

# Composting Toilet Taxonomy: How They Work

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The United States' infrastructure, once arguably the best in the world, has suffered neglect and decline for decades. Some [800 U.S. cities](#) still have combined sewer systems that are designed to overflow in heavy rains, discharging raw sewage into bodies of water — sometimes the same ones that provide drinking water. In some rural communities, straight pipes release all sewage directly into the environment, and septic systems are commonly dysfunctional or missing entirely. These conditions have led to a [return of diseases](#) once thought eradicated from the U.S.

But even when sewers are intact and functioning properly, the system suffers from an inherent design flaw. Using fresh water to transport excrement is incredibly wasteful of a precious resource.

Worldwide, more than [1.2 billion people](#) lack access to clean drinking water, while the average American family of four dumps 380 gallons of fresh water into the sewer system each day. As we address our declining wastewater system, there are good reasons to consider adding [composting toilets to the sanitation mix](#). People who are used to flushing and forgetting can be confused and intimidated by composting toilets.

## Composting Basics

Composting is a straightforward biological process of aerobic decay. The [basic process](#) is essentially the same in a composting toilet as it is in a backyard pile.

During composting, naturally occurring microorganisms decompose waste in a controlled environment where the carbon to nitrogen ratio is roughly 30:1; temperature is in the range of 120-170 degrees Fahrenheit (49-77 degrees Celsius); and moisture levels are between 40-60 percent. But the nutrient-rich and potentially pathogenic nature of the feedstock (material to be composted) in a composting toilet requires a more sophisticated management system than regular backyard composting. There are several critical design choices that will determine how — and sometimes whether — your composting toilet manages waste.

## Site-Specific vs. Manufactured

A site-specific [design](#) is a custom design tailored to specific site and usage conditions and is built on-site, often built into the very structure of a home or as free-standing outhouse-type structures. In earlier decades, most composting toilets were site-specific. And if you know what you are doing, this can still be the most effective approach.

However, the number of composting toilet manufacturers has grown and there is a much wider variety of options available commercially today. If you prefer the security

of having access to professional expertise for design, installation, and troubleshooting, it is no longer as challenging as it once was to find a manufactured system that will suit your circumstances. Additionally, most permitting agencies are much more open to commercial systems than self-designed plans.

## **Self-Contained vs. Split**

As the name implies, a self-contained composting toilet includes a toilet seat and composter in a single, self-contained unit. These units tend to be small and are most suitable for occasional use or very small households. Also, they may require more active management than larger systems; they can easily be overwhelmed. Some designs are not large enough to compost waste effectively, essentially making them no different from a port-a-potty.

Buyers of manufactured self-contained units should research products carefully. However, for those whose homes have no lower level or very limited space, they may be the only option.

Split systems separate the toilet from the composter, usually by placing the composting chamber directly below the toilet in the basement. With sufficient space and clever design, multiple toilets can sometimes be connected to the central composting chamber. These systems can be very large but may require less maintenance and may be more effective composters.

## **Continuous vs. Batch**

Both self-contained and split systems can be either continuous or batch composters, although self-contained units are more likely to be batch composters. In a batch system, waste remains in the same container from start to finish. A batch system will usually consist of two or more chambers, with only one chamber receiving new material while the other completes composting.

In a continuous composting system, waste moves through space as it composts. Most commonly, continuous composters have a long slope (roughly 30°) that waste slides down over time. By the time waste reaches the container at the bottom of the ramp, it is fully composted and ready for collection.

## **Passive vs. Powered**

Very large, continuous composting systems may be entirely passive, but most composting toilets use power in some way. Active systems are composting toilets that use electricity. Active systems may include electric pumps, heaters, and vents to manage the volume of liquid, remove odors, and maintain optimal temperatures. Some may have motorized mixing systems.

## **A Note on Peecycling**

The composting process is most efficient with a 30:1 carbon-nitrogen ratio and a 40-60 percent moisture content. Urine can [interfere with composting](#) because it is a liquid with high nitrogen content, and the urea in urine degrades into ammonia, which kills the microbes that break down the waste. This requires adding carbonaceous material such as sawdust, wood chips, and straw (often referred to as

“bulking agents”).

Many composting toilets also use heaters and vents or filters to remove excess moisture from the compost mix. In recent years, it has become more common to design toilets that attempt to [divert urine entirely](#) from the composting process. This allows composting to proceed more smoothly. The separated urine can be used as liquid fertilizer. (Properly finished compost could also be used as fertilizer, although regulations often forbid it.)

## Not for Everyone

Composting toilets are not a universal solution. Many jurisdictions forbid them. Even a passive composting toilet system requires more attention and maintenance than a flush toilet on a sewer system. Owners of composting toilets need to be comfortable with both the idea and reality of physically managing their own waste. Owners need to inform themselves of the legal issues related to composting human waste. They must also thoroughly understand the technical aspects of their system.

When everything works perfectly, homeowners must still deal with the finished compost according to local regulations. Some troubleshooting is inevitable when dealing with ongoing biological systems, but especially when starting up a new system. And fixing a malfunctioning system can be, in a word, nasty. That said, for hands-on, DIY-types who are committed to responsibly managing their waste and protecting the world’s fresh water reserves, composting toilets are a practical solution that can have a significant impact on one’s environmental footprint.

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