

benefits of compost toilets

comparisons with other systems

I'll briefly describe some other sewerage systems, and then compare the performance of compost toilets with these systems as regards the environment. The systems are:

- conventional system to sewage plant
- septic tank and leachfield
- small rotating-arm sewer
- cesspool
- reed beds
- other types of toilet
- no treatment at all

conventional system to sewage plant

The most common scenario in Britain. Most houses are on mains sewerage, so after people flush the toilet, that's the last they want to see, hear or know about their waste. Here's what happens to it, very briefly:

- waste pipes take domestic sewage to sewage treatment plants
- first solids such as tampons, condoms, rags, paper, plastics, sand and grit are removed by screens, and disposed of in landfill
- then faeces are allowed to settle in large settling tanks (this is called sewage sludge), so that the liquids can be separated for further treatment
- usually, liquids are passed via rotating arms, through a filter or percolating bed consisting of stones on which are growing micro-organisms that feed on nutrients and other micro-organisms in the liquid waste
- sometimes oxygen is blown through tanks containing the liquid waste, again to encourage beneficial bacteria to consume nutrients and other micro-organisms. This is called aeration
- sewage sludge is then either heated and digested anaerobically by bacteria, to produce soil conditioner which is spread on agricultural land, or is incinerated or taken to landfill
- often there is further disinfection of the liquid waste by ultra violet light, or chlorination before it is allowed into water courses or the sea

septic tank and leachfield

Fewer people in Britain have this system (although millions have it in the US); generally it's for people in rural locations in properties without mains sewerage.

Waste from the house flows first to a tank where solids settle, and liquids are allowed to flow out and into a series of underground pipes with holes in, laid in a trench filled with gravel, called a leachfield (or drainfield, or soakaway system). The liquid seeps through the holes and into the gravel, then into the soil where it is purified by soil micro-organisms which take up the nutrients that the liquid contains. The water is then either taken up by plants, falls to the level of groundwater, and then (eventually) horizontally into streams, or evaporates.

In the tank, some of the solids float (scum) and some sink (sludge). There is some decomposition in a septic tank, by anaerobic bacteria on the sludge, and by aerobic bacteria on the scum. Periodically, a truck will come (ours has 'The Poo Lorry' in big letters on the side), insert a large flexible pipe into the septic tank via a manhole, suck up all the solids and take them away. This costs around £200 a time, and if it's done annually, this compares well to normal sewerage charges. Sometimes, for a family, the truck won't need to come every year – only every two or three.



This septic tank (made from concrete, half hidden by vegetation and dead leaves) holds solids and allows liquids to pass through to a rotating-arm sewer; a truck pumps out the contents once a year.

Some septic tanks have two chambers, and tend to be made of concrete, but newer ones can be made of reinforced fibreglass.

small rotating-arm sewer

Some larger properties can have their own rotating-arm sewer, similar to the large ones found in sewage treatment plants. Bacteria on the stones will remove nutrients and harmful micro-organisms, and the outflow will be checked for water quality periodically by the Environment Agency. The finished liquid can then be released into water courses.

A septic tank will collect solids before the liquid part of the waste enters the rotating-arm sewer. Everything works under gravity, so there is no electricity required for pumps etc. However, there is some maintenance required – each month the rotating arms need to be removed and cleaned out, and the stones turned.



Rotating-arm sewers use no electricity and are very durable; this one was built by the council for Redfield when it was an old peoples' home in the 1950s, and it's still going strong.

cesspool / cesspit

Cesspools or cesspits (there is no difference) are used where no consent has been given for a soakaway system, and the property is not on the mains sewerage system. Usually the reason that you can't have a leach field / soakaway is that the property has clay soil. Cesspools can be bought off the shelf – they are usually cylindrical, and bigger than a septic tank, because all solids and liquids are contained within it – there is no overflow to any kind of drainfield. For this reason they

have to be emptied by a tanker much more regularly than a septic tank, although some older ones (which are sometimes built of brick or stone) allow liquids to soak into surrounding soil.

reed beds

Reed beds can be used to purify liquid waste instead of the bed of stones used in rotating-arm sewers or sewage treatment plants. They are artificial mini-wetlands specifically built to purify waste liquids. Reeds are planted that capture oxygen from the air and deliver it to their roots, where it is used by micro-organisms to help consume nutrients and possible pathogens. A reed bed will usually have primary treatment supplied by a settling tank, and then liquids will flow out of it into the two types of reed bed mentioned below.

There are two types of reed beds – vertical-flow and horizontal-flow:

1. vertical-flow reed beds provide secondary treatment. They don't contain water all the time – water enters at the top, percolates down and leaves at the bottom; they operate aerobically
2. horizontal-flow reed beds provide tertiary treatment, and do contain water – if you imagine a bath filled with gravel, which is filled from one end, and overflows at the other; they operate less aerobically and more anaerobically than vertical-flow beds



Horizontal-flow reed bed installed by Elemental Solutions at a pub in Worcestershire.

The sludge that settles in the settling tank can be removed by tanker as with a typical septic tank, or it can be pumped into a 'sludge bed' planted with a different type of reed. After several years, the

sludge will be composted and can be dug out to use in the same way as compost from a compost loo (much harder work though).

Reed beds can be used in conjunction with a compost loo, so then you won't have to dig solids out. The reed bed can then just deal with urine, greywater and the leachate from the chamber. Even better - you can use nutrients in the urine for fertilizer (see urine section). I would say that possibly the best system for a dedicated low-impacter is a compost loo, waterless urinal onto a straw-bale, and a reed-bed leading to a pond, next to the garden so you can dip your watering can in. Then frogs and toads (very good for the garden, as they eat pests) can breed in it (introduce spawn from another pond and they'll keep coming back). Greywater can be directed to the reed bed too. It can be a beautiful facility as well as a useful one.

other types of toilet

There are other types of toilets available, usually for people off mains sewerage, or for boats, mobile homes etc. These often involve mixing waste with chemicals (usually formaldehyde-based - nasty), which are then tipped down a conventional toilet or into a sewer drain. The chemicals don't help in any way other than to control smells, and of course they hinder decomposition in the sewage plant, and cause toxicity problems in watercourses. The last thing we need is the application of more synthetic chemicals in a world already overloaded with synthetics that the environment (including humans) hasn't evolved to cope with. Having said that, you can now get environmentally-friendly additives to stop smells.

It's very difficult to think of a way to use compost toilets on a boat, where space is at a premium. The Envirolet and Biolet (see 'buying a compost toilet') are just about small enough in some cases, but use a heating element to evaporate liquids, which is a waste of energy. The best option is probably a chemical toilet using 'green' chemicals, with a 20-litre sealed container underneath which you empty about once a week (into a sewer pipe at an official mooring, into a conventional toilet, or if you are in a remote location, you could bury it).

Other toilets incinerate waste, using large amounts of energy to destroy a resource and cause pollution; and yet others coat waste in oil, further complicating the situation with a pollutant, and causing more problems than they solve.

We're going to discount these 'solutions' as too much of an environmental nightmare to discuss.

no treatment

In less-developed countries there may be no sewage treatment at all, and so sewage is either deposited directly into rivers, in woods or waste ground, or in holes in the ground. It was common to see people using the rivers as toilets in rural India when I was there 10 years ago.

Alternatively, there may be flush toilets and what appears to be a conventional sewerage system, but the proper sewage treatment facilities may not be in place, and so raw sewage is dumped straight into rivers. This is the case in Romania.

Raw sewage contains pathogens in the form of bacteria, viruses and worms.