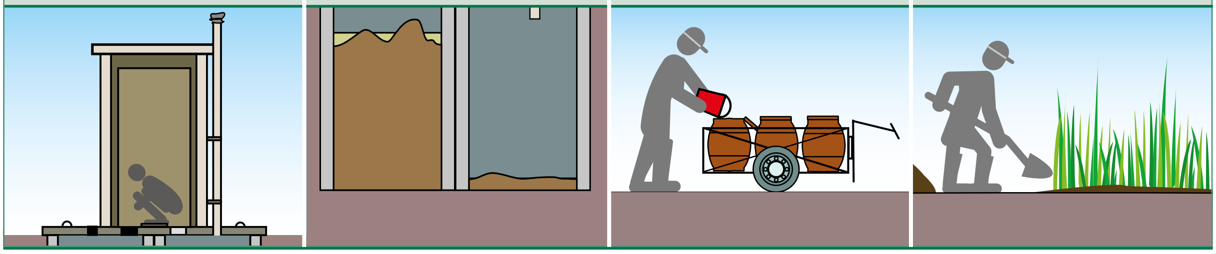
World Health Organization

Fact sheet 2

Dry toilet or urine-diverting dry toilet (UDDT) with onsite treatment in alternating pits or compost chamber

Toilet	Containment	Conveyance	End use / disposal
Dry toilet or urine diverting dry toilet	Fossa alterna, double VIP or compost chamber	Manual emptying and transport	Pit humus or compost used as a soil conditioner



Summary

This system is designed to produce a solid, earthlike material by using alternating pits or a composting chamber. Inputs to the system can include urine, faeces, organics, cleansing water, and dry cleansing materials. There is no use of flushwater.

A dry toilet is the recommended toilet for this system, although a urine-diverting dry toilet (UDDT) or a urinal could also be used if the urine is highly valued for application. A dry toilet does not require water to function and in fact, water should not be put into this system; cleansing water should be kept at a minimum or even excluded if possible.

The dry toilet is directly connected to a double ventilated improved pit (double VIP), fossa alterna or a composting chamber for containment. Two alternating containers, as in the double VIP or fossa alterna, give the material an opportunity to drain, degrade, and transform into pit humus (sometimes also called ecohumus), a nutrient-rich, hygienically improved, humic material which is safe to excavate.

When the first pit is full, it is covered and temporarily taken out of service. While the other pit is filling with excreta (and potentially organics), the content of the first pit is allowed to rest and degrade for at least two years before use. Only when both pits are full is the first pit emptied and put back into service. This cycle can be indefinitely repeated.

A composting container can also have alternating chambers and, if properly operated, produces safe, useable compost. For these reasons it is included in this fact sheet.

This system is different from the system shown in Fact sheet 5 regarding the treatment product generated at the containment step. In the other system, the sludge requires further treatment before it can be used, whereas the pit humus or compost produced in this containment technology is ready for end use and/or disposal.

Applicability

Suitability: Because the system is permanent and can be indefinitely used (as opposed to the single pits in Fact sheet 1, which are backfilled and covered), it can be used where space is limited.

Additionally, because the treatment product must be manually removed, this system is suitable for dense areas that cannot be served by trucks for motorized emptying. This system is especially appropriate for water-scarce areas and where there is an opportunity to use the compost or humic product as soil conditioner.

Cost: For the user, this system is one of the least expensive in terms of capital cost. The only maintenance costs will be for cleaning of the toilet, upkeep of the superstructure and arranging for periodic emptying of containers [2,3]; and it produces an end product that the user may be able to use or sell.

