REVISTA AIDIS

de Ingeniería y Ciencias Ambientales:

Investigación, desarrollo y práctica.

http://www.journals.unam.mx/index.php/aidis/index

Vol. 9 No. 2
6 de agosto de 2016
ISSN 0718-378X

Con el patrocinio de:
INSTITUTO DE INGENIERÍA UNAM

Foto: Módulo de membranas de birorreactor
Autor: G. Buitrón

ISSN 0718-378X

REVISTA AIDIS

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

Temática y alcance

La *Revista AIDIS de Ingeniería y Ciencias Ambientales: Investigación, desarrollo y práctica* es una publicación electrónica cuatrimestral coeditada por AIDIS y el Instituto de Ingeniería UNAM. Publica contribuciones originales de calidad y actualidad evaluadas por pares, dentro de su área de competencia. Se presentan trabajos que abarcan aspectos relacionados con el conocimiento científico y práctico, tanto tecnológico como de gestión, dentro del área de Ingeniería y Ciencias Ambientales en Latinoamérica.

El enfoque es multidisciplinario, buscando contribuir en forma directa a la generación de conocimiento, al desarrollo de tecnologías y a un mejor desempeño profesional. Entre los temas cubiertos por la revista están los siguientes: agua potable, calidad de agua, aguas residuales, residuos sólidos, energía, contaminación, reciclaje, cambio climático, salud ambiental, nuevas tecnologías, ética, educación, legislación y política ambiental, gestión ambiental, sostenibilidad y participación social, entre otros.

Cada edición muestra los trabajos que derivan del arbitraje académico estricto de carácter internacional. También se publican números especiales de temas particulares que fueron presentados en los diversos Congresos Interamericanos realizados por la Asociación Interamericana de Ingeniería Sanitaria y Ambiental (AIDIS) y que en forma adicional fueron sometidos al proceso de revisión interno de la revista.

Entidad editora
Instituto de Ingeniería, UNAM
Ciudad Universitaria, Coyoacán, México D.F.; C.P. 04360
Teléfono: (52) (55) 56-23-36-00; Fax: (52) (55) 56-16-28-94

Información Legal
La Revista AIDIS de Ingeniería y Ciencias Ambientales: Investigación, desarrollo y práctica es una publicación electrónica cuatrimestral, editada en el Instituto de Ingeniería, UNAM.

Reservas de derechos al uso exclusivo:
04-2011-011413271800-203

ISSN
0718-378X

Coordinadora editorial y Secretaría técnica
Biól. Blanca P. Gamboa Rocha
Instituto de Ingeniería, UNAM, México. DF.

Administrador de la plataforma (OJS)
Biól. Blanca P. Gamboa Rocha
Instituto de Ingeniería, UNAM, México. DF.

Contacto
revista_aidis@pumas.iingen.unam.mx (Principal)
revista.aidis@gmail.com

ISSN 0718-378X

REVISTA AIDIS

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

Directorio

Revista AIDIS de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica. ISSN 0718-378X

Vol. 9, No. 2
6 de agosto de 2016

Tabla de Contenido

Vol. 9, No 2

Revista AIDIS de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica. ISSN 0718-378X

Vol. 9, No. 2
6 de agosto de 2016

Revista AIDIS de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica. ISSN 0718-378X

Vol. 9, No. 2, 183 - 199
6 de agosto de 2016

REVISTA AIDIS

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

TRATAMENTO ANAERÓBIO DE ESGOTOS: AVALIAÇÃO DA EFICIÊNCIA DE REMOÇÃO DE ESTROGÊNIOS

Fernanda Dittmar Cardoso [1]
Alessandra Honjo Ide [1]
Mauricius Marques dos Santos [1]
*Júlio César Rodrigues de Azevedo [1,2]

ANAEROBIC WASTEWATER TREATMENT: EVALUATION OF ESTROGENS REMOVAL EFFICIENCY

Recibido el 10 de marzo de 2015; Aceptado el 18 de abril de 2016

Abstract

The release of domestic sewage, treated or not, in aquatic ecosystems, and urban and agricultural runoff causes changes in the characteristics of river basins due to the incorporation of different substances. The emerging contaminants, specifically endocrine disruptors, have attracted the attention of the scientific community due to the problems that it can cause to biota, when released into the environment. In the first sampling campaign was found increased concentration in the influent of estrogens in relation to the effluent. In the second collection, it was verified that the system employed in the Wastewater Treatment Plant, presented 99.0% efficiency in removal of 17β-estradiol and 77.8% of 17α-ethinylestradiol from the liquid phase, which may be associated with sludge return, and their sorption. Despite the removal, we observed that the process was not effective for the removal of 17α-ethinylestradiol, as this hormone showed to be more resistant to degradation / adsorption, which can be proven by concentration around 1 $\mu g.L^{-1}$ in the effluent.

