Vol. 3, No. 1, 1-10, 2010
ISSN 0718-378X

REVISTA AIDIS

de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica.

TRATAMIENTO BIOLÓGICO CON BIOMASA SUSPENDIDA ANAEROBIO/AEROBIO DE UN AGUA REAL TEXTILERA CON COLORANTE AZO

Ana Cecília Tomasini Ortiz [1] *
Gabriela Eleonor Moeller Chávez [1]

BIOLOGICAL TREATMENT WITH SUSPENDED ANAEROBIC/AEROBIC BIOMASS OF A REAL TEXTILE WASTEWATER WITH AZO DYES

ABSTRACT

Wastewater treatment from dyes of textile industry is a great environmental problem, to which a lot of attention has been given because many of this products used for dying in the textile industry are toxic. Such is de case of azo dyes, most of them are toxic and non-biodegradable and they are discharged to water bodies and channels with no change in there structure and remaining for long periods in the stream.

As a pretreatment to this wastewater a coagulation – flocculation process was applied and then a sequenced anaerobic + aerobic + granular activated carbon (GAC), using the last step as a polish treatment. Global COD removal efficiency of 92% was achieved (21% for the anaerobic step, 79% for global anaerobic + aerobic step and 92% for the anaerobic + aerobic + GAC). Related to color removal this had 97% removal efficiency. For BOD5 a 74% removal was achieved for the anaerobic step, and a 89% for the anaerobic + aerobic step and 98% efficiency was achieved for the global process. For TOC the removal efficiency achieved for the anaerobic effluent was 53% and 78% for the anaerobic + aerobic stage and 98% for the global process (anaerobic + aerobic + GAC).

Related to the toxicity test, this was measured by Vibrio fischerii, Daphnia magna and Selenastrun capricornutum bioassays.

Toxicity results were different depending on the used bioassay. Using Vibrio fischerii the measured toxicity was high, after GAC filtration the toxicity was not detected. Using Daphnia magna the results reported moderate toxicity for the influent and anaerobic effluent. Toxicity was not detected after the aerobic treatment and also for the global sequenced treatment. For Selenastrum capricornutum moderate toxicity was reported for the influent and anaerobic effluent, not toxicity was detected for the anaerobic + aerobic effluent, and for the global sequenced process (anaerobic + aerobic + GAC) a moderate toxicity was reported.

Key Words: Azo dyes, biologic treatment, flocculation, toxicity.

[1] Instituto Mexicano de Tecnología del Agua

* *Contact* Instituto Mexicano de Tecnología del Agua, Paseo Cuauhnáhuac Nº 8532, Progreso, Jiutepec, Mor. C.P.62550, México. 52(777)329-36-00, ext. 377; FAX. 52(777)329-36-63; mail: atomasini@tlaloc.imta.mx; gmoeller@tlaloc.imta.mx

Vol. 3, No. 1, 11-21, 2010
ISSN 0718-378X

REVISTA AIDIS

de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica.

AVALIAÇÃO DA INFLUÊNCIA DO TEMPO DE DETENÇÃO HIDRÁULICA E DA TAXA DE APLICAÇÃO SUPERFICIAL NA COMPOSIÇÃO DA COMUNIDADE FITOPLANCTÔNICA PRESENTE EM LAGOAS DE POLIMENTO E A INFLUÊNCIA DESSA COMUNIDADE NAS CONDIÇÕES AMBIENTAIS (pH, OD e amônia) DAS LAGOAS

Marcos von Sperling [1] *
Carolina Moreira Oliveira [1]

EVALUATION OF THE INFLUENCE OF HRT AND SUPERFICIAL LOADING RATE ON THE FITOPLANTONIC COMMUNITY COMPOSITION PRESENT IN WETLANDS AND THE INFLUENCE OF SUCH COMMUNITIES ON ENVIRONMENTAL CONDITIONS ON WETLANDS

