ATTACHED GROWTH DENITRIFICATION SYSTEM (SIDECA)

David Miguel Seisdedos[1], Sergio Alonso Hernández[1], Eulalia Durán Fernández[2], Ricard García Cudinach[2], Ignacio Sangüesa Roger[3],Ignacio Bernacer Bonora[4], Jose Antonio Basiero Sichet[4] , Jose Juan Morenilla Martínez[4], Carlos Ferrer Torregrosa[1].

[1] **FACSA:** Mayor 82-84, 12001 Castellón. Tel.: 964 221 008, Fax: 964 727 150; Correo-e: cferrer@facsa.com, Internet: www.facsa.com

[2] **DEISA:** Avda. Roma, 25-27; 08029 Barcelona. Tel: 934286800, Fax: 934286851; Correo-e: deisa@deisa.es, Internet: www.deisa.es

[3] **DIPUTACIÓN PROVINCIAL DE CASTELLÓN:** Plaza Aulas,1. 12001 Castellón. Tel: 964349600. Internet: www.dipcas.es

[4] **EPSAR:** Mayor 82-84, 12001 Castellón

Summary

Secondary treatment based on fixed-film or attached growth including rotating biological contractors (RBC) in small and middle-size towns is effective to eliminate the organic material, however it is not the most adequate method to eliminate nitrogen and phosphor.
To avoid this issue and obtain values according to the current legislation, a system called SIDECA has been designed. It consists in combining a secondary treatment based on attached growth, consisting in an anoxic reactor with fluidized bed technology, as a previous step complementary to the attached growth treatment

Key words

SIDECA, denitrification, attached growth, fluized bed, biodisc.

Introduction

Rotating Biological Contractors are characterized by the stability given to sewage treatment processes and its low operation cost, for these reasons it is an ideal technique in contrast to other technologies. It also allows higher rates of organic material elimination; nevertheless denitrification results are not as acceptable yet.
As a solution, the new system has been developed from combining two systems: RBC to eliminate organic material and attached film set on fluidized bed, growing in anoxic conditions to improve denitrification.

This installation not only assures the accomplishment of EU Directive 91/271/CEE, but also increases the conventional CBR system strength and capacity.

Method

The SIDECA pilot plant was designed for a 20m3/day flow, with an average load rate of 300 ppm BOD5 and 40ppm of Total Nitrogen. The outfall was adapted to Directive 91/2717CEE regulations.
The samples were taken in several locations: intake, effluent, anoxic tank and CBR recirculation effluent, and discharge. Samples were analyzed in Iprona laboratories, which accredited by ENAC.

Results

The study was divided in five stages:
Firstly, the CBR was arranged to reach the stationary status in order to reach the requirements included in the Directive 91/271/CEE.
-Phase I: Stationary Status efficiency: Nitrogen elimination improves through the use of an anoxic reactor (fast bacterial growth).
-Phase II: Study of the system behavior in overflow conditions: to check the strength of the system.
-Phase III: Study of the system behavior in organic overload conditions; using high amounts of organic material over the initial design-values (8g BOD5/m2d).
-Phase IV: Study of the system behavior in ammonium overload conditions, added in influent sewage water.
-Phase V: Analysis of the system efficiency without the fluidized bed, in order to check its effect on nitrogen elimination.

The table below shows the efficiency reached in every phase:

FASE	AVERAGED EFFICIENCY					
	N	DQO (%)	N	N_T (%)	N	NH_4 (%)
II	27	87,0	27	78,0	52	97,0
III	71	86,7	72	63,8	84	94,9
IV	7	88,5	5	59,2	16	94,7
V	17	87,8	18	50,9	18	97,9
VI	14	81,0	16	51,0	16	95,0

Table 1.- Efficiency phases

The following graphs illustrate the results:

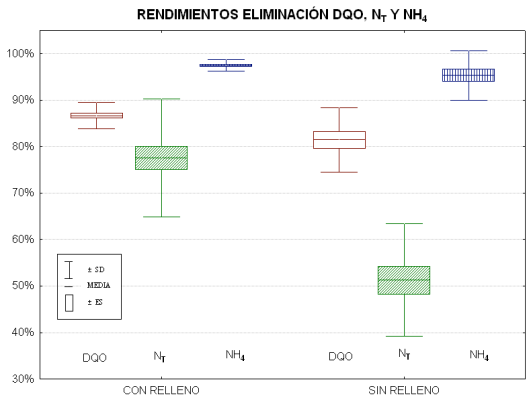

Figura 1.– Compared efficciency

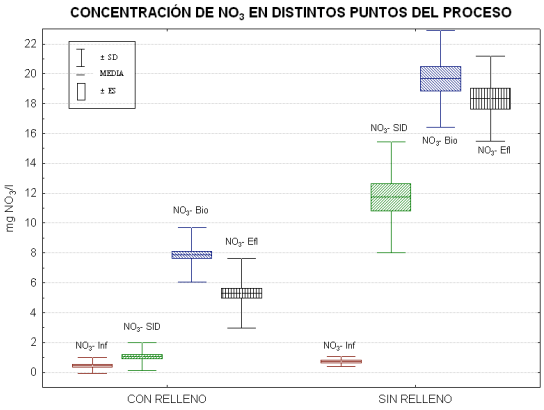

Figura 2.– Compared concentration

As shown in figure 1, the organic material elimination values (DQO) reached with SIDECA are slightly higher than the CBR ones. In regard of nitrification process, both systems achieve excellent results, but SIDECA raises lightly higher levels, as well as in denitrification processes. Consequently, it can be said that the SIDECA increases considerably nitrogen elimination (70–80% of total values).

Over the summer period as increased pressure is inflicted on the system due to a larger population?? tourists ect??

Conclusions

In conclusion, SIDECA process intensifies biologically the nitrogen elimination capacity in CBR-based wastewater treatment systems, enough to reach the officially permitted values to allow discharging in sensitive receiving environments. In addition, it is important to notE the synergic effect on organic material elimination, as it intensifies the stability in overcharging conditions, both hydraulic and organic, which usually take place in small-sized with towns over the summer period as increased pressure is inflicted on the system due to a larger population.

References

C. Ferrer, I, Sangüesa, E. Bécares, J.A. Llopis (2007). ''La depuración en pequeños municipios de Castellón''. Facsa y Diputación de Castellón. Castellón.

C. Ferrer, D. Miguel, L. Ferrer (2008) ''Analísis comparativo entre tratamiento de aguas residual de pequeñas poblaciones de la provincia de castellón'' Tecnología del Agua / 294

E.P.A ''Rotating biological contactors checklist for a trouble – free facility''

Metcalf and Eddy. '' Wastewater engineering (treatment, disposal andreuse). Third edition.

J. García, R. Mujeriego, J.M Obis. (2001) ''Wastewater treatment for small communities in catalonia (mediterranean region) Water policy: Oficial journal of the world water

M. Henze, (1992). ''Characterisation of wastewater for modelling of activated sludge processes''. Wat. Sci

M. Henze, P. Harremoës, J. La Cour Jansen and E. Arvin, (1997). ''Wastewater treatment''. Springer, Berlin.

N. Schmitt, Ricard García y J. Dalmau, (2005) ''Biodiscos, una tecnología para la depuración de pequeños núcleos de población'', Tecnologia del Agua / 256

R.L Antonie, (1972) ''Factors affecting bod removal and nitrificacion in the bio-disc process'' central states water poll. Control assoc. Annual meeting, Milwaukee.

W.W Eckenfelder, (1980) ''Principles of water quality management'' Bi publishing company, Inc. Boston.