

Toilet Flush Noise

By Bruce Martin

A 1990s Federal mandate restricted toilet consumption to a maximum of 1.6 gallons/flush [gpf]. Unfortunately, the new law was void of any extraction performance requirements. This resulted in a major market frustration — thousands upon thousands of water closets were sold that failed to meet the performance demands of users. While Congress has yet to take any corrective action of this legislative oversight, the American free market stepped up to fill the void with:

- a. Introduction of higher efficiency toilets;
- b. Widespread dissemination of toilet performance data like “MaP,” which allows consumers to make their purchase decisions based on performance rather than “good looks.”

MaP [“Maximum Performance Testing of Popular Toilet Models”] is a cooperative Canadian and American project sponsored by 23 city and regional water/wastewater districts in the United States and Canada and conducted by Veritec Consulting [Ontario, Canada] and Koeller & Company [California]. Their latest update — #12th, published in June, 2008 — reports the bulk extraction capability of 725 toilet models offered by 44 companies that market WCs in North America. Of these 82% are gravity; 15% flushometer-tank and 3% flushometer-valve activated WCs; and

- c. Home Depot’s decision [and other mass merchants] to publish toilet performance ratings [based on the MaP tests] for the toilets they offer.



Consumers should not have to make a trade-off between performance and quietness!

While these market developments are welcome additions for helping consumers make intelligent purchasing decisions, one area completely neglected is toilet flush noise.

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Misinformation dominates the toilet flush-noise arena. Walk into almost any retail store or plumbing wholesaler and ask the sales person about pressure-assisted [“PA”] toilets and, very frequently, you’ll hear something like,

‘At Home Depot and Lowes, for example

“... pressure-assisted WC performance is excellent, however their flush-noise is loud and they are expensive.” It is no surprise that comments like these have scared away many potential PA buyers, especially in residential applications.

While in the past, PA toilet selling prices were considerably higher than traditional gravity [with 2" flush valves] activated WCs¹, this is no longer true. With the introduction of the new large- [e.g. 3" & 4" FVs] flapper gravity water closets, the price differential has virtually disappeared. The improved extraction performance of these larger FV designs has also brought the gravity toilet’s reputation back to reasonable respectability in the eyes of the market place.

A 4" flush valve’s inlet area is 400% larger than the 2" version. Its larger size allows water to enter the WC considerably faster. This results in a higher flow rate [gpm] through the bowl and improved extraction capability. Unfortunately, like pressure-assisted WCs, the higher flow rate causes louder flush-noise.

It is ironic that some who constantly complained about [PA] toilet flush loudness are now by eagerly accepting these new, much louder, gravity WCs. Fixture manufacturers eagerly accepted the more noise for better performance because, to them, it was a blessing to get rid of the market complaints. Now, the peak noise emission of water closets in both groups is roughly the same — some PAs are quieter, others are not.

Most fixture manufacturers have historically opposed publication of competitive performance data. However,

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without readily available flush-noise information, consumers have had very limited ability to judge this toilet characteristic before purchasing. Few argue that the publication of automobile mileage ratings or electrical operating rates for appliances has not been good for consumers.

