中国环境科学学会

第二届全国水环境污染控制与生态修复技术高级研讨会
暨中国环境科学学会水环境分会2017年学术年会

主办单位：中国环境科学学会　中国环境科学研究院

2017年7月　中国 · 兰州

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论文集

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目录

Gentle Treatment for Small Sewage Discharges by a Catalytic Environmental System

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Abstract: The Plocher catalytic environmental system comprises of catalysts (either mineral powders or simple devices) which are being introduced into the water body to be treated. The catalysts do not react themselves but they help the inherent water regeneration factors for example aerobic bacteria to accomplish the objectives of treatment. The aim of this work was to provide a preliminary assessment of the catalytic treatment effects in small sewage flows against the treated effluent reuse standards for irrigation in Greece. An existing on-site sewage treatment facility in Northern Greece was selected and monitored by monthly sampling for one year. Monitoring results showed compliance with the current treated effluent irrigation reuse standards.

Keywords: Plocher, reuse, sewage, Catalytic Environmental System

Background

Treatment of sewage from single dwellings or small groups of houses in unsewered areas has traditionally been a challenge. A number of systems have successfully been implemented and stood the test of time. Septic tanks and small package plants are mainly used for the treatment of small flows[1]. Alternative systems frequently in use are constructed wetlands in a number of configurations: vertical flow, horizontal flow, aerated beds and other.

In this short report a novel approach is presented based on the ROLAND PLOCHER® integral-technik a "catalytic environmental system" from Germany. It has been in the market for 37 years now; the specific component related to sewage treatment is in use since 2010. Earlier reports on the system can be found in BioCycle [2,3].

System description

The specific application for the treatment of small sewage flows is similar to a septic tank (see Figure 1). The tank is divided into four compartments. In the first section sedimentation-sludge settling and accumulation takes place. In the last section the treated effluent is temporarily stored and pumped for irrigation.

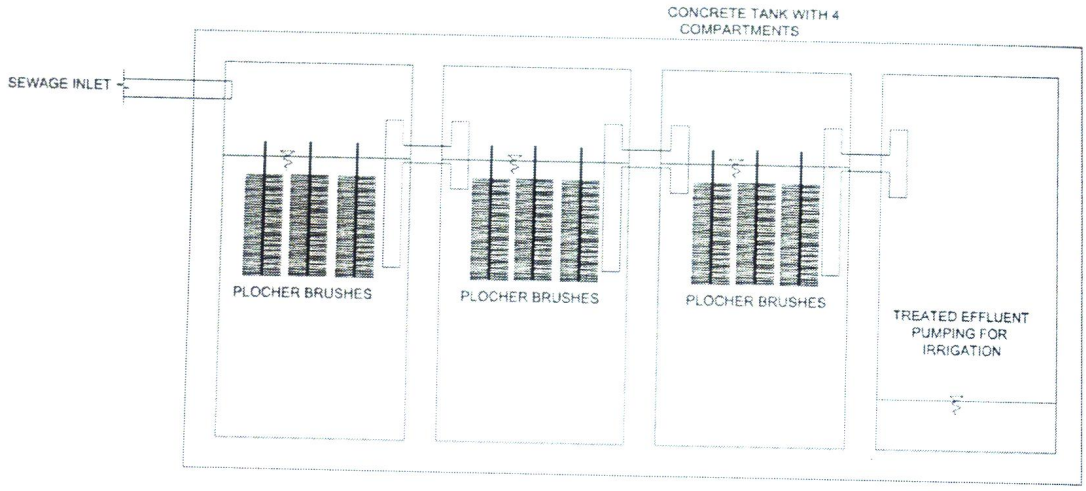
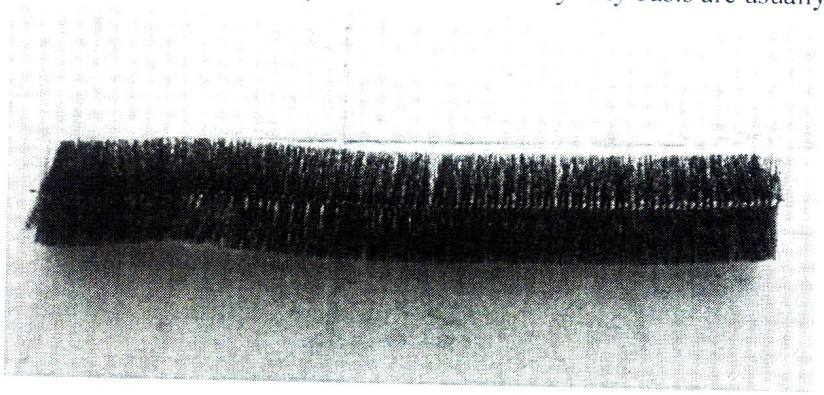


