

WASTEWATER TREATMENT SYSTEM FOR ECOLOGICAL HOUSE

B.D. Zhukov, I. A. Ogorodnikov

Novosibirsk State Technical University, Marx prospect 20, 630092, Novosibirsk, Russia
Institute of Thermophysics of Siberian Branch of Academy of Science of Russia,
Lavrentyev prospect 1, 630090, Novosibirsk, Russia,

The present work presents practical development of key ideas of decentralized and ecologically reasonable system of clearing of home wastewater in conditions of Siberia presented in [1,2]. In their basis lay: separate processing of waters of different quality, their effective utilization and the use of natural technologies for wastewater treatment.

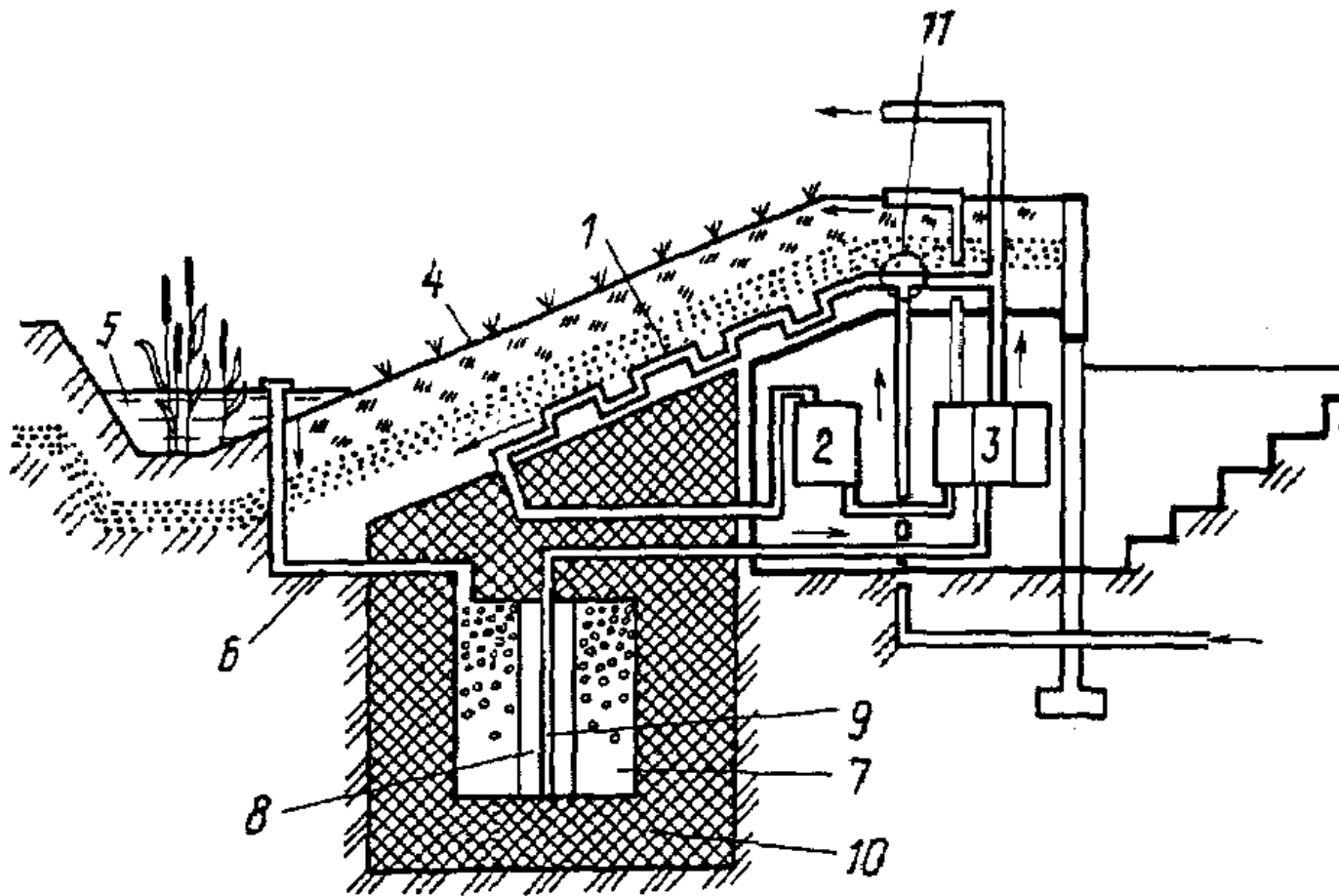
Structure of the system and cleaning process

