



Centre for
Alternative
Technology

SMALL-SCALE SEWAGE TREATMENT AND COMPOSTING TOILETS

Information Service, Centre for Alternative Technology, Machynlleth, Powys, SY20 9AZ
Tel: 01654 705989; e-mail: info@cat.org.uk
For more information sheets, see our web site: <http://info.cat.org.uk>

Most of us are connected to mains sewerage, and this is usually a very convenient and trouble free way of getting rid of both sewage and 'grey water' (from our sinks, baths, washing machines, etc.). We recommend connection to mains sewerage when available, as it provides an efficient way of disposing of material that would otherwise be difficult to treat on a small scale.

Water conservation is always the best place to start when reducing your 'water footprint', so whatever your situation, see CAT's 'Water Conservation in the Home' tipsheet (50p). This gives advice on reducing water use, whether you have pennies to spend or hundreds of pounds.

For those not on the mains, many treatment options can be considered. Some of these could be of interest to people who are on the mains, but want to reclaim some of the nutrients they are currently flushing away. Treating sewage usually involves a combination of different methods to separate out solids, deal with pathogenic (disease carrying) organisms, and remove nutrients.

The first stage (**primary treatment**) is the separation of most of the solids from the liquid effluent, usually by some kind of settlement chamber. The most common example is the **septic tank**. These are a robust and economic option if used properly. Most of the solid material will either sink (as sludge) or float to the top (as crust), leaving the effluent between to flow out to a secondary treatment stage.

In a septic tank, some breakdown of solids by bacteria takes place, but they will gradually build up over time and need removing occasionally (a process known as desludging). No additives should be needed to make your septic tank operate properly. People occasionally tell us of tanks that have never been emptied - but this will be either due to a hole in the tank (which may mean the solids are being eaten by rats), or because solids are washing into the leachfield (will tend to lead to a blockage, a bad smell, and a costly rescue operation).

If you're concerned about your septic tank or have recently moved to a property that has one, then we recommend the booklet **Septic Tanks: An Overview** (sold by CAT Mail Order), which tells you all you need to know about getting a good performance from your tank.

Cesspools tend to be used when conditions prohibit a secondary treatment system; they have no outlet and so need emptying every few weeks, making them expensive to run.

A common **secondary treatment** system is a **leachfield**. This is a system of perforated pipes laid in underground gravel trenches. They are unsuitable for very clay soils or areas with a high water table. The liquid effluent percolates through the gravel, where solids are removed and digested by micro-organisms, leaving the liquid clean enough to filter into groundwater.

Vertical flow reed beds are another kind of secondary treatment. The effluent from a septic tank (or similar) is percolated through a tank containing layers of sand and gravel planted with reeds. The reeds help bacteria to break down the pollutants and make the beds attractive to wildlife.

Horizontal flow reed beds are usually a third stage of treatment, used after other systems when a high level of treatment is needed.

Our 'Constructed Wetlands and Reed Beds' tipsheet (50p) explains the construction of reed beds, and where and when they are appropriate.

Several kinds of **package treatment plants** are available. These carry out primary and secondary treatment in compact units, and so produce a cleaner effluent than a septic tank. However, these usually require some kind of power supply - if so, they will be more costly to install and run, and not necessarily more environmentally friendly.

There is more detail on these systems and others in the CAT book **Choosing Ecological Sewage Treatment** (by Grant, Moodie & Weedon), which covers all aspects of small-scale wet sewage treatment. This book looks at typical water and nutrient flows through domestic systems and evaluates treatments including reed or willow beds, septic tanks, leachfields, trickling filters, solar ponds, living machines, and composting toilets. It also explains how to collect and use urine and grey water, and reduce clean water use.

COMPOSTING TOILETS

Another option is a **composting (or dry) toilet**. These don't use any water and compost the waste so that you can use it on the garden. Most types, commercial or DIY, need a fair bit of room to allow composting to occur at a steady pace, as it is best left for up to two years to decompose thoroughly.

