

## Waste water treatment of small villages solved by on-site household units



### In Summary:

Waste water treatment of small villages was solved by the installation of individual small-scale wastewater treatment equipment to households. The equipment reduce the nitrogen and phosphorus load from the wastewater. Depending on the sensitivity of the given area, the required effluent quality should not exceed 75 (100) mg/l COD; 15 (25) mg/l BOD, 10 mg/l  $\text{NH}_4\text{-N}$ ; 25 mg/l  $\text{TN}_{\text{unorg}}$ . The average reduction of annual external loading could be calculated based on the quality and quantity of generated waste water of households.

**Lake water quality is sensitive to nutrient load from the catchment. Therefore, proper waste water treatment is necessary for settlements in the catchment.** It is enhanced by the regional land use plan at lake Balaton, stating that building permission can not be issued in areas where sewage treatment is not solved. The lack of solution limits the development of small villages. In addition, in small villages the construction of sewer and treatment plant is not cost efficient. On-site treatment units can solve the problem. Village level program requires additional coordination efforts both in planning and installation, and operation.

### Activities

Selection of appropriate sized settlements where cost-benefit of installation and operation is realistic alternative of tradition sewer networks. For the selected settlements pre-feasibility studies were prepared. The studies end with the recommendations for the most suitable solution. Based on the pre-feasibility study the Settlement Wastewater Management Program (SWMP) has to be approved by local councils. The approved SWMP is the basic requirement for development funding, hence implementation.

### Target groups:

Recommended to be used in small villages where centralised system is not cost efficient.  
Planners and citizens, decision makers of small settlements, environmental authorities.

### Advantages

- The equipment is easy to install, it needs small space, and therefore a relatively low amount of ground work
- There is no need to terminate the village's / town's road network during the work, a normal sustainable transport takes place
- The equipment is long-life, all components of the equipment made of plastic, which have excellent resistance to chemical effects of water and soil
- The operation is quiet and odourless
- The maintenance of the equipments is simple
- Operation of the equipment does not require any chemical additions
- The purified water is desiccating / infiltrating into the ground, hence utilized by the plants
- The dryness of the soil decreases, the plants grow better and the microclimate of the environment improves
- The power consumption of the equipment is low

### Objectives and goals of the good practice:

The objective was to provide cost efficient solution for small villages to solve waste water treatment.

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Treated water quality – after secondary treatment

Parameter	Guaranteed value	Average value
COD <sub>Cr</sub>	70 mg/l	35 mg/l
BOD <sub>5</sub>	15 mg/l	10 mg/l
SS	20 mg/l	15 mg/l
N-NH <sub>4</sub>	5 mg/l	2 mg/l
N <sub>total</sub>	25 mg/l	15 mg/l
P <sub>total</sub>	7 mg/l	3 mg/l



Treated water quality – after tertiary treatment

Parameter	Guaranteed value	Average value
COD <sub>Cr</sub>	50 mg/l	35 mg/l
BOD <sub>5</sub>	7 mg/l	5 mg/l
SS	10 mg/l	3 mg/l
N-NH <sub>4</sub>	2 mg/l	1 mg/l
N <sub>total</sub>	20 mg/l	15 mg/l
P <sub>total</sub>	1 mg/l	0,5 mg/l
E.Coli	20/100 ml	2/100 ml

The individual wastewater treatment equipment consists of two main parts: a strong, chemical resistant plastic barrel and perforated pipe (drain) which can infiltrate the biologically treated water into the porous soil. If dewatering is not possible (eg, rocky, clay soil), the treated water can be led into water courses according to the authority permission. The definition of treating method of purified water is a planning task (dewatering or leading into water course).

The wastewater treatment technology based on combined mechanical and biological principles. The mechanical treatment is realized by a coarse grid for eliminate the hard-degradable pollutants. The biological treatment uses activated sludge.

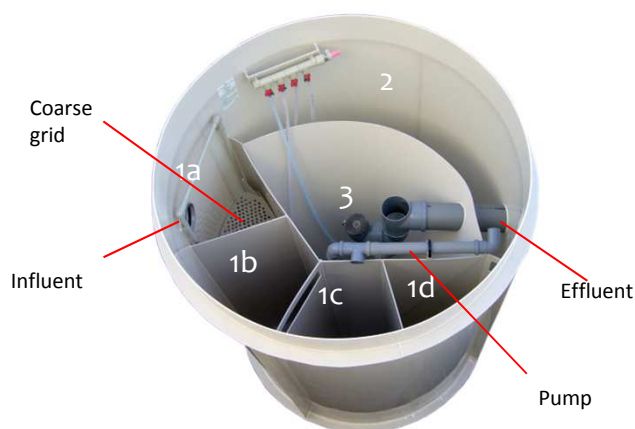
The inside of plastic barrel is divided into compartments, and as the waste water moves between the compartments, water is becoming cleaner. The purification is carried out by aquatic bacteria, which break down, "eating" the dirt. The oxygen is needed to break down the pollutants, which is provided by an intermittently operated electric air blower.

The waste water get into the first non-aerated compartment (1) through an influent, where the nitrogen biodegradation takes place and this condition (anaerobic environment) is available for the phosphorus partial biodegradation. In this section, the separation and demolition of biodegradable mechanical pollutants are carried out as well. In the non-aerated compartment, a so-called vertical flow labyrinth structure (1a, 1b, 1c, 1d) was formed, which provides an internal sludge recirculation: mixing the non-aerated space and sludge (keeping it in a floating state).

The mixture of sludge and waste water flows from the non-aerated compartment into the aerated compartment (2) by a spillover. The aerobic degradation of organic pollutants and the nitrification of the ammonia-ammonium nitrogen carry out in the aerated compartment.

The activated sludge is separated by gravity in the sedimentation unit (3) and the treated sewage get into water courses through the effluent and / or infiltrate into the porous soil. The settled sludge will be released by a pump into the non-aerated compartment.

The small amount of sediment sludge at the bottom of the barrel is needed to remove only once a year.



### MORE INFORMATION

[www.balatonregion.hu/szennyviz](http://www.balatonregion.hu/szennyviz)

<http://www.aquatec.hu/>

[http://www.senex.hu/szennyviztisztitok\\_forgalmazasa1.html](http://www.senex.hu/szennyviztisztitok_forgalmazasa1.html)

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