ABSTRACT

O presente estudo investiga a influência do tempo de detenção hidráulica (TDH) e da taxa de aplicação superficial (TAS) na composição da comunidade fitoplanctônica presente em lagoas de polimento, além da influência dessa comunidade nas condições ambientais dessas lagoas. A pesquisa foi desenvolvida na ETE Experimental UFMG/COPASA, em escala de demonstração, localizada em Belo Horizonte, Brasil. O aparato experimental consistia de um reator UASB, quatro lagoas de polimento e dois filtros de pedra, sendo que as lagoas 1 e 2 operaram em série e as lagoas 3 e 4 em paralelo. Foram realizadas análises físico-químicas de DBO (total) para o cálculo da taxa de aplicação superficial, nitrogênio amoniacal para cálculo de amônia livre, clorofila a e qualitativo e quantitativo de algas, além de medições de pH e OD. Durante todo o período de estudo, as classes de algas que se mostraram dominantes foram as clorofíceas e euglenofíceas. Com a mudança de fase e conseqüente elevação da TAS nas lagoas 3 e 4 houve uma diminuição de Scenedesmus e aumento de Chlamydomonas, bem como o surgimento dos gêneros Trachelomonas, Phacus e Euglena. Com a redução do TDH, esse trabalho apontou também a diminuição de Chlorococcales, Cryptomonas e o desaparecimento de Closterium, além do aumento de Micractinium, Chlorogonium e Mallomonas. O pH, o OD e a amônia parecem confirmar a existência de uma forte relação com a atividade biológica exercida pelas algas presentes ao longo do sistema de lagoas.

Palavras-chave: fitoplâncton, lagoas de polimento, tratamento de esgotos

[1] Departament of Sanitary and Environmenatl, Federal University of Minas Gerais

* *Contact* Av. do Contorno 842 – 7º andar – Belo Horizonte – Brazil – 30110-060 – Tel: (55-31) 3409-1935 – e-mail: marcos@desa.ufmg.br

Vol. 3, No. 1, 22-35, 2010
ISSN 0718-378X

REVISTA AIDIS

de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica.

TRATAMIENTO DE COLORANTES TIPO AZO POR MEDIO DE UN PROCESO FOTOCATALÍTICO

Dorian Prato Garcia [1]
Jaime Pérez Trevilla [1]
Germán Buitrón Méndez [1]*

AZO DYES TREATMENT WITH PHOTOCATALYTIC PROCESS

ABSTRACT

By using advanced oxidation processes assisted by solar radiation in CPC (Compound Parabolic Concentrator) reactors it was possible the decolourisation (98%) of the azo dyes acid red 151 (AR151), acid orange 7 (AO7) and acid blue 113 (AB113). The dose of Fenton reagent was determined through a central composite design and by using response surface methodologies. The experimental strategy allowed the reduction of the reagent dose up to 40%, providing even the same decolourisation percentages as well as the generation of potentially biodegradable effluent.

Key words: Azo, optimization, photo-Fenton, response surface, solar collector

[1] Instituto de Ingeniería, UNAM. Campus Juriquilla.

Contact Instituto de Ingeniería, Universidad Nacional Autónoma de México (UNAM). Laboratorio de Investigación en Procesos Avanzados para el Tratamiento de Aguas, Campus Juriquilla. Blvd. Juriquilla 3001, 76230 Querétaro, QRO., México.
e-mail: GBuitronM@ii.unam.mx

Vol. 3, No. 1, 36-48, 2010
ISSN 0718-378X

REVISTA AIDIS

de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica.

AVALIAÇÂO DA QUALIDADE DE ÁGUAS CINZAS SINTÉTICAS, DURANTE ARMAZENAMENTO

Eduardo Cohim [1] *
Asher Kiperstok [1]
Vitor Gaudêncio de Andrade Passos [1]
Ana Cristina Bomfim Peixoto [1]

EVALUATION OF SYNTHETIC GREYWATER QUALITY DURING STORAGE

ABSTRACT

The reuse of greywater (GW) is a promising option for more sustainable management of water resources. In a reuse system, usually the production and consumption of water occur at different times, which may imply the need for a storage tank prior to treatment step. This study aims to evaluate changes in quality of synthetic greywater (SGW), stored at home. Were also studied GW bathroom and washing machine. Another goal is the calibration of a formulation for SGW, found in a British publication, in order to achieve greater representation of Brazilian reality. The CA storage showed rapid depletion of the DO levels below 1 mg/L, accompanied by increase in reducing character of the medium. In some samples, growth was observed between densities of fecal coliform since day 1 of storage. The synthetic calibrated formulation provided a good fit to the tracks target pre-set to their physicochemical and microbiological contaminants.

