

**Spectrum**

## A non-flush toilet assessed

An estimated 25–45% of the water supplied to Australian households goes down the toilet. Clearly, methods of sewage disposal that don't use water have big advantages in terms of conservation of precious water resources.

Much of the flushed sewage goes into septic tanks. Often these are not properly maintained, and may overflow and pollute nearby waterways. Many areas where reticulated sewerage is not available are quite unsuitable for septic systems. These include clayey, marshy, rocky, and very steep locations where little absorption can occur in the soil.

The pan in the outhouse, emptied by the nightsoil collector, has been the main alternative to the toilet flushing into a sewerage system or septic tank. Happily, some healthier and much less smelly non-flush systems have been devised in recent years.

The type with the best potential, according to Dr Bob Rich of the CSIRO Division of Building Research in Melbourne, is the electrically aided composting, or 'biological', toilet. Dr Rich is studying the operation of such devices, with the aim of

gathering data that will aid local councils in deciding whether to permit their installation. Up to now, councils have adopted widely differing attitudes to the toilets.

Biological toilets occupy little more space than flush models and are easy to install. Their price is competitive with that of septic systems.

In operation, they use electrical heating and fanning to encourage the breaking down of their contents into small quantities of harmless compost. The heater and fan are adjusted to keep the temperature and humidity at levels that encourage maximum activity by the composting microorganisms. In one test in Norway, evaporation and composting reduced the weight of a toilet's contents by 91%.

The fan sucks air through the seat. After circulating through the decomposing waste, the air escapes through a flue that extends above the roof of the house. The circulation system is designed to ensure that no smell escapes into the toilet room. The device is meant to be installed in the house, and would probably operate less efficiently in an outhouse that wasn't heated in

the winter.

But it needs regular maintenance. The bottom of the waste pile should be raked a few times a month with a horizontally inserted 'slice iron', to encourage composted waste to drop into removable trays. These trays normally need emptying about once a year.

Plant matter from the kitchen or garden needs to be added regularly, to assist the composting process. So does light sandy loam, to mop up excess moisture. The user needs to keep an eye on the moisture content of the decomposing waste, and should add soil if it becomes too wet or water if it dries out too much.

The top of the waste mound sometimes needs to be spread out, and the toilet has a built-in spreader for this job. During periods of disuse or lack of maintenance, a crust can form on the mound, and this has to be broken up.

Biological toilets have come into wide use in some parts of the world, particularly in Scandinavia, where at least 21 different models are offered for sale. The brands available in Australia, Bio-Loo and Ecolet, are both Swedish.

The Microbiological Institute of the Agricultural College of Norway has conducted a major study of the devices. One important finding was that, a week after a waste mound was inoculated with *Salmonella* bacteria and polio

virus, no trace of these pathogens could be found.

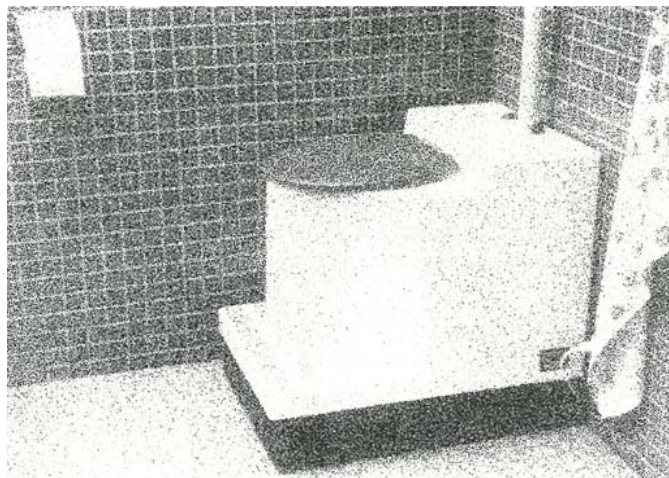
Dr Rich's first study, recently completed, was of a model that is designed for intermittent use — perhaps in a holiday house — by three or four people. A bigger unit designed for full-time use by a family is also available. Dr Rich is now gathering data on other models.

Initially, he arranged for a detailed record to be kept of the use and maintenance of one unit. Then, having learnt much about the device and problems likely to be encountered, he interviewed 17 owners, mostly in the Melbourne metropolitan area. Most of the toilets had been installed for at least a year when he spoke to the owners.

Information Dr Rich elicited included the numbers of regular and occasional users, odour inside and outside the house, electricity consumption, reaction of the unit to overloads if these occurred, and ease and regularity of maintenance.

He also asked questions about convenience, comfort, and aesthetic considerations, and encouraged owners to offer comments on the toilet and suggest any improvements that might have occurred to them.

Seven owners preferred the biological toilet to a flush unit. Another seven would have been happier with a flush toilet, but four of these preferred a biological toilet to any other alternative known to them. The other three owners



were dissatisfied. The people who were most critical said their units worked, but only if maintenance they considered excessive or distasteful was carried out.

The number of regular users per unit varied from one to eight. Interestingly, the number and severity of problems appeared to bear no relation to the number of users. In fact, the two most-used units were giving complete satisfaction.

Problems mentioned were varied. One owner's flue had been blocked by a bird's nest, and two more flues had been blocked by spider webs. In another case flies had entered through the flue. Netting the flue outlet prevents these problems.

Three owners had experienced bad odours outside the house. In one case the problem was solved by extending the flue. The other two units were in houses on steep hills where frequent downdrafts occurred, and there was no ready solution.

Another problem was jamming of the motor operating the spreader. In newer models the motor-operated spreader has been replaced by a hand-operated device, eliminating that difficulty.

Problems were also reported with the maintenance operation of raking the bottom of the waste mound. This can be quite hard work if not done frequently (perhaps once a week), and several of the women respondents reported that they were not strong enough for the job. Some owners, however, said raking caused them no problems.

Removing the trays for emptying presented some problems. In four cases, the material in the trays was very wet, and emptying was a smelly, unpleasant job. One user had a different problem: the material was dry and powdery, and rose in a cloud as he removed the tray. An owner

suggested that these problems could be solved if a cover or box was provided for the trays to slide into, producing a virtually water- and air-tight container for carrying the compost outside for disposal.

Dr Rich concludes that the model he examined — which has recently been superseded by a new model of the same capacity, incorporating a number of improvements — will perform satisfactorily as long as it is installed correctly and maintained regularly and correctly. From the points of view of hygiene, aesthetics, and cost to the community, he believes it is far superior to the pan system.

From his interviews, he

gained the impression that keen gardeners and back-yard mechanics do not mind the maintenance operations, but that some other people find aspects distasteful and react negatively to the unit as a whole.

Uses of the biological toilet are limited by the fact that it deals only with sewage — not with waste water from the sink, bath, washing machine, and so on. This 'sullage' has to be disposed of separately. Pan services and many septic systems have the same limitation, but reticulated sewerage systems in Australia deal with both sewage and sullage. In some situations, separate treatment has

environmental advantages.

Dr Rich sees roles for the biological unit in replacing existing pan services and relieving pressure on overloaded septic systems. He suggests that it could also be used in a variety of other situations — for example in unsewered factories where minimal amounts of sullage are produced, as an additional toilet in houses already served by a septic system, and in intermittently used buildings such as holiday houses and ski lodges.

Evaluation of biological toilets, stage I. R. Rich. *Australian Health Surveyor*, 1978, 9 (in press).