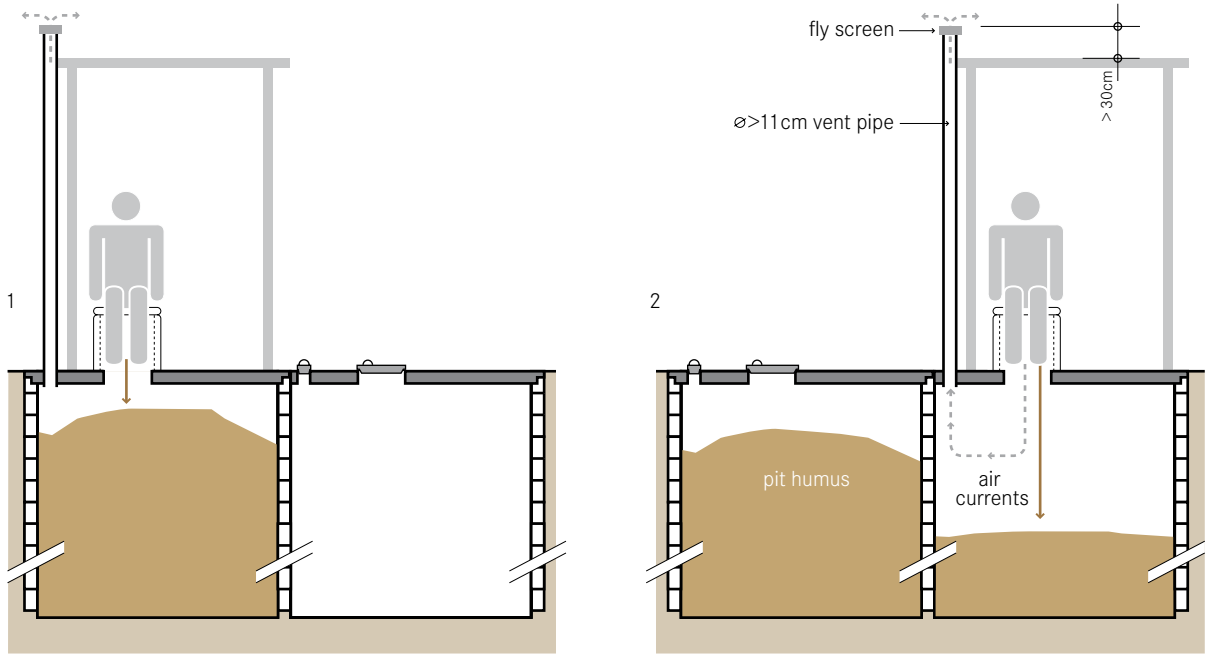
S.4 Double Ventilated Improved Pit (VIP)

Applicable to: **System 2**

Application Level:	**Management Level:**	**Inputs:** Excreta Faeces (+ Anal Cleansing Water) (+ Dry Cleansing Materials)
★★ Household ★ Neighbourhood City	★★ Household ★★ Shared ★ Public	**Outputs:** Pit Humus



The double VIP has almost the same design as the Single VIP (S.3) with the added advantage of a second pit that allows it to be used continuously and permits safer and easier emptying.

By using two pits, one pit can be used, while the content of the second rests, drains, reduces in volume, and degrades. When the second pit is almost full (the excreta is 50 cm from the top of the pit), it is covered, and the content of the first pit is removed. Due to the extended resting time (at least 1 or 2 years after several years of filling), the material within the pit is partially sanitized and humus-like.

Design Considerations The superstructure may either extend over both holes or it may be designed to move from one pit to the other. In either case, the pit that is not being filled should be fully covered and sealed to prevent water, garbage and animals, or people from falling into the pit. The ventilation of the two pits can be accomplished using one ventilation pipe moved back and forth between the pits, or each pit can be equipped with its own dedicated pipe. The two pits in the double VIP are continually used and should be well lined and supported to ensure longevity.

Appropriateness The double VIP is more appropriate than the Single VIP for denser, peri-urban areas. After the resting time, the soil-like material is manually emptied (it is dug out, not pumped out), so vacuum truck access to the pits is not necessary.
The double VIP technology will only work properly if the two pits are used sequentially and not concurrently. Therefore, an adequate cover for the out of service pit is required. Double VIPs are especially appropriate when water is scarce and where there is a low groundwater table. They should be located in an area with a good breeze to allow for proper ventilation. They are not suited for rocky or compacted soils (that are difficult to dig) or for areas that flood frequently.

Health Aspects/Acceptance The double VIP can be a very clean, comfortable and well accepted sanitation option, in some cases even more so than a water-based technology. However, some health concerns exist:

- Leachate can contaminate groundwater;
- Pits are susceptible to failure and/or overflowing during floods;
- Health risks from flies are not completely removed by ventilation.

Operation & Maintenance To keep the double VIP free of flies and odours, regular cleaning and maintenance is required. Dead flies, spider webs, dust and other debris should be removed from the ventilation screen to ensure a good flow of air. The out of service pit should be well sealed to reduce water infiltration and a proper alternating schedule must be maintained.

Pros & Cons

+ Longer life than Single VIP (indefinite if maintained properly)
+ Excavation of humus is easier than faecal sludge
+ Significant reduction in pathogens
+ Potential for use of stored faecal material as soil conditioner
+ Flies and odours are significantly reduced (compared to non-ventilated pits)
+ Can be built and repaired with locally available materials
- Manual removal of humus is required
- Possible contamination of groundwater
- Higher capital costs than Single VIP; but reduced operating costs if self-emptied

References & Further Reading

_ ARGOSS (2001). *Guidelines for Assessing the Risk to Groundwater from on-Site Sanitation.* British Geological Survey Commissioned Report, CR/01/142, Keyworth, UK. Available at: www.bgs.ac.uk

_ Franceys, R., Pickford, J. and Reed, R. (1992). *A Guide to the Development of on-Site Sanitation.* WHO, Geneva, CH. Available at: www.susana.org/library

_ Graham, J. P. and Polizzotto, M. L. (2013). *Pit Latrines and Their Impacts on Groundwater Quality: A Systematic Review.* Environmental Health Perspectives, National Institute of Environmental Health Sciences, Research Triangle Park, US. Available at: www.ehponline.org

_ Mara, D. D. (1984). *The Design of Ventilated Improved Pit Latrines.* UNDP Interregional Project INT/81/047, The World Bank and UNDP, Washington, D.C., US. Available at: documents.worldbank.org/curated/en/home (A good reference for detailed double VIP design information)

_ Mara, D. D. (1996). *Low-Cost Urban Sanitation.* Wiley, Chichester, UK. (General description of VIPs with a focus on the ventilation system)

_ Morgan, P. R. (2009). *Ecological Toilets. Start Simple and Upgrade from Arborloo to VIP.* Stockholm Environment Institute, Stockholm, SE. Available at: www.ecosanres.org