Addition of the right amount of 'soak' gives good decomposition. A 'soak' is a source of carbon - typical materials include sawdust, straw & earth.

Keeping **urine** separate is usually the key to a successful composting toilet, otherwise they can become anaerobic and smelly. As urine is high in nitrogen, potassium and phosphorus, if collected separately it can be used as a fertiliser (on non-food plants) when mixed about 1:10 in water.

Another simple option is a '**straw bale urinal**' - a bale of straw (ends uppermost), for men to urinate on. The liquid soaks in and composts the middle of the bale in a few months. Technical approaches include flat panels in the front of compost toilets to capture and divert urine.

Bucket toilets are the cheapest and most basic kind of dry toilet. The waste needs to be emptied into a suitable container for composting. There are now more 'civilised' versions of these, and as they are fairly compact and portable they can be put in almost any location. If you can keep the urine separate, then in an average house these toilets might only need emptying once every few months.

De-watering toilets are more expensive, and use fans or electric elements to dry the waste. They use lots of energy and don't compost the waste, so generally we do not recommend them.

To avoid handling raw sewage, you can buy or build a **dual-chamber** compost toilet. Each chamber is sized to fill up over a year. The seat can be switched between chambers, so that the second is filled whilst the first composts down completely. The soil produced is more pleasant to remove, and can be put straight on the garden (although preferably on non-food plants)

You can spend anything from a few hundred to several thousand pounds on a composting toilet; those at the lower end of this scale require a more 'hands-on' attitude to maintenance.

For those put off by the front end of compost toilets, a device called an **Aquatron** (about £500) can be fitted to the outlet of a flush toilet, to separate the solids and liquids. The former drop into a composting chamber; the latter are treated, for example, in a leachfield or reed bed

If you are off mains sewerage and install a composting toilet, you will still need to deal with

grey water. This may just involve a simple soak-away pit, or diversion for garden irrigation. Other approaches will be similar to those listed above - perhaps a small septic tank & leachfield system, or a vertical flow reed bed.

Our *Making Use of Grey Water in the Garden* tipsheet (50p) looks at many simple ways to divert grey water directly to your garden, using basic traps to catch grease and solids. The use of 'eco' washing and cleaning products is not only recommended if you're diverting grey water to your garden, it is also general good practice for reducing pollution. Ask us about suppliers of diverters and eco-friendly cleaning products.

More detailed information on dry toilets can be found in the book '**Lifting the Lid** - an ecological approach to toilet systems', by Louise Halestrap and Peter Harper. Unfortunately this is currently out of print - but may be available through a library. It contains case studies detailing the pros and cons of commercially available dry toilet systems, written by users, as well as advice on the design of dry toilets and the treatment of urine and grey water.

A variant on the compost toilet is the '**treebog**'. These are simpler; usually a basic cubicle over a compost heap with lots of fast-growing willow planted around it. They're a good option as temporary toilets for outdoor events & festivals, but can also be built for more permanent use. A wire mesh barrier filled with straw keeps rodents out of the heap and keeps the compost aerated.

FURTHER INFORMATION & CONTACTS

CAT Mail Order sell the publications mentioned. 01654 705959 or <http://store.cat.org.uk>

CAT runs **short courses** on sewage systems, dry toilets, reed beds, and rain & grey water. 01654 704952 or <http://courses.cat.org.uk>

CAT Consultancy offers professional advice on all sanitation systems and reed bed design. www.cat.org.uk/consultancy

NatSol
Design and build dual chamber compost toilets. Supply urine separators & DIY components. 01686 412 653 or www.natsol.co.uk

Solution Elements
Supply 'Aquatron' units. 01594 516 344 or www.solutionelements.co.uk

For Treebogs:
Permaculture Magazine Article: www.permaculture.co.uk/articles/loo-view-build-your-own-treebog
Steward Community Woodland: www.stewardwood.org/resources/DIYtreebog.htm