Keywords: Greywater, Reuse, Environmental Sanitation, Ecological Sanitation, Water Sustainability.

[1] TECLIM, Departamento de Engenharia Ambiental, (EP/UFBA).

* *Contact* Rua Aristidis Novis, 02, 4º andar - Federação - Salvador - Bahia - CEP: 40210-630 - Brasil - Tel: +55 (71) 3283-9892/9860 - e-mail: ecohim@ufba.br

Vol. 3, No. 1, 49-61, 2010
ISSN 0718-378X

REVISTA AIDIS

de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica.

EFICIÊNCIA SANITÁRIA DE FILTROS ANAERÓBIOS AVALIADA EM FUNÇÃO DA REMOÇÃO DE OVOS DE VERMES E COLIFORMES FECAIS

Fernanda Lima Cavalcante [1] *
Cícero Onofre de Andrade Neto [1]
André Luis Calado Araújo [1]
Henio Normando de Souza Melo [1]

SANITARY EFFICIENCY OF ANAEROBIC FILTERS IN REMOVAL WORMS EGGS AND FAECAL COLIFORMS

ABSTRACT

The technology of anaerobic reactors for sanitary wastewater treatment has been extensively developed in Brazil.They present several advantages, such as low construction and operating costs, and low sludge production, the anaerobic reactors are an attractive alternative to minimize problematic lack of basic sanitation in urban areas, and also of the rural areas. The anaerobic filters have been widely used in Brazil. It produces an effluent with low concentration of organic matter and solids suspended, besides conserving the nutrients, therefore, it is good for use in irrigation, but the practice must be associated with knowledge of the pathogens presence. The main objective of this study was to evaluate the efficiency of anaerobic filters in removal faecal coliforms and helminth eggs, about to that, three different systems of sewer treatment composed by anaerobic filters were analyzed. The protocol used to enumerate helminths eggs was the modified Bailenger method, (Ayres and Mara, 1996) recommended by WHO for evaluation of raw effluent and treated effluent.The membrane filtration method was utilized to determine the concentrations of faecal coliforms. The results, in a general analysis, showed that all the researched systems reached a larger removal than 93% to helminth eggs, resulting in an effluent with smaller average than 1 egg/L. One of these systems, Sistema RN, reached a larger removal than 99%, confirming the good performance of the anaerobic filters in removal helminths eggs. Even with low concentrations of eggs in the influent, the filters were able to effectively remove this parameter, ensuring a satisfactory result because it is a cheap and simple reactor of the viewpoint operational and maintenance, and has a significant health response. About faecal coliforms, it was observed for all the researched systems an effluent with 106 CFU/100mL .Even the filters not having made a good efficiency on removal of faecal coliform, the effluent of them showed low concentrations of suspended solids which is to facilitate the processes of disinfection by chlorine or UV.

Key-Words: anaerobic filters, faecal coliforms, helminth eggs, wastewater treatment.

[1] Universidade Federal do Rio Grande do Norte – UFRN.

* *Contact* Campus Universitário/LARHISA/CT, Lagoa Nova. CEP 59072-970. Natal-RN/Brasil Telefone/Fax: ddi brasil(84) 3215-3775.
e-mail: fernandacatcho@yahoo.com.br

Vol. 3, No. 1, 62-73, 2010
ISSN 0718-378X

REVISTA AIDIS

de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica.