Keywords: anaerobic system, emerging contaminants, estrogens, female sex hormones, Brasil.

[1] Universidade Tecnológica Federal do Paraná (UTFPR), Programa de Pós-Graduação em Ciência e Tecnologia Ambiental (PPGCTA), Laboratório de Estudos Avançados em Química Ambiental (LEAQUA), Brasil.
[2] Universidade Federal do Paraná, Programa de Pós-graduação em Engenharia de Recursos Hídricos e Ambiental (PPGERHA), Brasil.

**Autor corresponsal:* Universidade Tecnológica Federal do Paraná (UTFPR), Rua Deputado Heitor de Alencar Furtado, 4900, CEP 81280-340, Curitiba – PR, Brasil. Email: jcrazevedo@hotmail.com

Revista AIDIS de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica. ISSN 0718-378X

Vol. 9, No. 2, 200 - 211
6 de agosto de 2016

REVISTA AIDIS

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

MONITORAMENTO E MODELAGEM DOS RECALQUES DE RESÍDUOS SÓLIDOS DE DIFERENTES COMPOSIÇÕES EM UM LISÍMETRO DE LABORATÓRIO

*Eduardo Pavan Korf [1]
Isadora Comparin [2]
Valter Caetano Dos Santos [2]
Pedro Domingos Marques Prietto [3]

SETTLEMENTS MONITORING AND MODELING OF DIFFERENT COMPOSITIONS SOLID WASTE IN A LABORATORY LYSIMETER

Recibido el 25 de junio de 2015; Aceptado el 1 de julio de 2016

Abstract

Solid waste of landfills have different sources and compositions. All these factors combined with environmental variables influence the waste mass compressibility, since the largest of settlements in landfills are from biologic degradation. The use of experimental cell small (lysimeters) can contribute to a better understanding theses behaviour. In this context, the work aimed the solid waste behavior modeling for two different compositions, in a laboratory scale lysimeter, for consequent settlements. Two samples were evaluated: composition 100% organic waste (L1) and typical composition of municipal solid waste (L2). The settlements were monitored over time in a laboratory lysimeter and the results were calibrated to four mathematical models of settlements prediction over time, allowing to obtain behavior parameters. During the monitoring of 100 days, the largest settlements were observed in L1 experiment (57%) compared to L2 experiment (24%). This behavior was also seen by α *and a parameters indicating greater mass loss and settlements and also by* C_{α}', $C_{\alpha 1}'$ *e* $C_{\alpha 2}'$ *values indicating that the largest settlements occurs in the secondary compression stage which is characteristic of waste with a high compressibility, such as the predominantly organic composition evaluated in this study.*

Keywords: Waste biodegradation, primary and secondary compression, settlements models.

[1] Programa de Pós-Graduação em Ciência e Tecnologia Ambiental (PPGCTA) e Curso de Engenharia Ambiental, Universidade Federal da Fronteira Sul, Erechim – RS, Brasil
[2] Universidade de Passo Fundo – RS, Brasil
[3] Programa de Pós-Graduação em Engenharia Civil e Ambiental (PPGEng), Passo Fundo – RS, Brasil

**Autor corresponsal:* Erechim – RS, Brasil, Rodovia ERS 135, km 72, Erechim/RS, CEP: 99700-970.
Email: eduardo.korf@uffs.edu.br

Revista AIDIS de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica. ISSN 0718-378X

Vol. 9, No. 2, 212 - 228
6 de agosto de 2016

REVISTA AIDIS

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

ESTADO TRÓFICO EM RESERVATÓRIO URBANO RASO – ESTUDO DE CASO: AÇUDE SANTO ANASTÁCIO, FORTALEZA (CE)

* Germário Marcos Araújo [1]
Iran Eduardo Lima Neto [1]
Helena Becker [2]

TROPHIC STATE IN A URBAN SHALLOW RESERVOIR - CASE STUDY: SANTO ANASTÁCIO DAM, FORTALEZA (CE)

