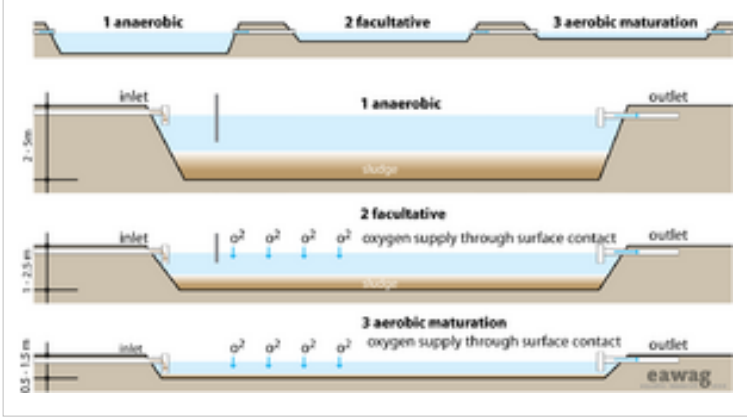
Waste_Stabilization_Pond

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



Applicable to systems:	Languages / langues / idiomas
1, 5 , 6 , 7 , 8	

Inputs: Blackwater , Greywater

Outputs: Faecal Sludge , Effluent

Waste Stabilization Ponds (WSPs) are large, manmade water bodies. The ponds are filled with wastewater that is then treated by naturally occurring processes. The ponds can be used individually, or linked in a series for improved treatment. There are three types of ponds, (1) anaerobic, (2) facultative and (3) aerobic (maturation), each with different treatment and design characteristics.

For the most effective treatment, WSPs should be linked in a series of three of more with effluent being transferred from the anaerobic pond to the facultative pond and finally the aerobic pond. The anaerobic pond reduces solids and BOD as a pre-treatment stage. The pond is a fairly deep man-made lake where the entire depth of the pond is anaerobic. Anaerobic ponds are built to a depth of 2 to 5m and have a relatively short detention time of 1 to 7 days. The actual design will depend on the wastewater characteristics and the loading; a comprehensive design manual should be consulted for all types of WSPs. Anaerobic bacteria convert organic carbon into methane and in the process, remove up to 60% of the BOD. Anaerobic ponds are capable of treating strong wastewaters.

In a series of WSPs the effluent from the anaerobic pond is transferred to the facultative pond, where further BOD is removed. A facultative pond is shallower than an anaerobic pond and both aerobic and anaerobic processes occur within the pond. The top layer of the pond receives oxygen from natural diffusion, wind mixing and algaedriven photosynthesis. The lower layer is deprived of oxygen and becomes anoxic or anaerobic. Settleable solids accumulate and are digested on the bottom of the pond. The aerobic and anaerobic organisms work together to achieve BOD reductions of up to 75%. The pond should be constructed to a depth of 1 to 2.5m and have a detention time between 5 to 30 days.

Following the anaerobic and the facultative ponds can be any number of aerobic (maturation) ponds to achieve a highly polished effluent. An aerobic pond is commonly referred to as a maturation, polishing, or finishing pond because it is usually the last step in a series of ponds and provides the final level of treatment. It is the shallowest of the ponds, usually constructed to a depth between 0.5 to 1.5m deep to ensure that the sunlight penetrates the full depth for photosynthesis. Because photosynthesis is driven by sunlight, the dissolved oxygen levels are highest during the day and drop off at night. Whereas anaerobic and facultative ponds are designed for BOD removal,

maturation ponds are designed for pathogen removal. Dissolved oxygen in the lake is provided by natural wind mixing and by photosynthetic algae that release oxygen into the water. If used in combination with algae and/or fish harvesting, this type of pond is effective at removing the majority of nitrogen and phosphorus from the effluent.

To prevent leaching, the ponds should have a liner. The liner can be clay, asphalt, compacted earth, or another impervious material. To protect the pond from runoff and erosion, a protective berm should be constructed around the pond using the excavated material.

Advantages	Disadvantages/limitations
- High reduction in pathogens. - Can be built and repaired with locally available materials. - Construction can provide short-term employment to local labourers. - Low operating cost. - No electrical energy required. - No real problems with flies or odours if designed correctly.	- Requires expert design and supervision. - Variable capital cost depending on the price of land. - Requires large land area. - Effluent/sludge require secondary treatment and/or appropriate discharge.

Adequacy

WSPs are among the most common and efficient methods of wastewater treatment around the world. They are especially appropriate for rural communities that have large, open unused lands, away from homes and public spaces. They are not appropriate for very dense or urban areas. WSPs work in most climates, but are most efficient in warm, sunny climates. In the case of cold climates, the retention times and loading rates can be adjusted so that efficient treatment can be achieved.

Health Aspects/Acceptance

Although effluent from aerobic ponds is generally low in pathogens, the ponds should in no way be used for recreation or as a direct source of water for consumption or domestic use.

Upgrading

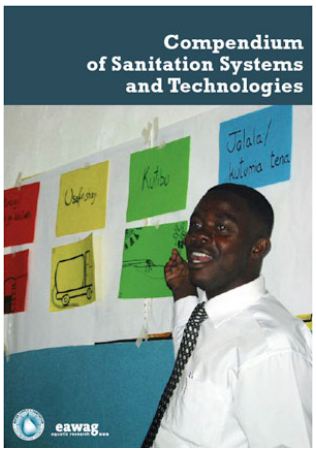
Ideally, several aerobic ponds can be built in series to provide a high level of pathogen removal. A final aquaculture pond can be used to generate income and supply a locally grown food source.

Maintenance

To prevent scum formation, excess solids and garbage from entering the ponds, pre-treatment (with grease traps) is essential to maintain the ponds. The pond must be desludged once every 10 to 20 years. A fence should be installed to ensure that people and animals stay out of the area and excess garbage does not enter the ponds. Rodents may invade the berm and cause damage to the liner. Raising the water level should prompt rodents to evacuate the berm. Care should be taken to ensure that plant material does not fall into the ponds. Vegetation or macrophytes that are present in the pond should be removed as it may provide a breeding habitat for mosquitoes and prevent light from penetrating the water column.

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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[4] http://www.eawag.ch/index_EN
[5] http://www.irc.nl/docsearch/title/163208

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