MONITORAMENTO DE REATOR HÍBRIDO EM BATELADAS SEQÜENCIAIS (RHBS) UTILIZANDO TESTES RESPIROMÉTRICOS

Luiz Gonzaga Lamego Neto [1] *
Jamile Wagner [1]
Anderson Marconi Holtz [1]
Rosane Hein de Campos [1]
Rejane Helena Ribeiro da Costa [1]

MONITORING OF A HYBRID SEQUENCING BATCH REACTOR BY RESPIROMETRY

ABSTRACT

This work studies the performance of a hybrid sequencing batch reactor (HSBR) in the treatment of domestic wastewater. The reactor's operation consisted of 3 daily cycles of 8 hours, with 3 step-feedings per cycle. The wastewater volume of each feeding was 180 L resulting in a total of 540 L treated wastewater per cycle. Nylon nets were used in the hybrid system as support material. Carbon degradation processes, nitrification-denitrification, and phosphorous biological removal were evaluated as well as the oxygen uptake rate by respirometry. The reactor presented average efficiencies of: 84 ± 8.8% for CODT removal; 78 ± 15% for nitrification; 94 ± 6.4% for denitrification; 45 ± 30% for PT removal; and 44 ± 31% for PO4-P removal. The average oxygen uptake rate (OUR) varied between 18.7 and 32.3 mgO2/L.h. The reactor's sludge consisted of well structured and compact flocs with good settleability; the biofilm was dense with the presence of many amoebas and rotifers in its surface.

Keywords: hybrid sequencing batch reactor, nutrients removal, respirometry, domestic wastewater treatment.

[1] Universidade Federal de Santa Catarina

* *Contact* Rua Professor Adriano Mosimann, 240 – Trindade – Florianópolis – Santa Catarina – CEP 88040-470 – Brasil Tel.:+55(48)23241828. e-mail: luizlamego@hotmail.com

Vol. 3, No. 1, 74-85, 2010
ISSN 0718-378X

REVISTA AIDIS

de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica.

METANO COMO FUENTE DE CARBONO Y ENERGÍA PARA LA DESNITRIFICACIÓN BIOLÓGICA DE AGUAS RESIDUALES

Margarita Elizabeth Cisneros Ortiz [1]
Adalberto Noyola Robles [1] *

METHANE AS CARBON SOURCE AND ENERGY FOR BIOLOGICAL WASTE WATER DENITRIFICATION

ABSTRACT

In Mexico, waste water treatment does not focus in the elimination of nutrients (nitrogen and phosphorous). Nevertheless, Mexican legislation, NOM-001-ECOL-1996 establishes maximum permissible limits of 40 total nitrogen mg/l for water discharged into receiving bodies (Diario Oficial de la Federación, 1997). In order to overcome this requirement, it is necessary to develop biological processes for nutrient removal. In the last 30 years, a limited number of works has been published where it is considered to use the methane as carbon source and energy in the biological denitrification. The reported works defer in their results leaving a filed for developing research studies on this subject, methane being the main by-product of anaerobic digestion. Biogas is an attractive option of cheap substrate capable of achieving reasonable rates of nitrate removal. In this study, methane was used as energy and carbon source for biological denitrification under anoxic conditions. During 152 days, a reactor with capacity of 2.5L was fed with synthetic (denitrifying) water and a concentration of 35 mg/l of N-NO3-. Pure methane (99.0%) was introduced to the system until reaching a partial pressure of 4.41lb/in2. Although the obtained denitrifying activity is low, 14.6g N-NO3-/g SSV*d (0.61g N-NO3-/g SSV*h) it may be concluded that it is feasible to use methane as carbon source and energy for wastewater desnitrification.

Palabras Clave: Anóxico, desnitrificación, metano, nitratos, tratamiento de aguas residuales.

[1] Instituto de Ingeniería, UNAM.

* *Contact* Circuito Escolar sin número Edificio 5, Cubículo 413. Ciudad Universitaria, Delegación Coyoacán, CP 04510, México, D.F. MEXICO. Coordinación de Bioprocesos e Ingeniería Ambiental, Instituto de Ingeniería, Universidad Nacional Autónoma de México. Tel (++) (525) 56 23 36 00 extensión 8700, Fax (++) (525) 56 16 27 98.
E-mail: mec@pumas.iingen.unam.mx y noyola@pumas.iingen.unam.mx

Vol. 3, No. 1, 86-96, 2010
ISSN 0718-378X

REVISTA AIDIS

de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica.

