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Finnish DT-Technology and practical experiences on earth closets.

Opening words:

Cleanliness is next to godliness. Primitive waste management and lack of pure water are growing problems in the world. The UNDP (United Nations Development Program) has studied how ecological toilet culture could improve the purity of the environment and food.

In the developing countries over 90 percent of the wastewater is let straight to the environment without any kind of processing. This has disastrous consequences on both the environment and the poor population. The wealthy get rid of their excrement by flushing it down the toilet and to the sewer systems, which let the waste to rivers. The people living downstream are exposed to contaminated water. The poor do not have water closets or even sewerage. People use toilets where excretion only drops through a hole in to a heap. The cumulated waste can leak to the surrounding environment polluting the ground water. Also floods may flush it away. In addition, diseases thrive in such moist environments.

According to the UNDP, excrement should not be considered as waste, but as fertiliser. The feeding of ever growing population is making the soil poorer in many places. The nutrients are carried from countryside to town in the shape of food, and from towns the nutrients travel to water systems in the shape of excrement. If animal faeces are accepted as fertiliser, why is not human excrement? Almost all the pathogens found in excretion thrive in solid excrement. When composted, however, the excrement turns into soil. Urine, in itself, is a very good fertiliser: it contains all the important nutrients like nitrogen, potassium and phosphate. The valuable nutrients are wasted by discharging them to water systems where they pollute or by using vast amounts of energy to purify wastewater. Exploiting the nutrients in excrement and urine would result in cleaner environment as well as purer water and food.

In general:

Earth closet is a practical solution for single-family houses, summer cottages, camping sites, tourist attractions, marinas and field conditions. Application of composting is the smartest way of handling excrement in areas of scattered settlement, recreational areas and such conditions. The following points favour handling waste on the spot:

- The amount of waste is reduced to a fraction of the original amount.
- Composted waste can be used on the spot in soil improvement.
- There is no need to transport waste.
- Handling costs are reduced remarkably.

Earth closet tanks that are used around the year should be insulated.

At camping sites and recreational areas there may be big variations in use. Vast amounts of fluid are particularly troublesome. Although most of the moisture caused by the liquids evaporates during composting and through ventilation, it is possible that during periods of heavy use extra liquids are accumulated. There are solutions to this. The ventilation may be made more effective with a use of wind ventilator. The liquids may be lead to soil treatment. Extra liquid may also be lead to a separate closed tank. The local conditions, such as soil conditions, groundwater levels and the frequency of use, dictate which solution is the most suitable.

A very good solution is a closet with a changeable tank. The composting of the waste continues in the tank. Only thoroughly composted matter can be returned safely to nature.

Extra liquids are lead from toilets and urinals to a bio-filter. Replaceable mineral wool is used as the filter material. The filter removes some of the nutrients in the liquids. After filtering the liquids are absorbed to the ground. (Taking the nutrient cycle into consideration, the best way of handling the liquids is to collect it and use as fertiliser.)

If the groundwater level is close to surface or the soil is otherwise vulnerable, absorbing liquids to the ground is out of the question. In such cases, as mentioned before, tanks may be used. There are special fluids to prevent undesired odours.

Tank bio fluid is non-toxic natural product containing microorganisms that break up the odour producers. If one uses canister collecting or other kind of small container, one should use **tank bio** product especially during summertime.

Covering materials

The covering materials are an important factor in successful composting in the earth closets. It is sensible to use peat-cutter mixture in public closets. The mixture should contain 70 percent of peat and 30 percent of cutter. Homemade wood chips (grain size 25-30 millimetres) mixed with unfertilised peat works well also. The mixture should be 50/50. The acidic peat absorbs moisture and neutralises the alkaline urine while the woodchips aerate the mixture to ensure enough oxygen gets in.

Directions to users

There should be simple directions to users inside the closets. The situation stays under control when closets are serviced periodically and the serviceperson is motivated and well guided in his task. It should be kept in mind that eco closets are not automats.

The amount and composition of excrement

One person per day:

- Faeces 100-200 g
- Urine 1000-1500 g
- Toilet paper 20 g

One person produces around 500 kilograms of excrement per year, of which 70 kg is solid matter and the rest is urine. Excrement contains a lot of nitrogen, potassium, phosphorous and micronutrients. All of this should be returned to nature's circle of life. Urine is, for the most part, free from bacteria. Solid waste, in other hand, contains a multitude of bacteria. In functioning compost the amount of bacteria drops to one percent in just two weeks. In four weeks the amount drops to one thousandth of the original amount. In a year bacteria are virtually non-existent. Freezing of the manure in composting closets or in composts kills intestinal flora efficiently.

Decent hygiene should always be taken care of. Containers and structures should always be easy to clean. There should be a chance to wash one's hands. Extra caution should be exercised during emptying and cleaning.

Requirements for DT-toilets:

- Easy to use. Toilet's correct use shouldn't demand many auxiliary activities. Mixing substances should be easily available or they should be applied automatically. Prepares should be easy to do.
- Odourless.
- No animals. Flies, other insects or rodents shouldn't be able to get into the toilet. Help in problematic situations should be easily available.
- Agreeable price. The relationship between price and quality should be agreeable.
- Should not present a health risk. The handling and transportation of the compost and excrement should be planned in a way that there is no risk to soil, ground water or wells.
- Recycling of nutrients. Nutrients in the waste are easy to take in to use.
- Easy to control in exceptional situations. There should be no undesirable odours in cases of heavy use.
- Easy to keep clean. Cleaning taken into consideration during planning of the closet
- Long service life. Closet can be used continuously without long service delays caused by emptying or repairs.
- Elegance. Should represent a viable competitor to a toilet seat and space.
- Controllable in crisis situations. If a part breaks or situation gets out of control, there should be no need to go among the waste to make repairs.
- Follow-up possible. Follow-up on moisture, covering materials and filling of the tank should be easy.
- Flexibility. Installation of tanks and such should be effortless with standardised sizes and modules.
- Sits well into scenery.
- There should be no sense of draught when the toilet is used.
- Separation of urine. The use of the urine should be known. Otherwise the separation must not be done.

Only about one third of the people live in areas with sewer systems. Even in those cases, not all of the sewage leads to a high-quality treatment facility.

In closing:

DT-Technology is studied and put into practise all over the world. The development on the field is quite strong. In Finland new regulations on wastewater treatment of areas of scattered settlements have increased people's interest in the technology manifold. My belief is that earth closet and its' different variations suit people's everyday needs very well.

Securing world's water supplies takes careful planning and efficiency, for now water is simply wasted too much.

Thank you.

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