Recibido el 6 de agosto de 2015; Aceptado el 15 de junio de 2016

Abstract

Urban reservoirs face a growing deterioration in the quality of their waters due to lack of sanitation, mainly related to the incorrect disposal of domestic wastewater and solid waste. This promotes the contribution of contaminants through point and diffuse sources, causing significant impacts on the reservoir. One impact is eutrophication, which is the excessive algae growth due to high nutrient loads, especially nitrogen and phosphorus. This phenomenon is observed mainly in lentic environments, which contributes to the development of phytoplankton and aquatic weeds at levels above the natural growth. This study evaluated the process of eutrophication in a shallow urban reservoir, the Santo Anastácio Dam, located in the State of Ceará, Northeastern Brazil, which was taken as a case study. To identify the trophic status of the reservoir, the Trophic State Index (TSI) was used. The total phosphorus and chlorophyll-a analysis were used to calculate the average TSI and classify the reservoir as hypereutrophic. It was found that the reservoir is under an advanced process of eutrophication, which is still increasing over time. The results of the monitored parameters compared with Resolution CONAMA 357/05 for freshwater class 2 remained outside the established standards, except for the pH parameter. The total phosphorus exhibited much higher concentrations than the limits established by the environmental legislation, which reflected directly in the trophic level of the reservoir.

Keywords: chlorophyll-a, eutrofication, nutrients, total phosphorus, urban lakes.

[1] Departamento de Engenharia Hidráulica e Ambiental, Universidade Federal do Ceará, Brasil
[2] Departamento de Química Analítica e Físico-Química, Universidade Federal do Ceará, Brasil

**Autor corresponsal:* Departamento de Engenharia Hidráulica e Ambiental, Universidade Federal do Ceará, Brasil. Bloco 713 - 1.º Andar - Centro de Tecnologia, CEP 60451-970, Brasil. Email: germariomarcos@gmail.com

Revista AIDIS de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica. ISSN 0718-378X

Vol. 9, No. 2, 229 - 239
6 de agosto de 2016

REVISTA AIDIS

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

APLICAÇÃO DE REAGENTE DE FENTON E ESTUDO DAS VARIÁVEIS INTERVENIÊNTES NA DEGRADAÇÃO DO 2,4,6 -TRICLOROFENOL

* Eliane Pereira dos Santos [1]
Mariele Fioreze [1]
Magdielli Schweickardt [2]

APPLICATION OF FENTON REAGENT AND STUDY OF INTERVENING VARIABLES IN THE 2,4,6-TRICHLOROPHENOL DEGRADATION)

Recibido el 2 de octubre de 2015; Aceptado el 28 de junio de 2016

Abstract

The polychlorinated phenols or chlorophenols belong to the most important class of environmental contaminants, because of the extensive use of these compounds in the industry, agriculture and domestic environment for more than 50 years. Studies have shown that these substances are toxic at low concentrations, and persistent in the environment. In this study was evaluated the effectiveness of degradation and the influence of the parameters pH, temperature, hydrogen peroxide concentration, iron sulfate concentration and reaction time on the degradation of 2,4,6-Trichlorophenol submitted to Fenton's reagent. In all, 18 different treatments were applied to determine the best operational settings for application of the Fenton's reagent. Fenton's reagent demonstrated efficiency for the degradation of chlorophenol compound 2,4,6-Trichlorophenol, reaching the maximum degradation of 73.2% in just 20 minutes of reaction. Regarding the variables, the best operating conditions were: pH 5, 20 °C, 0.12% of H_2O_2, 0.05 mol/L of $FeSO_4$ concentration, with a maximum reaction time of 20 minutes. The Fenton's reagent proved quite dependent on the variables, and the speed of the reactions directly affected by each of them.

Keywords: advanced oxidation process, chlorophenols, wastewater.

[1] Universidade Federal de Santa Maria, Brasil.
[1] Universidade Regional Integrada do Alto Uruguai e das Missões, Brasil.