TECNOLOGÍAS NO CONVENCIONALES (INFILTRACIÓN-PERCOLACIÓN Y ZONAS HÚMEDAS CONSTRUIDAS) EN EL TRATAMIENTO DE AGUAS RESIDUALES

Mercedes Lucero Chávez [1] *
Esther Huertas Hidalgo [2]
Montserrat Folch Sánchez [3]
Miquel Salgot de Marçay [4]
José Antonio Sánchez Martínez [5]

NON CONVENTIONAL WASTEWATER TREATMENT TECHNOLOGIES (INFILTRACIÓN PERCOLATION AND CONSTRUCTED WETLANDS)

ABSTRACT

The use of non-conventional technologies for treating wastewater in small communities is in a stabilisation step at the autonoums region of Catalonia (Spain). This fact is a consequence of the advantages associated to this type of treatments (low building costs, low energetic requirements, easy to manage, etc.). This study presents the experience carried out at a Catalan municipality which treats its wastewater through two different types of natural systems (modified infiltration-percolation and constructed wetlands). During the research period, the population has grown up from 1,200 inhab-eq to 2,000 inhab-eq at the end of the study, consequently hydraulic load has increased and changes on the influent quality were observed. Results associated to modified infiltration-percolation show that the increment of hydraulic load influence on ammonia removal, nitrification percentage and disinfection capacity. In relation with constructed wetlands, organic matter removal is bigger when the system doesn't work in a continuum way (the bed is emptied after 5 days of functioning).

The aim of this work is, first of all, to determine the viability of natural treatments, specifically related to modified infiltration-percolation and constructed wetlands, in a small community which has increased its number of inhabitants and has produced a wastewater with different qualities. Besides, the influence of hydraulic and contaminant load are studied in order to find out their impact on treatment capacity of both natural systems.

Keywords: aguas residuales, infiltración percolación modificada, zonas húmedas construidas.

[1] Universidad Autónoma del Estado de México.
[2] Agencia Catalana para la Calidad Universitaria. Generalitat de Catalunya
[3] Facultad de Farmacia, UB. España
[4] Facultad de Farmacia, UB, España
[5] Empresa COPISA INFILCO

* *Contact* Facultad de Farmacia, UB. Laboratorio de Edafología. Av Joan XXIII s/n - Barcelona, España – 08028 Tel.: + 34(93)402-4494 – Fax: +34(93)402-4495. e-mail: mlucero@ub.edu

Vol. 3, No. 1, 97-107, 2010
ISSN 0718-378X

REVISTA AIDIS

de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica.

DINÂMICA DA QUALIDADE DA ÁGUA E DA COMUNIDADE PLANCTÔNICA EM LAGOAS DE POLIMENTO. ESTUDO DE CASO NO SUDESTE BRASILEIRO

R.K.X. Bastos [1]*
F.L. Dornelas [1]
E.N. Rios [1]
D.B.Ruas [1]
W.Y. Okano [1]

DYNAMICS OF WATER QUALITY AND PLANKTON COMMUNITY IN POLISHING PONDS. A CASE STUDY IN SOUTHEAST BRAZIL

ABSTRACT

A system of polishing ponds, as a post-treatment unit of a UASB + submerged aerated biofilter effluent (domestic wastewater) in Viçosa, Minas Gerais, Brazil, was analyzed with regard to the dynamics of the water quality, and the phytoplankton and zooplankton communities. The study included different geometric and hydraulic configurations of the pond system. Chlorella and Euglena were the dominant phytoplankton genera, whereas rotifers, cladocerans and copepods prevailed in the zooplankton community. In both cases, the gender dominance was associated with the position of the pond in the series and its water quality. The phytoplankton and zooplankton populations were inversely related, indicating grazing pressure of zooplankton on phytoplankton.

Palavras-chave: DBO, clorofila, fitoplâncton, nutrientes, zooplâncton.

[1] Universidade Federal de Viçosa

* *Contact* Universidade Federal de Viçosa, Departamento de Engenharia Civil. 36570-000, Viçosa-MG, Brasil.
E.mail: rkxb@ufv.br; filipedornelas@yahoo.com.br; enardotto@yahoo.com.br; diegoruas@yahoo.com.br

Vol. 3, No. 1, 108-119, 2010
ISSN 0718-378X

REVISTA AIDIS

de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica.

