Low-Flush Toilets Take Bean Curd Test

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MISSISSAUGA, ONTARIO — Researchers are conducting yet another round of toilet testing, and the bean curd will inevitably hit the fan as some toilet manufacturers are displeased with the results.

Nevertheless, one of the researchers, John Koeller, P.E., of Koeller & Co. in Yorba Linda, Calif., cautioned that no toilet test will be the last word on the subject, but it can be another useful tool.

Canadian engineer William Gauley at Veritec Consulting in Mississauga conducted the latest round of testing. The tests have included more than 50 toilets, and more will be added, Koeller said.

The tests have pointed out several shortcomings in low-flush technology, Koeller noted. All the toilets tested have been approved and are available for sale, yet some of them do a less than satisfactory job clearing solid waste out of the bowl.

Researchers noted that Consumer Reports ranked 32% of the toilets it tested as "Poor." Repeated flushing eliminates any water-saving potential. Veritec Consulting found that about half the toilets it tested wouldn't flush what it considers to be an acceptable amount of solids in a single flush.

Some of the toilets, when installed and adjusted according to manufacturers' instructions, are not 1.6-gal. per flush toilets — they're more like 1.9-gpf toilets.

When a homeowner replaces a flapper in a low-consumption water closet, the flushing mechanism has to be adjustable to 1.6-gpf. Researchers found that couldn't be done in about half the toilets tested.

Sponsoring the tests are 19 governments and organizations, including the Canadian Water and Wastewater Association as the lead agency. Other sponsors include: Canada Mortgage and Housing Corp.; various Canadian provincial and municipal governments; B.C. Buildings Corp., Victoria, British Columbia; Tampa Bay Water, Clearwater, Fla.; Los Angeles Department of Water and Power; Seattle Public Utilities; East Bay Municipal Utility District, Oakland, Calif.; and California Urban Water Conservation Council, Sacramento.

Researchers decided that solids removal is the most important criterion and that they wanted to use a medium that is more realistic than sponges or plastic balls. They settled on bean curd, specifically miso soup base.

They looked in the medical records to find out what the average loading of a toilet

should be. In 1978, as part of a study entitled "Variability of Colonic Function in Healthy Subjects," British doctors measured excrement. They discovered that an average bowel movement is 130 grams and the average maximum for a male is 250g. The toilet testers, consequently, decided that the water closets should be able to pass 250g of bean curd, plus toilet paper.

Researchers formed the faux feces with a moisture content of 51.5%, density of 1.16g/mL, extruded through a 78-in. diameter die to a length of approximately 4 in. and weighing 50g. Four loosely crumpled balls of toilet paper (meeting ASME A112 testing standards), six sheets each, were thrown in the bowl. Water pressure was adjusted to 50 psi.

All the toilets were loaded in 50g increments and flushed until they were so loaded that they failed. The "winner," if you could call it that, was the Toto Drake, which passed a whopping 900g of bean curd.

Some of the lesser performing toilets passed 100g of solids or less.

Researchers noted that a water exchange test is a common toilet-testing regimen. In this case, they used a brine solution and a conductivity-testing meter. They found that almost all the toilets, even those that did a poor job of passing solids, could exchange 98% of their water. Researchers questioned, consequently, if water exchange is a meaningful test.

Researchers also found that almost half the toilets, when set up and adjusted according to manufacturers instructions, flush more than 1.6 gpf. They also had problems adjusting replacement flappers on about half the toilets.

Testing products from three flapper manufacturers, engineers found that significant numbers either didn't fit the toilets or could not be adjusted to 1.6 gpf. In addition, significant percentages of the flappers could only be adjusted within a broad range and might yield anywhere from 1.45 to 1.72 gpf.

The flapper issue particularly concerns water utilities that push low-consumption toilets for water conservation and then find the savings eroded when homeowners begin changing out flappers.

A number of the toilets tested avoid the flapper problem by being either vacuum- or pressure-assisted or by having a proprietary system such as a 3-in. flush valve.

Reaction to the tests was mixed. Almost all major manufacturers had some models that tested well and some that did not.

American Standard said that its engineers had not had time to study the test results and declined comment.

Toto has been using bean curd in its own tests, and it believes that miso soup base is the most realistic substitute for human waste that researchers can use, said Lenora Campos, manager of media relations.

"We're pleased but not surprised," Campos said. "We have been asking for years for performance to be considered when doing toilet testing and to get an accurate picture. It is not accurate to talk about gallons per flush but gallons per capita per day, because if the toilet will not perform, then the consumer will flush multiple times, raising the water used and negating the label on the box that says 1.6."

Kohler is skeptical about lab testing in general, said Kathryn Streeby, senior product manager for toilets.

"One product does well one year and poorly the next year because the tests are not repeatable," Streeby said "There's only so far that tests can go in lab settings."

Kohler has about 15 people from engineering, marketing and manufacturing that have toilets — Kohler's and its competitors' — installed in their homes. They keep the toilets for a month or so, see what they think, and compare notes on what impresses them and what they dislike.

Because a toilet is affected by the DWV, especially the venting and length of waste runs, Kohler is more comfortable using the real-world tests, Streeby said.

Kohler also believes that progressively loading a toilet with toilet paper until it clogs is a better test than bean curd, she said.