse if any of the internal trim made contact with it. This device may not work in all toilet models depending on tank size.

Toilets	Toto Drake	American Standard New Marina	Mansfield Summit 3	Kohler Sterling
Original flush volume (L)	6	11.5	5.7	6.2
Reduced flush volume (device installed) (L)	5.68	10.3	5.18	5.47
Difference, per flush (L)	0.32	1.2	0.52	0.73



Conclusion

It is important to note that all displacement devices can affect the performance of a toilet. This may mean it flushes less waste or does not completely refill the bowl. This may not be important if it is installed in a very powerful toilet, but if it is installed in weak flushing toilet then the flush will be even worse. These devices also reduce the bowl refill volume – something that may or may not be harmful to the flushing performance depending on the type of toilet mode

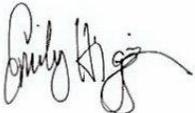
Our testing verified to us that the little bit of water savings you can achieve by installing displacement devices is likely not worth the risk. For example, saving a litre per flush for a typical family toilet would save about 3,200 L/year (about \$5 per year), however, if the device causes a leak for even a few days it would more than eclipse the savings.

We also found that none of these devices worked well (or even worked at all) in all toilet models, i.e., while some worked better than others in certain models, these same displacement devices might be problematic in other models. Since most displacement devices come with only one set of installation instructions, it's unlikely to work in a broad-range of toilets. It is not practical to provide instructions for the several hundred toilet models in the marketplace.

Although displacement bags are often a relatively inexpensive ways to promote water-efficiency they pose the risk of causing leaks and damage for homeowners. We believe that promoting the installation of efficient toilets is a far more reliable and effective method for reducing water consumption within the home.

Please feel free to contact me with any questions or concerns regarding this report.

Regards,

A handwritten signature in black ink, appearing to read "Emily Higginson".

Emily Higginson

Project Manager