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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.

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Editorial

Tengo el gusto de presentar el primer número de 2023 de la Revista AIDIS de Ingeniería y Ciencias Ambientales. Felicitamos a Marília Vasconcellos Agnesini y colaboradores ya que su artículo ***Avaliação da remoção de diuron em água com uso de tecnologias complementares associadas ao tratamento em ciclo completo*** [*Evaluation of diuron removal in water with use of complementary technologies associated with complete cycle treatment*] es la Selección del Editor de este número. La investigación fue realizada en el Departamento de Engenharia Química de la Universidade de Ribeirão Preto, Brasil. Enhorabuena a los autores y a la institución.



Damos la bienvenida al Dr. Diógenes Hernández Espinoza de la Universidad de Talca (Chile) quien se une al Equipo Editorial de nuestra Revista. El Dr. Hernández es Doctor en Ciencias y Tecnologías Ambientales por la Universidad Autónoma de Barcelona y tiene una amplia experiencia en la gestión y valorización de residuos agroindustriales, así como en procesos biotecnológicos para el tratamiento de compuestos en fase gaseosa.

[Guillermo Quijano](#)

Editor en Jefe

Instituto de Ingeniería, UNAM
México

Tabla de Contenido

Vol. 16 No. 1

- 1. AVALIAÇÃO DA REMOÇÃO DE DIURON EM ÁGUA COM USO DE TECNOLOGIAS COMPLEMENTARES ASSOCIADAS AO TRATAMENTO EM CICLO COMPLETO**
EVALUATION OF DIURON REMOVAL IN WATER WITH USE OF COMPLEMENTARY TECHNOLOGIES ASSOCIATED WITH COMPLETE CYCLE TREATMENT

Marília Vasconcellos Agnesini, Maristela Silva Martinez, Reinaldo Pisani Junior, Cristina Filomêna Pereira Rosa Paschoalato, Angela Di Bernardo Dantas, Luiz Di Bernardo

Selección del Editor
1-17
- 2. QUANTIFICAÇÃO DE METAIS PESADOS E ANÁLISE DOS PARÂMETROS FÍSICO-QUÍMICOS E MICROBIOLÓGICO NA ÁGUA DO ESTUÁRIO DO RIO CEARÁ**
QUANTIFICATION OF HEAVY METALS AND ANALYSIS OF PHYSICOCHEMICAL AND MICROBIOLOGICAL PARAMETERS IN THE WATER OF THE CEARÁ RIVER ESTUARY

Gardilene Monteiro da Silva, Rita Mickaela Barros de Andrade, Daniel Silveira Serra, Francisco Sales Ávila Cavalcante, Mona Lisa Moura de Oliveira, Antonia Mayza de Moraes França, Ronaldo Ferreira do Nascimento

18-32
- 3. SUBSÍDIOS PARA ELABORAÇÃO DE UM PLANO DE GERENCIAMENTO DA DEMANDA DE ÁGUA EM CENTRAIS DE AULAS DE CAMPUS UNIVERSITÁRIO**
SUBSIDIES FOR THE DEVELOPMENT OF A WATER DEMAND MANAGEMENT PLAN IN UNIVERSITY CAMPUS CLASSROOMS

Êmele Rádna Rodrigues do Vale, Maria Josicleide Felipe Guedes

33-49
- 4. EVALUACIÓN DE LA EFICIENCIA DE UN VERMIFILTRO CON LA ESPECIE *Eisenia Foetida* PARA EL TRATAMIENTO DE AGUAS RESIDUALES DE USO DOMÉSTICO**
EVALUATION OF THE EFFICIENCY OF A VERMIFILTER WITH THE *Eisenia Foetida* SPECIES FOR THE TREATMENT OF WASTEWATER FOR DOMESTIC USE

Flor Angela Meza Pinedo

50-64
- 5. AVALIAÇÃO DA EFICIÊNCIA DO USO DE COAGULANTES PARA A REMOÇÃO DE FÓSFORO EM EFLUENTES**
EFFICIENCY EVALUATION OF COAGULANTS USE FOR PHOSPHORUS REMOVAL IN EFFLUENTS