Figure 1. Home Sewage Treatment Unit

Each compartment is equipped with a few "Plocher brushes". They are made of polyethylene fibers attached to a twisted galvanized wire forming a cylinder shape. The length of the brush is 1000mm and its diameter is 140mm. The brush is shown in the photo below in horizontal position.

Sludge stabilization and digestion is achieved by adding Plocher-ak in the first compartment, a product in calcium carbonate powder form designed for solids humification. Plocher-ak is added to keep ORP to positive values and thus promote aerobic decomposition of the settled solids to CO_2, water and inert solids. A few cups of Plocher-ak on a yearly basis are usually sufficient.



The brushes are effectively promoting aerobic activity in the effluent which is observed by the steady ORP values. Treated effluent is pumped for drip irrigation of garden ornamental plants. No smells are noticed in the treated effluent.

Monitoring of a small Sewage Treatment Facility

A small home sewage unit in Northern Greece serving a single dwelling has been monitored for one year. Monthly treated effluent samples were collected and analyzed. ORP levels have been measured on site. Performance of the system has been encouraging and further research is justified. ORP levels varied from -220mV to +115mV. Suspended solids in the effluent ranged from 9 to 32mg/L with 70% of the samples <20mg/L. COD values ranged from 10 to 67mg/L.

Microbiological quality has been followed by testing for *E.Coli*. Bacterial levels were determined to be from 110 to $24*10^3$ CFU/100mL. Testing for *Salmonella Spp.* has been added in the last four months as an additional safety factor. All four samples were tested negative for *Salmonella Spp.* It has been observed that positive ORP values correlated with low *E.Coli* levels

(less than 1000CFU/100mL).

This specific relationship ORP to bacterial levels has been verified over long time as a characteristic of the Plocher System. It is simple for the homeowners to purchase and use a relatively inexpensive portable ORP meter and test their effluent quality. Maintenance of the system consists of once or twice a year hosing the brushes with clean water to remove any settled solids. Emptying of the (mainly inert) sludge is required on a timescale of once in 5 to 10 years.

Effluent Recycling Regulations

Treated effluent recycling standards have been introduced in Greece relatively recently in 2011. A small system like the one presented here falls in the *Restricted Reuse* category of the Treated Effluent Regulations ([4]) and it is required to perform as close as practicable to the European Council Directive 91/271/EEC effluent quality standards. No contact of end users with the treated effluent is permitted. The reused effluent should be applied to non-edible plants.

The specific requirements of the 91/271/EEC Directive are COD 125mg/L, SS 35mg/L. Twelve samples should be taken in the first year of operation; sampling frequency can be reduced following compliance. Allowable microbial levels for these small systems by the 2011 Treated Effluent Regulations are *E.Coli* <1000CFU/100mL.

Conclusions

Overall system performance is acceptable given that effluent is drip irrigated to non-edible (ornamental) plants. Non-contact of the public with the effluent is practically achieved. System performance can be easily improved by either adding more brushes and/or more Plocher-ak. Operational requirements are minimal, simple and inexpensive.

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