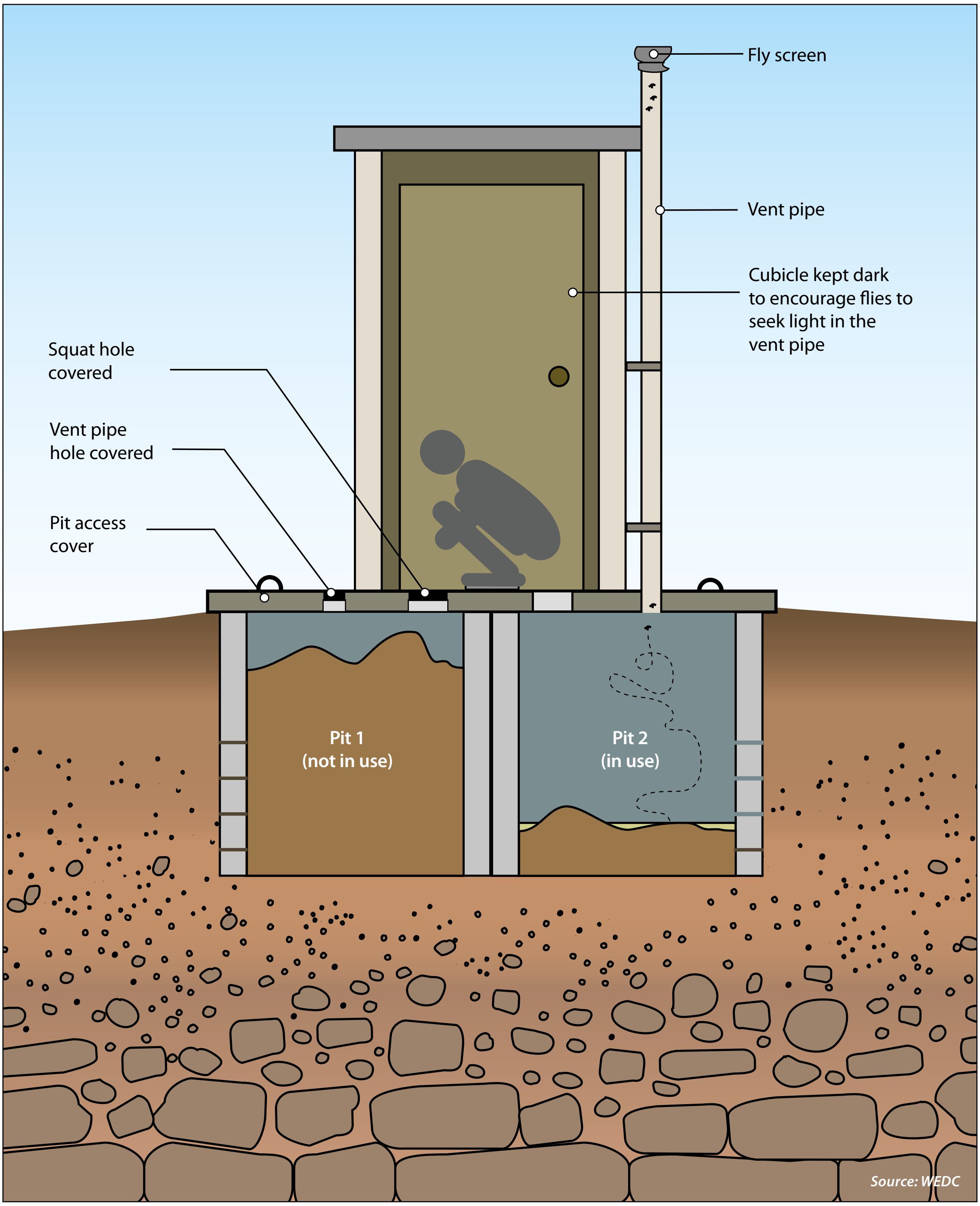


Figure 1. A twin-pit latrine (fossa alterna)

Design considerations

Toilet: The toilet should be made from concrete, fibreglass, porcelain or stainless steel for ease of cleaning and designed to prevent stormwater from infiltrating or entering the container [2,3].

Containment: For the pit-based technologies, the water table level and groundwater use should be taken into consideration in order to avoid contaminating drinking water. If groundwater is not used for drinking or alternative cost effective sources can be used, then these options should be explored before assuming that groundwater contamination by pit latrines is a problem. Where groundwater is used for drinking and to prevent its contamination, the bottom of the pit should be at least 1.5m above the water table [3]. In addition, the pit should be installed in areas located down gradient of drinking water sources, and at a minimum horizontal distance of 15m [4].