AVALIAÇÃO DAS ROTINAS OPERACIONAIS E DE MANUTENÇÃO EM REATORES UASB: O CASO DAS ESTAÇÕES DE TRATAMENTO DE ESGOTOS NO DISTRITO FEDERAL DO BRASIL

Ricardo Augusto Ramos [1] *
Klaus Dieter Neder [1]
Tarcísio dos Reis Queiroz [1]
Rogério Botelho de Paula [1]
Marco Antônio Almeida de Souza [2]

HANDLING CHARACTERIZATION OF UASB SLUDGE: SEWAGE WASTEWATER TREATMENT PLANTS OF THE FEDERAL DISTRICT (BRAZIL)

ABSTRACT

Operation and maintenance data of UASB reactors in the sewage treatment plants of the Federal District of Brazil are presented and analyzed. Efficiency aspects of preliminary treatment and sludge handling into the UASB reactors are presented. After evaluation of these units, it was verified that they operate with satisfactory removal efficiencies for COD, BOD and TSS. Although the UASB reactors present performance superior to the ones previewed in project, the reactors still need an appropriate sludge handling, requesting better strategies concerning the frequency of sludge discard and scum removal. Possible causes for the observed problems are analyzed and measures for their solution are discussed.

Key Words: sewage, scum, sludge, UASB, UASB reactors.

[1] Caesb, DF.
[2] PTARH, UnB.

* *Contact* Av. Sibipiruna Lts. 13/21 Centro de Gestão Águas Emendadas - Águas Claras – Brasília – DF - CEP: 71928-720 - Brasil - Tel: +55(61)3213-7148 – Fax: +55(61)3213-7360 e-mail: ricardoaugustoramos@hotmail.com

Vol. 3, No. 1, 120-131, 2010
ISSN 0718-378X

REVISTA AIDIS

de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica.

REÚSO DE ÁGUAS CINZAS EM EDIFICAÇÕES URBANAS – ESTUDO DE CASO EM VITÓRIA (ES) E MACAÉ (RJ)

Ricardo Franci Gonçalves [1] *
Giovana Martinelli da Silva Simões [1]
Renate Wanke [1]

GREYWATER REUSE IN URBAN BUILDINGS: CASE STUDY OF VICTORIA (ES) AND MACAÉ (RJ) - BRAZIL

ABSTRACT

A new generation of buildings are emerging at some Brazilian cities, focusing on better efficiency for renewable resources (energy, water, and materials). Concerning the water conservation techniques, one of the most important practices is the greywater reuse, which must be considered for non-potable reuse as toilets flush water and car wash. This paper presents a new technology for greywater treatment, based on the association of anaerobic baffled reactors, submerged aerated biofilters, tertiary filtration with fibers and disinfection with sodium chlorine. One of the innovative aspects of this system is the simplified sludge management by recycling the aerobic sludge to anaerobic reactor, with thickening and digestion. The main advantages of this proposed design are the compactness, low implantation costs, low energy consumption, operational simplicity, low environmental impact in building area and low sludge production. This paper presents two cases in the Southeast Region from Brazil: a residential building in the city of Vitória (ES) and a hotel in the city of Macaé (RJ).

Key Words: greywater , reuse, water conservation techniques.

[1] Departamento de Engenharia Ambiental da Universidade Federal do Espírito Santo.

* *Contact* Departamento de Engenharia Ambiental - Universidade Federal do Espírito Santo - Av. Fernando Ferrari, S/N, Goiabeiras, CEP: 29060-970 Vitória ES. Brasil - Tel: (27) 3335-2857 - e-mail: franci@npd.ufes.br

Vol. 3, No. 1, 132-144, 2010
ISSN 0718-378X

REVISTA AIDIS

de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica.

