

How Does Bill Gates's Ingenious, Waterless, Life-Saving Toilet Work?

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More than two billion people don't have access to safe, clean sanitation systems. This toilet might be a big step toward fixing that.

In Beijing today, Bill Gates spoke at a conference with a fantastic name: the Reinvented Toilet Expo. The Microsoft founder took with him to the lectern a sealed jar containing human feces, according to [BBC News](#). Gates reportedly pointed to the poop jar and said that it could contain “as many as 200 trillion rotavirus...20 billion Shigella bacteria, and 100,000 parasitic worm eggs.”

Gates's stunt was conceived to draw attention to the need for sanitary, off-grid toilets that can remove harmful byproducts from human waste, which helps to stop the spread of disease among the two billion people who don't have access to clean sanitation. The expo, which was the culmination of a Bill and Melinda Gates Foundation initiative called [Reinvent the Toilet](#), featured 20 toilet designs developed by companies from around the world, most of which used clever engineering to separate solid and liquid waste safely and without odor.

An Archimedes' screw lifts solid waste to the top, and it's converted into pellets and combusted.

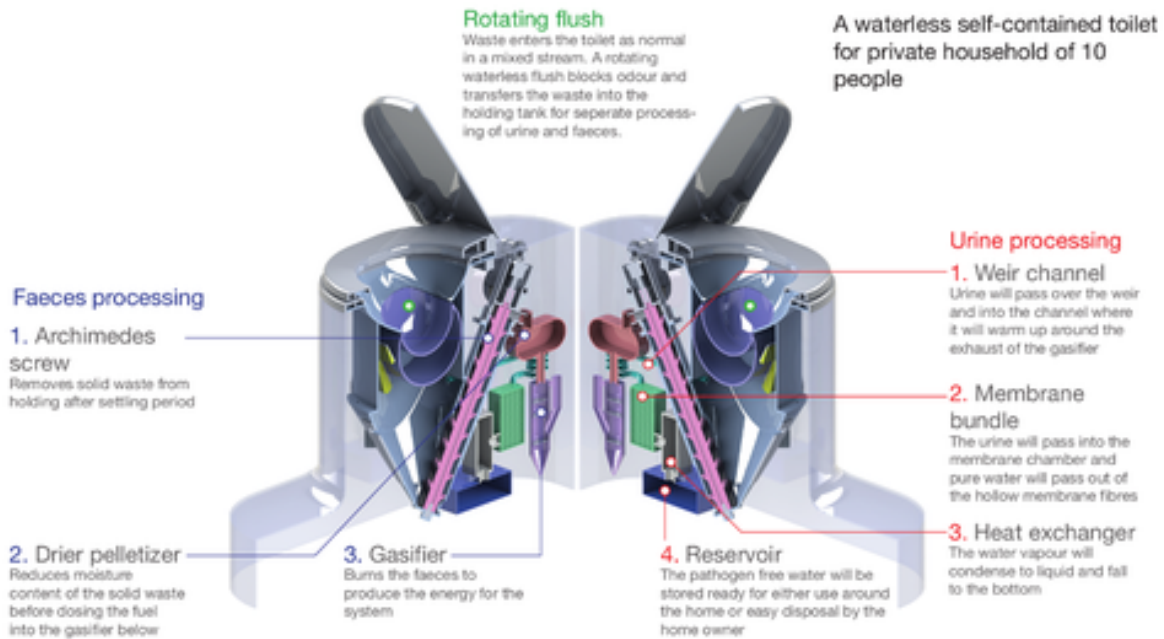
How do these toilets work? How is a self-contained, pathogen-killing, odorless toilet miles away from the nearest sewer pipe different from a regular toilet?

One of the leading designs that reportedly has the backing of the Gates Foundation was developed by scientists and engineers at Cranfield University and won two top awards at the 2018 International Water Association Product Innovation Awards in Tokyo in September. It's called the Nano Membrane Toilet, and it uses a brilliant series of gears, screws, and holding chambers to separate, clean, and store waste.

First, after the user's business is done and he or she puts the seat down, the seat's hinge turns a series of gears that opens the bottom of the bowl and squeezes it, all with no water, effectively “flushing” it.

The waste is now down below, in a holding tank. An Archimedes screw lifts the solid waste to the top, where it's converted into dry pellets and deposited into a combustion chamber. Once a week, you can remove the ash-like material and throw it away.

System configuration



Cranfield University/Bill & Melinda Gates Foundation

Urine, meanwhile, is cleaned, purified, and deposited into a holding chamber under the footstep at the front of the toilet. It can be used for outdoor irrigation and cleaning, according to the Nano Membrane website.

That's just one way to reinvent the toilet. Overall, the Gates Foundation has invested some \$200 million into projects having to do with clean waste and sanitation, and put some money behind each of the twenty toilets showcased in Beijing. The expo was done in partnership with the China Council for the Promotion of International Trade and the China Chamber of International Commerce.