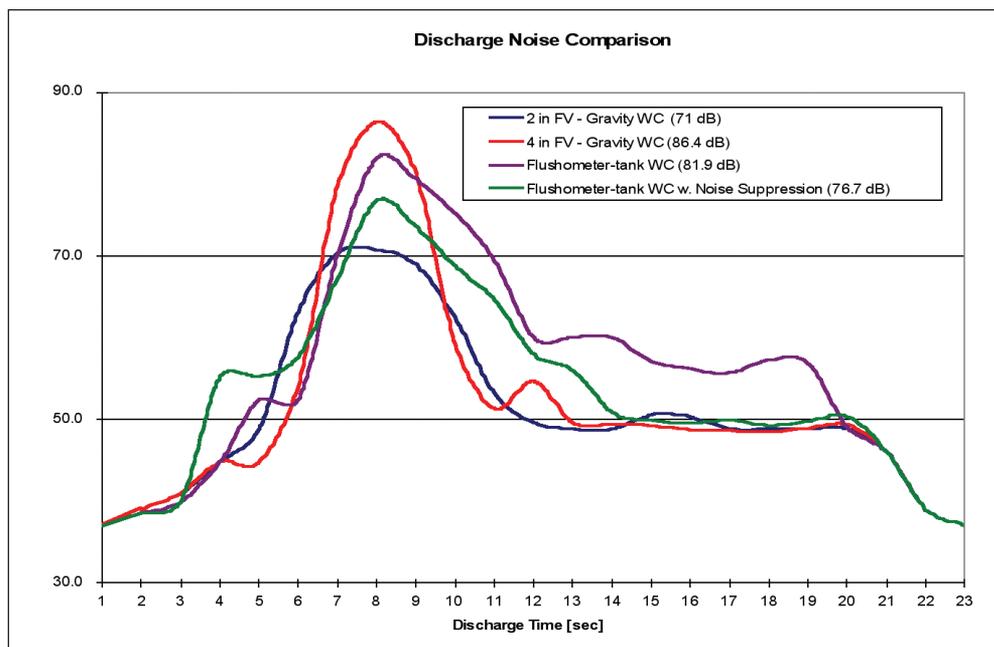
To gain a perspective on this problem, we selected three top selling WC combinations for study:

1. gravity activated 1.6 gpf water closet with 2" flapper;
2. gravity activated 1.6 gpf water closet with 4" flapper;
3. flushometer-tank ["F-T"] activated WC; and,
4. flushometer-tank ["F-T"] activated WC — unit #3 [above] equipped with the new, but not yet commercially available, FlushMuffler® noise suppression ["NS"] technology.

Sound tests showed the peak flush dB readings for each of the above

Toilet Combo	Peak dB
1. Gravity WC with 2" FV	71
2. Gravity WC with 4" FV	86
3. F-T Powered WC	82
4. F-T Powered WC w/NS	77

The following chart shows the noise emissions for these same WCs over the first 23 seconds of each unit's flush cycle.



To properly evaluate a toilet's flush-noise this writer's believes is that one must consider more than just peak dB. For example:

Sustained noise

A sustained noise at level "a" is obviously more annoying than just a quick burst at the same dB. The higher the

peak dB and/or the longer it continues, the more annoying it becomes. Thus, any rating method should include sustained noise discomfort factor.

Here are the ingredients of sustained noise for the above referenced WCs:

	Gravity -Fed		Pressure-assisted	
	2" FV	4" FV	Std.	w/NS
Average dB > 60	67.1	81.6	75.2	70.2
Discharge time > 60 dB [sec]	4.3	5.7	3.9	3.2

Night-time flushing

Especially for or nighttime use considerations, toilets should be rated for their through-wall flush-noise transmission.

Noise acceleration rate

Another flush-noise aspect of needing evaluation is how quickly the flush emission level climbs from ambient to its peak dB. The slower the rate of increase, the less hearing stress.

The following table shows the noise acceleration data for the above four toilets.

	Gravity -Fed		Pressure-assisted	
	2" FV	4" FV	Std.	w/NS
Noise Acceleration Rate				
Total dB Increase [Max-Min]	33.7	49.4	44.9	39.7
Time to Reach Peak dB [sec]	2.3	3.2	2.9	3.2

These are [some of] the aspects by which it is believe water closet discharge noise acceptability should be evaluated. Specifically how these factors are put together is yet to be determined. These tools should be an opportunity for manufacturers to enhance their product value by offering the buyer the ability to evaluate toilet flush-noise before installation. The hope is that the market influentials will give serious consideration to this proposal. Consumers should not have to make a trade-off between performance and flush-noise. ■

Bruce Martin is the inventor of the Flushmate® and the PF/2 Energizer® flushometer tanks that were sold to Sloan Valve in 1986 and Geberit (Switzerland) in 2002. His latest development is the FlushMuffler® noise suppression technology for flushometer tanks used in pressure-assisted water closets.