Excreta, cleansing water and dry cleansing materials can usually be collected in the pit or chamber, especially if they are carbon-rich (e.g., toilet paper, newsprint, corncobs, etc.) as this may help degradation and airflow. Other inputs such as menstrual hygiene products and other solid wastes are common and may contribute significantly to the contents. Where they cause the container to fill up more rapidly and make it more difficult to empty, an appropriate container for disposal of these wastes should be provided in the toilet cubicle.

Greywater must be collected and treated separately. Too much moisture in the container will fill the air voids and deprive the microorganisms of oxygen, which may impair the degradation process.

End use/disposal: As the excreta in the resting container is draining and degrading for at least two years, the resulting pit humus or compost needs to be manually removed using shovels (the material is too dry for motorized emptying) and can be used in agriculture as a soil conditioner [5].

Operation and maintenance considerations

Toilet and containment: The user is commonly responsible for the construction of the toilet and container, although they may pay a mason to carry out the work. The user will be responsible for cleaning of the toilet and are most likely to be responsible for removing the pit humus or compost, although they may pay a labourer or service provider to do this.

At shared facilities, a person (or persons) to clean and carry out other maintenance tasks (e.g. repairs to superstructure) on behalf of all users needs to be identified.

The success of this system depends on proper operation and an extended storage period. If a suitable and continuous source of soil, ash or organics (leaves, grass clippings, coconut or rice husks, woodchips, etc.) is available, the decomposition process is enhanced and the storage period can be reduced. The required storage time can be minimized if the material remains well aerated and not too moist.

End use/disposal: The material removed from the container or compost chamber should be in a safe, useable form, although workers must wear appropriate personal protection during removal, transport and end use.

Mechanisms for protecting public health

Toilet and containment: The toilet separates users from excreta and the container isolates the excreta and pathogens within from physical human contact.

The main mechanism for pathogen reduction is through long storage time. The conditions in the pit are not favourable for pathogens survival, which die off over time. In the pit, any leachate permeates into the surrounding soil and pathogens contained in the liquid are filtered out, adsorbed onto particles, or die off during their slow travel through soil [2, 3].

During rains, the slab and the pit or composting chamber contain the fresh excreta and prevent it from being washed away into surface water bodies, while squat-hole covers or lids can reduce disease transmission by preventing disease carrying vectors from entering and leaving the pit [2, 3].

Conveyance: Any non-degradable solid waste removed from the container needs to be disposed of properly, for example through a regulated solid waste management service or, where this is not available, through burial.

End use/disposal: Since it has undergone significant degradation, the pit humus or compost is quite safe to handle and use as a soil conditioner in agriculture. If there are concerns about the pathogen level or quality of the pit humus or compost, it can be further composted in a dedicated composting facility before it is used. If there is no end use for the treatment product, it can be permanently disposed of.

References

The text for this fact sheet is based on Tilley, et al. [1] unless otherwise stated.

1. Tilley E, Ulrich L, Lüthi C, Reymond P, Schertenleib R, and Zurbrügg C (2014). *Compendium of Sanitation Systems and Technologies. 2nd Revised Edition.* Swiss Federal Institute of Aquatic Science and Technology (Eawag).

2. Brikké F, and Bredero M (2003). *Linking Technology Choice with Operation and Maintenance in the Context of Community Water Supply and Sanitation. A reference document for planners and project staff.* Geneva, Switzerland.

3. Reed R A, Scott R E, and Shaw R J (2014). *WEDC Guide No. 25: Simple Pit Latrines.* WEDC, Loughborough University, UK.

4. Graham J, and Polizzotto M (2013). *Pit latrines and their impacts on groundwater quality: A systematic review.* Environmental Health Perspectives.

5. Strande L (2017). *Introduction to Faecal Sludge Management.* Online Course available at: www.sandec.ch/fsm_tools (accessed March 2017). Sandec: Department of Sanitation, Water and Solid Waste for Development Eawag: Swiss Federal Institute of Aquatic Science and Technology.