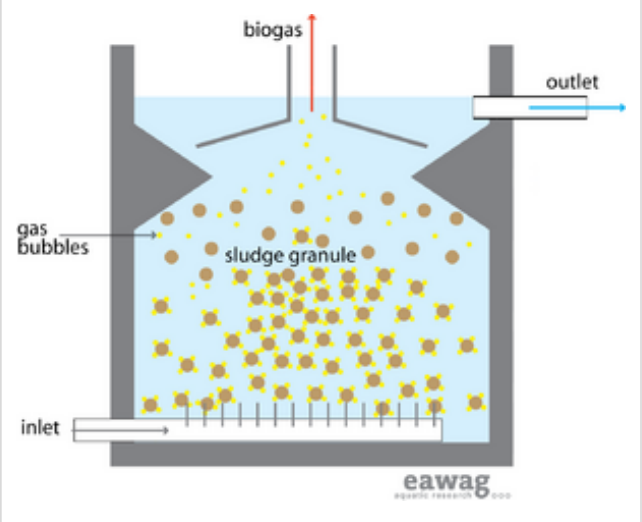
Upflow_Anaerobic_Sludge_Blanket_Reactor

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



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

Inputs: Blackwater , Greywater

Outputs: Effluent , Treated Sludge , Biogas

The Upflow Anaerobic Sludge Blanket Reactor (UASB) is a single tank process. Wastewater enters the reactor from the bottom, and flows upward. A suspended sludge blanket filters and treats the wastewater as the wastewater flows through it.

The sludge blanket is comprised of microbial granules, i.e. small agglomerations (0.5 to 2mm in diameter) of microorganisms that, because of their weight, resist being washed out in the upflow. The microorganisms in the sludge layer degrade organic compounds. As a result, gases (methane and carbon dioxide) are released. The rising bubbles mix the sludge without the assistance of any mechanical parts. Sloped walls deflect material that reaches the top of the tank downwards. The clarified effluent is extracted from the top of the tank in an area above the sloped walls.

After several weeks of use, larger granules of sludge form which in turn act as filters for smaller particles as the effluent rises through the cushion of sludge. Because of the upflow regime, granule-forming organisms are preferentially accumulated as the others are washed out.

The gas that rises to the top is collected in a gas collection dome and can be used as energy (biogas). An upflow velocity of 0.6 to 0.9m/h must be maintained to keep the sludge blanket in suspension.

Advantages	Disadvantages/limitations
- High reduction in organics. - Can withstand high organic loading rates (up to 10kg BOD/m3/d) and high hydraulic loading rates. - Low production sludge (and thus, infrequent desludging required). - Biogas can be used for energy (but usually requires scrubbing first).	- Difficult to maintain proper hydraulic conditions (upflow and settling rate must be balanced). - Long start up time. - Treatment may be unstable with variable hydraulic and organic loads. - Constant source of electricity is required. - Not all parts and materials may be available locally. - Requires expert design and construction supervision.

Adequacy

A UASB is not appropriate for small or rural communities without a constant water supply or electricity. A skilled operator is required to monitor and repair the reactor and the pump in case of problems. Although the technology is simple to design and build, it is not well proven for domestic wastewater, although new research is promising.

The UASB reactor has the potential to produce higher quality effluent than Septic Tankseptic tanks, and can do so in a smaller reactor volume. Although it is a wellestablished process for large-scale industrial wastewater treatment processes, its application to domestic sewage is still relatively new. Typically it is used for brewery, distillery, food processing and pulp and paper waste since the process can typically remove 85% to 90% of Chemical Oxygen Demand (COD). Where the influent is low strength, the reactor may not work properly. Temperature will also affect performance.

Health Aspects/Acceptance

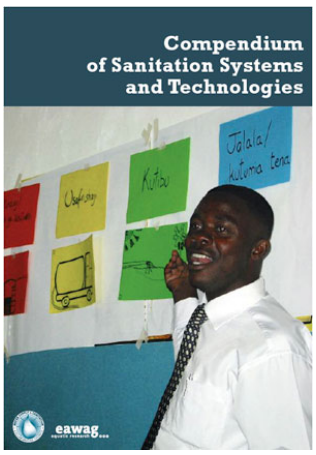
UASB is a centralized treatment technology that must be operated and maintained by professionals. As with all wastewater processes, operators should take proper health and safety measures while working in the plant.

Maintenance

Desludging is infrequent and only excess sludge is removed once every 2 to 3 years. A permanent operator is required to control and monitor the dosing pump.

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]



Download the Eawag Compendium of Sanitation Systems and Technologies! [1]

References and external links

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- Vigneswaran, S., et al. (1986). Environmental Sanitation Reviews: Anaerobic Wastewater Treatment- Attached growth and sludge blanket process. Environmental Sanitation Information Center, AIT, Bangkok, Thailand. (Chapter 5 provides a good technical overview.)

References

[1] http://www.eawag.ch/organisation/abteilungen/sandec/publikationen/compendium_e/index_EN
[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
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