**Autor corresponsal:* Universidade Federal de Santa Maria, *campus* Frederico Westphalen. Linha Sete de Setembro, s/n, BR 386, Km 40, CEP 98400-000, Frederico Westphalen, Rio Grande do Sul, Brasil. Email: elianeps@ufsm.br

Revista AIDIS de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica. ISSN 0718-378X

Vol. 9, No. 2, 240 - 255
6 de agosto de 2016

REVISTA AIDIS

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

TRATAMENTO DE LIXIVIADO DE ATERRO SANITÁRIO POR COAGULAÇÃO, ULTRAFILTRAÇÃO E PROCESSO OXIDATIVO AVANÇADO

* Ivanna Carlla Cabral Hetka [1]
Jeanette Beber de Souza [2]
Carlos Magno de Souza Vidal [3]
Kely Viviane de Sousa [4]

TREATMENT OF LANDFILL LEACHATE BY COAGULATION, ULTRAFILTRATION AND ADVANCED OXIDATIVE PROCESS

Recibido el 17 de noviembre de 2015; Aceptado el 1 de enero de 2016

Abstract

Leachate of landfill is defined as the residual liquid generated during biochemical decomposition of waste. Due to high concentrations of organic matter, ammonia, heavy metals and toxic organic compounds, their treatment requires attention. The objective of this research was to determine the most appropriate technique for effective treatment of leachate of landfill. Was evaluated in isolation and combined processes: coagulation/flocculation, ultrafiltration membranes and the advanced oxidative process (AOP) type photo-Fenton. Coagulation/flocculation was held in jar-test type equipment employing the natural tannin OF18 Acquapol coagulant in great doses. Then, the leachate and the supernatant of coagulation were submitted separately to the membrane filtration of ultrafiltration (UF) and the AOP. The effectiveness of these treatment procedures was monitored through analysis of colour, turbidity and COD as well as metal Cr, Cd, Pb, Ni, Zn, Fe and Al. With the obtained results it was verified the combined processes presented good removal of parameters analyzed, showing up as appropriate alternatives for the treatment of leachate.

Keywords: Tannin, natural coagulant, heavy metals, advanced wastewater treatments, photo-Fenton.

[1] Universidade Estadual do Centro-Oeste do Paraná – UNICENTRO, Departamento de Engenharia Ambiental da Universidade Estadual do Centro-Oeste do Paraná – UNICENTRO, Brasil

**Autor corresponsal:* Rua Ernesto Nunes 27 – Centro - Fernandes Pinheiro – PR - CEP: 84535-000 – Brasil.
Email: ivannacabral@yahoo.com.br

Revista AIDIS de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica. ISSN 0718-378X

Vol. 9, No. 2, 256 - 273
6 de agosto de 2016

REVISTA AIDIS

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

AVALIAÇÃO MICROBIOLÓGICA DE TRATAMENTO CONJUNTO DE LIXIVIADO DE ATERRO SANITÁRIO E ESGOTO SANITÁRIO EM LAGOAS DE ESTABILIZAÇÃO

* Alinne Gurjão de Oliveira [1]
Valderi Duarte Leite [2]
José Tavares de Sousa [2]
Wilton Silva Lopes [2]
Elaine Gurjão de Oliveira [2]
Andrezza Raphaella Costa Campos [2]

MICROBIOLOGICAL EVALUATION OF COMBINED TREATMENT OF LANDFILL LEACHATE AND SEWAGE IN STABILIZATION PONDS

Recibido el 15 de diciembre de 2015; Aceptado el 28 de junio de 2016

Abstract

This study aimed to evaluation the microbial community present in the effluents of treatment combined of sanitary landfill leachate "in nature" and sewage in wastewater stabilization ponds. The experimental system consisted of four shallow stabilization ponds in series. The substrate used for feeding the series of ponds consisted of mixture of sewage (99%) plus landfill leachate “in nature” (1%). The average removal efficiency of thermotolerant coliforms and helminthes eggs was 99.78% and 100%, respectively. The average concentration of algal chlorophyll mass in the was 1032.6 ug / L. 29 taxons included in seven taxonomic classes were identified: *Cyanobacteria, 7 spp; Chlamydophyceae, 3 spp; Chlorophyceae, 9 spp; Euglenophyceae, 4 spp; Bacillariophyceae, 4 spp; Chrysophyceae, 1 spp; and Zygnemaphyceae, 1 spp.*

Keywords: combined treatment, algae, coliforms, helminthes eggs.

[1] Universidade Federal da Paraíba (UFPB), Brasil.
[1] Universidade Estadual da Paraíba, (UEPB), Brasil.

