

Treatment of domestic sewage at Akuse (Ghana)

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Abstract

Waste stabilisation ponds are used to treat sewage from the Akuse township. Akuse is located in the Eastern Region of Ghana with a population of about 3 000 people. The whole township has been seweraged and the domestic sewage is treated in a series of four waste stabilisation ponds consisting of facultative and maturation processes.

The flow rates of both raw and final sewage effluents are about 570 m³/d. The weak raw sewage has a BOD and faecal coliform count per 100 ml of less than 100 mg/l and 5 900 000 counts per 100 ml respectively. The final effluent is discharged into the Lower Volta River. The ponds achieve BOD reduction of about 65% and the faecal coliform removal efficiency is about 99.99%. The reduction in suspended solids by the ponds is about 46%. The ammonia and phosphate concentrations of the raw effluent are reduced by about 92% and 94% respectively by the ponds.

Under Ghanaian tropical conditions the waste stabilisation ponds have been found to be more suitable and appropriate compared to conventional treatment systems, i.e. trickling filters and activated sludge, because of the ease of operation and maintenance and the high level of treatment efficiencies they are able to achieve.

The trend now is to adopt waste stabilisation ponds to replace conventional treatment facilities especially in localities where the cost of maintenance and operation of the conventional facilities seem to be excessive.

Introduction

Background

Usage of waste stabilisation ponds for treatment of seweraged wastewaters can be found in over fifty countries with very different climatic conditions ranging from tropical to temperate climates. A great number of these ponds can be found in Asia, Latin America and Africa (Arceivala, 1981).

In Ghana the common treatment technologies adopted for domestic sewage treatment are trickling filters, activated sludge and waste stabilisation ponds.

The waste stabilisation ponds installed in some of the towns and communities in Ghana have performed remarkably well. Some of the places where the waste stabilisation ponds can be found include Akuse, Akosombo and Kumasi.

Akuse is located in the Eastern Region of Ghana and has a population of about 3 000 people. It has a tropical climate with monthly average rainfall ranging from 13.7 mm to 195.9 mm with a mean of 95.7 mm. The monthly average temperatures are between 25.9°C and 29.1°C with a mean of 27.5°C, while the monthly average evaporation is between 4.9 and 6.6 mm with a mean of 5.1 mm.

Akosombo township is seweraged and waste stabilisation ponds are used to treat the sewage. The waste stabilisation ponds are managed by the Estate Department, Volta River Authority. The seweraged wastewater at Akuse is treated in a series of four waste stabilisation ponds consisting of a facultative and a maturation process. The surface area of the four ponds is in the region of 15 000 m² with a retention time of about 40 d. The discharge rate of the final effluent is about 570 m³/d. The final effluent is discharged into the lower Volta River. The ponds have high fish

proliferation which may be the cause of minimal mosquito or insect nuisance usually common with waste stabilisation ponds.

Objective of the study

The objective of the study is to investigate the treatment of domestic sewage and also evaluate the efficiencies of the treatment ponds at Akuse.

Methodology

Samples were taken of the raw sewage, Pond 1, Pond 2, Pond 3 and the final pond effluent. Samples were taken on six different days and seasons over a period of three years. Standard sampling methods were used. The temperature, pH and conductivity of the samples were measured *in situ*.

Standard methods for the examination of water and wastewater were followed (*Standard Methods*, 1995)

Results and discussions

The treatment performance of the ponds was assessed based on the following considerations, namely:

- suspended solids (SS) removal;
- organic matter removal (BOD);
- nutrient removal (ammonia, nitrate, phosphate); and
- micro-organisms removal.

The summary of the laboratory results is given in Table 1.

SS removal

The discharge of effluents with high SS concentrations can cause sludge depositions and anaerobic conditions in the receiving water body.

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