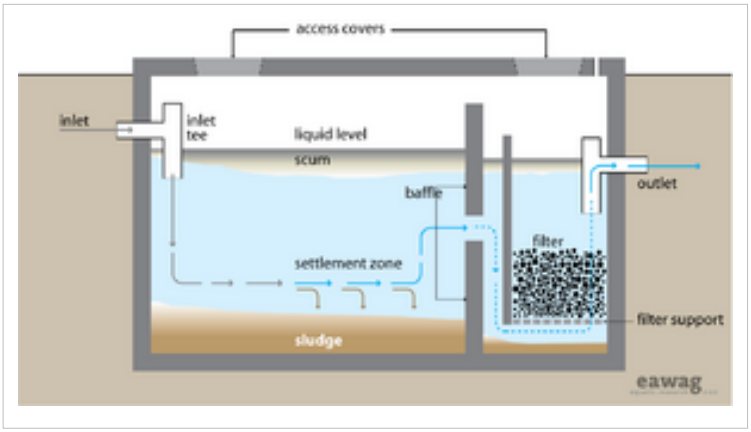
Anaerobic_Filter

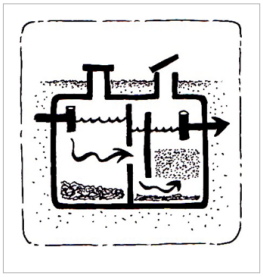
Application level		Management level	
Household	XX	Household	XX
Neighbourhood	XX	Shared	XX
City		Public	XX



Applicable to systems:	Languages / langues / idiomas
5, 6	

Inputs: Blackwater , Greywater

Outputs: Faecal Sludge , Effluent



An Anaerobic Filter is a fixed-bed biological reactor. As wastewater flows through the filter, particles are trapped and organic matter is degraded by the biomass that is attached to the filter material.

This technology consists of a sedimentation tank (or Septic Tank) followed by one or more filter chambers. Filter material commonly used includes gravel, crushed rocks, cinder, or specially formed plastic pieces. Typical filter material sizes range from 12 to 55mm in diameter. Ideally, the material will provide between 90 to 300m2 of surface area per 1m3 of reactor volume. By providing a large surface area for the bacterial mass, there is increased contact between the organic matter and the active biomass that effectively degrades it.

The Anaerobic Filter can be operated in either upflow or downflow mode. The upflow mode is recommended because there is less risk that the fixed biomass will be washed out. The water level should cover the filter media by at least 0.3m to guarantee an even flow regime.

Studies have shown that the HRT is the most important design parameter influencing filter performance. An HRT of 0.5 to 1.5 days is a typical and recommended. A maximum surface-loading (i.e. flow per area) rate of 2.8m/d has proven to be suitable. Suspended solids and BOD removal can be as high as 85% to 90% but is typically between 50% and 80%. Nitrogen removal is limited and normally does not exceed 15% in terms of total nitrogen (TN).

Advantages	Disadvantages/limitations
- Resistant to organic and hydraulic shock loads. - No electrical energy required. - Can be built and repaired with locally available materials. - Long service life. - Moderate capital costs, moderate operating costs depending on emptying; can be lowered depending on number of users. - High reduction of BOD and solids.	- Requires constant source of water. - Effluent require secondary treatment and/or appropriate discharge. - Low reduction of pathogens and nutrients. - Requires expert design and construction. - Long start up time.

Adequacy

This technology is easily adaptable and can be applied at the household level or a small neighbourhood (refer to Technology Information Sheet T2: Anaerobic Filter for information about applying an Anaerobic Filter at the community level). An Anaerobic Filter can be designed for a single house or a group of houses that are using a lot of water for clothes washing, showering, and toilet flushing. It is only appropriate if water use is high, ensuring that the supply of wastewater is constant.

The Anaerobic Filter will not operate at full capacity for six to nine months after installation because of the long start up time required for the anaerobic biomass to stabilize. Therefore, the Anaerobic Filter technology should not be used when the need for a treatment technology is immediate. Once working at full capacity it is a stable technology that requires little attention.

The Anaerobic Filter should be watertight but it should still not be constructed in areas with high groundwater tables or where there is frequent flooding.

Depending on land availability and the hydraulic gradient of the sewer (if applicable), the Anaerobic Filter can be built above or below ground. It can be installed in every type of climate, although the efficiency will be affected in colder climates.

Health Aspects/Acceptance

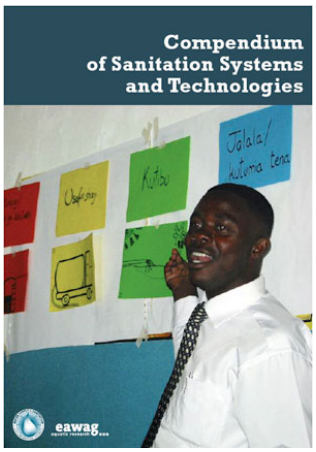
Because the Anaerobic Filter unit is underground, users do not come in contact with the influent or effluent. Infectious organisms are not sufficiently removed, so the effluent should be further treated or discharged properly. The effluent, despite treatment, will still have a strong odour and care should be taken to design and locate the facility such that odours do not bother community members. To prevent the release of potentially harmful gases, the Anaerobic Filters should be vented. The desludging of the filter is hazardous and appropriate safety precautions should be taken.

Maintenance

Active bacteria must be added to start up the Anaerobic Filter. The active bacteria can come from sludge from a septic tank that has been sprayed onto the filter material. The flow should be gradually increased over time, and the filter should be working at maximum capacity within six to nine months. With time, the solids will clog the pores of the filter. As well, the growing bacterial mass will become too thick and will break off and clog pores. A sedimentation tank before the filter is required to prevent the majority of settleable solids from entering the unit. Some clogging increases the ability of the filter to retain solids. When the efficiency of the filter decreases, it must be cleaned. Running the system in reverse mode to dislodge accumulated biomass and particles cleans the filters. Alternatively, the filter material can be removed and cleaned.

Acknowledgements

The material on this page was adapted from: Tilley, E. et al. (2008). Compendium of Sanitation Systems and Technologies [2], published by Sandec [3], the Department of Water and Sanitation in Developing Countries of Eawag [4], the Swiss Federal Institute of Aquatic Science and Technology, Dübendorf, Switzerland. The publication is available in English, French, and will be made available in Spanish. Available in the IRC Digital Library [5]



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References and external links

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[2] http://www.eawag.ch/organisation/abteilungen/sandec/publikationen/publications_sesp/downloads_sesp/compendium_high.pdf
[3] http://www.eawag.ch/organisation/abteilungen/sandec/index_EN
[4] http://www.eawag.ch/index_EN
[5] http://www.irc.nl/docsearch/title/163208

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