TÍTULO DEL TRABAJO

"Integrated aerobe treatment of sludge and wastewater in compact wetlands for small communities of the mountainous regions of southern Spain"

TÍTULO RESUMIDO

Integrated sludge and waste water treatment in compact wetlands

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INTEGRATED AEROBE TREATMENT OF SLUDGE AND WASTEWATER IN COMPACT WETLANDS FOR SMALL COMMUNITIES OF THE MOUNTAINOUS REGIONS OF SOUTHERN SPAIN

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SUMMARY
According to German experiences with subsurface flow constructed wetlands sufficient pre treatment is essential. Usually this is done with rather large ponds or Imhoff´s tanks for settlement of the suspended solids. This is quite effective but sometimes expensive, especially in mountainous regions. On the other hand the sludge of small settling units has to be post treated for further agricultural use.

At Albondón, Costa Tropical de Granada, now there has been built a compact integrated system for treatment of raw wastewater based upon experiences in France.

The treatment plant consists in two steps: first step for combined filtering of sludge and suspended solids and reduction of COD, second step for further reduction of COD and particular nitrification.

Due to the combination of sludge treatment and wastewater purification in one plant the amount of needed area is very small, which is a an advantage especially in mountainous regions like south of Spain.

KEYWORDS: red bed filter

Tratamiento integrado de aguas residuales y lodos en humedales artificiales compactos para pequeñas comunidades en las regiones montañosas del sur de España.

RESUMEN
Según experiencias en Alemania con humedales artificiales del flujo subsuperficial un pretratamiento es necesario. Normalmente usan lagunas de sedimentación ó Tanque Imhoff para la sedimentación de sustancias sólidas. Estos sistemas funcionan con grande eficiencia pero son caro también, especialmente en regiones montañosas.

En Albondón, Costa Tropical de Granada, construyeron una planta compacta con tratamiento para agua cruda basada en experiencias en Francia.

La estación depuradora funciona con dos etapas: la primera es una combinación entre filtración de lodos y sólidas y reducción de DQO, la segunda etapa es para reducir mas el DQO y para nitrificación en parte.

A causa de la combinación del tratamiento de lodos y aguas servidos en una sola planta, el área necesaria es poco, una ventaja grande en regiones montañosos, como en el sur de España.

PALABRAS CLAVES: lodo

1. INTRODUCTION

Constructed wetlands with subsurface flow are constructed using a pre treatment, such like a lagoon or sedimentation tank e.g. Imhoff Tank. In both cases a further treatment for sludge dewatering and drying is necessary. Pre treatment and sludge treatment causes an additional need of area, construction and maintenance. Experiences in France, mainly made by SINT (Société d'Ingénierie Nature et Technique), show that a combination of sludge treatment and waste water treatment is feasible in constructed wetlands receiving raw waste water.

Based on these experiences (and in cooperation with SINT) AKUT now has built a compact integrated system for treatment of raw wastewater at the small town of Albondón, Costa Tropical de Granada. The design was made for about 800 inhabitants connected.

2. GENEREL CONFIGURATIONS

The plant consists of 2 stages of filters: Stage I of type A filters, followed by a stage II of type B filters. Stage I is divided into three units operating independently. Stage II operates with two units. Each primary stage unit receives the full organic load during the feeding phase, which lasts a number of days prior to being rested for twice this time.

For retaining large-size particles (> 1 cm) there is a self-cleaning screen. The self-cleaning system with rotating brushes is powered by solar energy.

Wastewater is supplied to the filters in hydraulic batches by storage and self-priming siphons. This ensures optimum distribution of wastewater, and as well suspended solids on stage I filters, over the completely available filter area and improves oxygen renewal between each batch feed due to convection induced by water movements. These alternating phases of feed and rest are fundamental to control the growth of the settled biomass on the filter material especially on stage I, to mineralise the organic deposits and to maintain aerobic conditions within the filter bed.

To alternate feeding in between the units, there is just after the siphon a distribution installation which has to be operated manually.

The effluent of stage I is then sent to stage II, where it is subjected to further treatment and, in particular, the nitrification of nitrogen compounds. For alternate and batch feeding there is a second siphon and distribution installation.