**Autor corresponsal:* Rua Cônsul Joseph Noujaim Habib Nacad, s/n. 58410-260. Campina Grande – PB, Brasil.
Email: alinnegurjao@gmail.com

Revista AIDIS de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica. ISSN 0718-378X

Vol. 9, No. 2, 274 - 289
6 de agosto de 2016

REVISTA AIDIS

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

UMA ANÁLISE DE REGRESSÃO PARA DETERMINAÇÃO DO NÍVEL DE EUTROFIZAÇÃO DE UM RESERVATÓRIO DO SEMIÁRIDO BRASILEIRO

Carlos Henrique Andrade Pacheco [1]
Beatriz Susana Ovruski de Ceballos [2]
* Iran Eduardo Lima Neto [3]

A REGRESSION ANALYSIS TO DETERMINE THE LEVEL OF EUTROPHICATION OF A RESERVOIR IN THE BRAZILIAN SEMIARID

Recibido el 8 de enero de 2016; Aceptado el 30 de junio de 2016

Abstract

This study aimed to analyze the relation between physicals, chemicals and biological parameters, and their influence on the level of eutrophication in an aquatic ecosystem, using linear regression analysis to identify the best explanatory correlations of trophic characteristics. The Acarape do Meio supply reservoir, located in the metropolitan area of Fortaleza in Ceará, Brazil, was the site chosen for development of the field study. The monitoring of water quality occurred on a monthly basis, during the period from January 2008 to December 2008, with subsurface sampling distributed in seven stations to cover the full reservoir. This dam has a large seasonal variability, with rainfall being one of the most influential factors in the dynamics of limnological characteristics. Regression analysis provided an adjusted model with good correlation (R2=0.95), that showed to be effective for prediction of the eutrophication state in the reservoir and demonstrated to have a good capacity to estimative the Trophic State Index, so the modeled results approached those measured in situ. Thus, this model can be used as a tool for assessing water quality in the selected reservoir.

Keywords: water quality, trophic state index, water pollution, water resources.

[1] Instituto Federal de Educação, Ciência e Tecnologia do Ceará – IFCE, Brasil.
[2] Universidade Federal de Campina Grande - UFCG, Brasil.
[3] Universidade Federal do Ceará – UFC, Brasil.

**Autor correspondente:* Iran Eduardo Lima Neto - Departamento de Engenharia Hidráulica e Ambiental/UFC, Campus do Pici, Bloco 713, 1º. andar, CEP 60.451-970, Fortaleza, Ceará, Brasil. Email: iran@deha.ufc.br

Revista AIDIS de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica. ISSN 0718-378X

Vol. 9, No. 2, 290 - 302
6 de agosto de 2016

REVISTA AIDIS

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

NOVAS ROTINAS OPERACIONAIS COMO FORMA DE MELHORIA DE PROCESSO E REDUÇÃO DE CUSTOS EM UM SISTEMA DE LODOS ATIVADOS: ESTUDO DE CASO

*Rodrigo Augusto Franco de Oliveira Zawadzki [1]
Wellington Ignácio Jaworski [2]
Juliene Paiva Flores[1]

NEW OPERATIONAL ROUTINES AS PROCESS UPGRADE AND TO DECREASE COSTS IN AN ACTIVATED SLUDGE SYSTEM: A CASE STUDY

Recibido el 14 de enero de 2016; Aceptado el 1 de julio de 2016

Abstract

The operational control of an activated sludge system it involves following a series of analytical parameters. These parameters allows the WWTP workers to apply preventive or corrective actions that guarantee properly efficiency of the treatment. Hence, this study describes the implementation of new operational routines in an activated sludge system. So, at first, the 17 workers of the WWTP were trained in what concern solids in mixed liquor control and sludge microscopy, than, new analytical control parameters were implemented. After implementation of the new operational routines we were able to establish strategies that prevent problems with sludge lost through the clarifier, excessive biomass mineralization, and, at last, decrease in average 89 % the chlorine gas application for filamentous bulking control.

Keywords: Chlorine gas application, Filamentous bulking, Operational routine, Solids in mixed liquor, Sludge microscopy.

[1] Área de Saneamento e Meio Ambiente, Serviço Nacional de Aprendizagem Industrial. Departamento Regional do Paraná – unidade Cidade Industrial de Curitiba, Brasil.
[1] Estação de Tratamento de Esgotos Belém, Companhia de Saneamento do Paraná, Brasil.

**Autor corresponsal:* Área de Saneamento e Meio Ambiente, Serviço Nacional de Aprendizagem Industrial. Rua Senador Accioly Filho, 298 – Cidade Industrial, Curitiba, PR, – 81.310-000, Brasil. Email: rodrigo.zawadzki@pr.senai.br