FILTRACIÓN AERADA DE AGUAS RESIDUALES MUNICIPALES UTILIZANDO UN MEDIO FILTRANTE DE BAJO COSTO

Simón González Martínez [1] *
Tatiana Carolina Millán Salazar [1]
Óscar González Barceló [1]

MUNICIPAL WASTEWATER AERATED FILTRATION USING A LOW-COST FILTRATION MEDIA

ABSTRACT

The main objective of this research was to demonstrate that selected natural lava stones can be successfully used for low-cost aerobic biofiltration of municipal wastewater. To demonstrate the procedure a pilot filter was built using 6 mm lava stones as support material. The filter depth was 3.0 m. Using 24-hour samples, analysis of the wastewater could be made for COD, TSS, ammonia and nitrate nitrogen, pH, temperature and Kjeldahl nitrogen. Backwashing was performed every 72 hours. The results indicate that total and dissolved COD and TSS behaved in a similar way when compared with the organic load. The highest COD removal rate (80 %) was observed with the lowest organic load of 0.8 kgCOD/m3•d and the lowest removal (60 %) was obtained with the highest organic load of 2.6 kgCOD/m3•d. The highest total and dissolved COD removal values were 81 and 84 %, respectively. For TSS the best removal value was 95 % with a best average removal of 89 %. Up to 75 % ammonia removal was achieved at the lowest organic load of 0.8 kgCOD/m3•d and decreased to 36 % with a higher organic load of 2.6 kgCOD/m3•d. The mean cellular retention time (MCRT) showed values from 1 to 6 days with an average of 3.2 days proving that the MCRT depends on the backwashing frequency more than on any other factor involved. Caused by abrasion during the backwashing procedure, the bed volume decreased in about 5 % after 300 days of operation.

Key-words: filtro biológico, medio filtrante, tezontle, nitrificación

[1] Instituto de Ingeniería, Universidad Nacional Autónoma de México.

* *Contact* Instituto de Ingeniería, Circuito Interior s/n, 04510 México DF, México, Tel. +52(55)5623-3670, Fax +52(55) 5616-2164, e-mail sgm@pumas.ii.unam.mx

Vol. 3, No. 1, 145-154, 2010
ISSN 0718-378X

REVISTA AIDIS

de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica.

TRATAMIENTO BIOLÓGICO AVANZADO DE AGUAS RESIDUALES UTILIZANDO UN REACTOR CON CINTA DE POLIETILENO

Tania Gutiérrez Macias [1] *
Petia Mijaylova Nacheva [2]

ADVANCED BIOLOGICAL TREATMENT OF WASTEWATER USING A REACTOR WITH POLYETHYLENE TAPE

ABSTRACT

The performance of an aerobic submerged packed bed reactor with polyethylene tape was studied for the treatment of domestic wastewater. The packing material had 1098 m2/m3 specific area. Three different zones were conformed within the reactor: anaerobic, anoxic and aerobic. The system was operated with 4 different organic loads. The objective of this study was to determine the simultaneous removal of COD, nitrogen and phosphorus and the best operational conditions for the system. The following parameters were analyzed and measured: COD, TN, NH4+-N, TP, TSS, VSS,. The duration of the experimental work was 308 days. The best average removal of COD (61%) and TP (39%) was obtained with an organic load of 4.73 kgCOD·m-3·d-1, HRT of 1.35 hours. It was observed that TP removal rates increased with the rise of the TP and organic loads. The best ammonia and TN removals, 71% and 66% respectively, were obtained when a load of 1.27 kgDQO·m-3·d–1 was applied, with 2.4 hours HRT and 100% recycling. There were not any clogging problems in the packed bed during all the operation period, thus backwashing procedures were not required. Based on the obtained results, it can be concluded that the aerobic submerged packed bed reactor with polyethylene tape allowed higher micronutrient removals than the conventional wastewater treatment systems, been in addition a novel system of easy operation.

Key words: Biofilter, C, N y P removal, polyethylene tape.

[1] UNAM-Campus Morelos.
[2] Instituto Mexicano de Tecnología del Agua

* *Contact* Universidad Nacional Autónoma de México campus Morelos. Paseo Cuauhnáhuac No.8532. Col. Progreso, Jiutepec, Morelos, 62550, México; Tel. (777) 329-3600 ext. 601; Tel/fax (777) 329-3663.E-mail: tanochis@hotmail.com