The figure shows the overview of the system. After mechanical removal of rough particles wastewater flows in a filter - homogenizer, where floating particles and coarse-dispersion fraction are separated. Filtrate containing dissolved impurities is diluted by pure water from anaerobic filter-collector (7). Then it pass through heat exchanger (1), by the way of intermediate capacities units 2 and 3 to a sector of inclined soil plant filter (4) and saturate it. There are at least three sectors of soil plant filter. One of them is located in all-the-year-round greenhouse. Unit 2 serves for optimization of temperature regime of soil - plant –filter. Unit 3 serves for optimization of water feeding of soil – plant filter. After that water passes to a trench with aquatic plant (5). At present we choose mainly between willow, cane and reed. A part of water is evaporated during processing on soil –plant filter and trench with aquatic plant (5). Outflow from the trench (6) is collected in the anaerobic filter-collector (7), which is inside a heat accumulator (10). Treated water pass chamber (8). Then it is conveyed by pump (9) through the intermediate capacity (3) to another sector of the soil–plant filter (4). After that the cycle begins anew. The block (11) automatically reallocates water flow between the heat exchanger and the soil- plant filter.

Water is discharged periodically. This allows intermittent drying of the soil-plant filter. During processing water undergoes conditioning. In the filter - homogenizer it is diluted by purified water and alkalized (first stage conditioning). At the second stage small water portions are mixed with large masses of water, which circulate between soil- plant filter, trench with aquatic plants¹ and the anaerobic filter-collector. If necessary purified water may be detoxicated by UV-irradiation with the help of apparatus described in [3].

Warm wastewater flows in heat exchanger. It makes warm the soil-plant filter and the upper part of the anaerobic biofilter that is constructed as a part of underground heat accumulator. The size of anaerobic biofilter equals water volume consumed in the house for about ten days. It provides sufficient long time for processing of drains.

In winter the processing and utilization of water is carried out mainly on the basis of filter homogenizer and the soil-plant filter section, which are located in warmed building compactly placed in the effective zone of ground heat accumulator. Excess of water gathers in trench 5.



Theoretical fundamentals of clearing

In the device the following natural processes of water clearing are combined:

- Dilution in the process of conditioning.
- Filtering in a soil stratum.
- Processing of water in an anaerobic biofilter.
- Hydrobotanical processing of water in trench with aquatic plants.

Water conditioning in a filter - homogenizer pursues the purpose to obtain water of homogeneous composition acceptable for further processing on soil- plant filter.

A multiple circulation within the chain of soil-plant filter – the trench with water vegetation - drainage channel -anaerobic filter - collector achieves the efficiency of clearing.

As the system has rather increased moisture capacity it optimize the conditioning on the second stage. Wastewater is processing and utilizing with the help of natural processes directly on site. This makes no need in chemical reagents or outside water drain and provide minimum effect to environment. At the same time for some groups of people the system may serve a part of complex, which produce green forage for animal industries and agricultural production for people in winter.

Greenhouse, heat accumulator and wastewater treatment system represents the complex in which greenhouse may serve as an additional bloc of ground heat accumulator. It optimizes heat and water supply not only of greenhouses, but also apartment house.

This system for wastewater treatment can be utilized for clearing, salvaging and storage of wastewater. It can be built mainly for individual houses, entire communities, industries with biodegradable sewage (for example dairies, cheese factories, farms etc.). Whereas the clearing structures are placed partly in an all-year-round greenhouse it makes by their attractive to use in conditions of a cold climate.

Reference

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- [2] Zhukov B.D., Ogorodnikov I. A. The device for processing household wastewater. Patent of Russia N 2119894, C O2 F 3/30, 3/32, 1997 (In Russian).
- [3] Zhukov B.D., Lapshin A.I. The device for water processing and impurity control. Patent of Russia N 2118946, C O2 F 1/32, G 01 N 21/63, 1997 (In Russian).