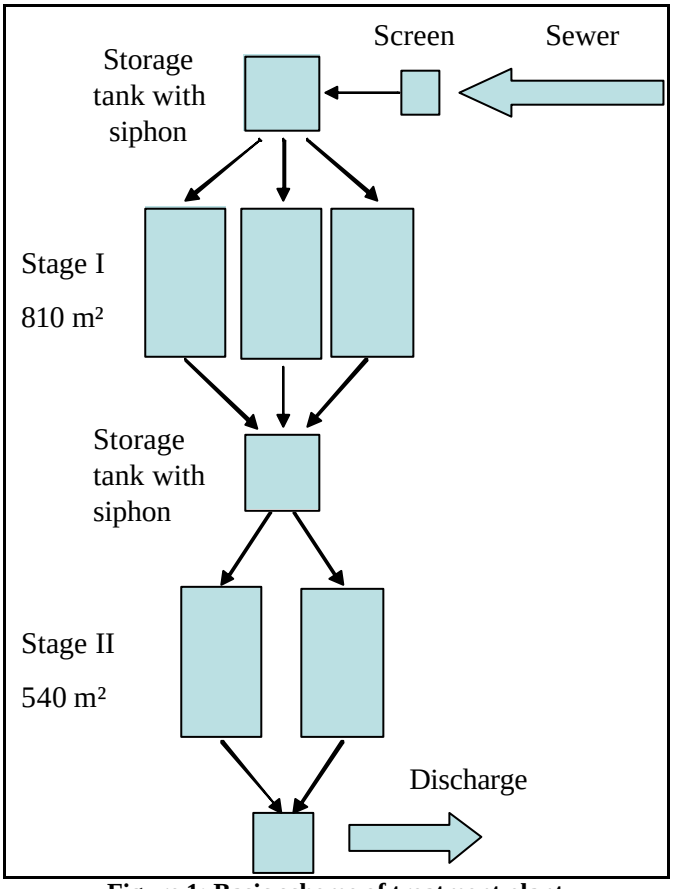

Figure 1: Basic scheme of treatment plant

3. DESIGN OF THE PLANT

The COD-load which had to be taken into account was estimated with about 70 kg per day.

The daily hydraulic volume is 75 m³. Given effluent limits for COD which has to be fulfilled are 125 mg/l. Under this conditions the stage I area has to be 810 m² divided into three units with 270 m² each. The stage II has an area of 540 m² divided into two units.

The plant is situated in south of the connected city on a slope. This causes construction with concrete walls to border the filter units. For water proof there is a waterproof foil of 1,5 mm.

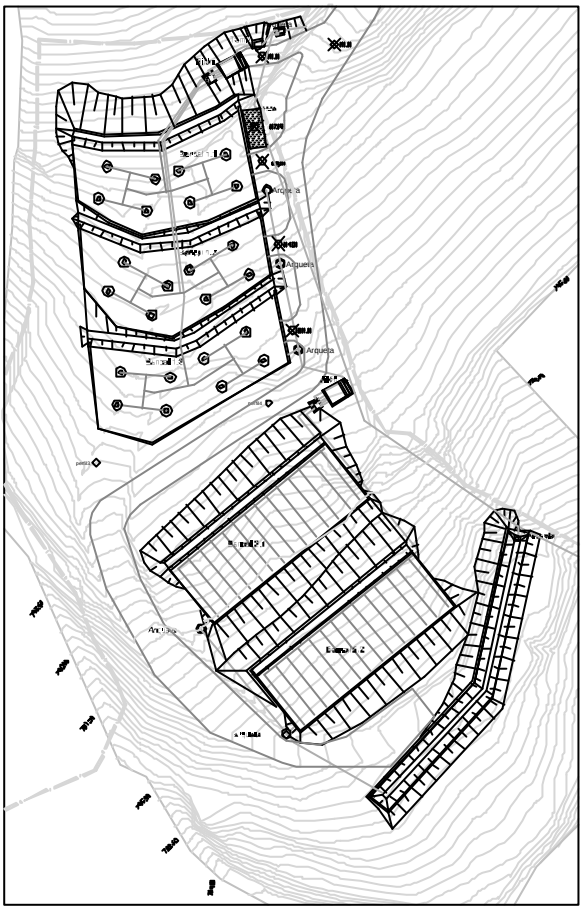

Figure 2: Plan of treatment plant

4. TREATMENT OF SLUDGE

Primary sludge accumulates on stage I. Due to these alternating phases of feed and rest the settled biomass on the filter is drying and mineralising. Reed stems growing from rhizome nodes break through accumulated organic deposits and thereby ensure a declogging effect.

Due to experiences in France the accumulation rate can be estimated with less than 2 cm per year. Every 10 years the sludge layer has to be removed.

5. CONCLUSIONS

The combination of sludge and waste water treatment allows to construct an artificial wetland with subsurface flow with about 2 m² per inhabitant which fits into the special requirements of the steep terrain.

6. REFERENCES

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