Antônio Carlos de Oliveira Martins Júnior, José Carlos Alves Barroso Júnior, Vinícius Duarte Soroka, Nestor Leonel Muñoz Hoyos, Maria Cristina de Almeida Silva

65-81
- 6. EDUCAÇÃO AMBIENTAL E OS HÁBITOS DE MANEJO DOS RESÍDUOS DOMICILIARES DOS MORADORES DO MUNICÍPIO DE GUARUJÁ, BRASIL**
ENVIRONMENTAL EDUCATION AND HOUSEHOLD WASTE MANAGEMENT HABITS OF RESIDENTS OF THE MUNICIPALITY OF GUARUJÁ, BRAZIL

Márcia Célia Galinski Kumschlies, Valdir Schalch

82-110

7. **AVALIAÇÃO AMBIENTAL DA ÁREA DE PRESERVAÇÃO PERMANENTE AO LONGO DO IGARAPÉ SANTOS LOCALIZADO NA CIDADE DE TUCURÚ – PA**
ENVIRONMENTAL ASSESSMENT OF THE PERMANENT PRESERVATION AREA ALONG THE IGARAPÉ SANTOS LOCATED IN THE CITY OF TUCURÚ – PA
José Eudes Silva de Aguiar, Camila Moraes Vaz, Eduardo Barbosa Rodrigues, Josiel Marques Santana, Marlon Sodré dos Reis, Raisa Rodrigues Neves, Grazielle Tigre de Souza 111-124
8. **APROVEITAMENTO DOS RESÍDUOS AGROINDUSTRIAIS DA CASTANHA-DO-BRASIL ATRAVÉS DO TRATAMENTO PIROLÍTICO EM REATOR DE LEITO FIXO**
USE OF BRAZIL NUT AGRICULTURAL WASTE THROUGH PYROLYTIC TREATMENT IN A FIXED BED REACTOR
Antonelli Santos Silva, Marcelo Mendes Pedroza, Maristela Silva Martinez, Luciana Rezende Alves 125-138
9. **DESEMPENHO DE FILTROS LENTOS COM MEIO FILTRANTE DE MISTURAS DE AREIA E MATERIAIS SUSTENTÁVEIS**
PERFORMANCE OF SLOW FILTERS WITH FILTER MEDIA MADE OF MIXTURES OF SAND AND SUSTAINABLE MATERIALS
Samara Tavares dos Santos, Anderson de Jesus Lima, Denise Conceição de Gois Santos Michelin 139-153
10. **ANÁLISE DA TENDÊNCIA DE SÉRIES HISTÓRICAS DE VAZÃO NA BACIA HIDROGRÁFICA DO RIO AMAZONAS**
TREND ANALYSIS OF HISTORIC DISCHARGE SERIES IN THE AMAZON RIVER HYDROGRAPHIC BASIN
Luanna Costa Dias, Lindemberg Lima Fernandes, Bruna Roberta Pereira Lira, Junior Hiroyuki Ishihara, Francisco Carlos Lira Pessoa, Luís Gustavo de Lima Sales 154-175
11. **A IMPLANTAÇÃO DA COBRANÇA PELO USO DA ÁGUA NO BRASIL: CONTRIBUIÇÕES E DESAFIOS**
THE IMPLEMENTATION OF WATER CHARGES IN BRAZIL: CONTRIBUTIONS AND CHALLENGES
Francisco Miquéias Sousa Nunes, Laércio Leal dos Santos, Camilo Allyson Simões de Farias, Yáscara Maia Araújo de Brito, Tássio Jordan Rodrigues Dantas da Silva, Willian de Paiva 176-197
12. **IMPACTO DA RECIRCULAÇÃO DE LIXIVIADO NA PRODUÇÃO E QUALIDADE DO BIOGÁS GERADO EM ATERROS SANITÁRIOS: REVISÃO SISTEMÁTICA**
IMPACT OF LEACHATE RECIRCULATION ON THE PRODUCTION AND QUALITY OF BIOGAS IN LANDFILLS: SYSTEMATIC REVIEW
Fernanda Nascimento de Andrade, Ana Ghislane Henriques Pereira van Elk 198-217

13. **INFLUÊNCIA DA ADIÇÃO DE FIBRAS CURTAS DE COCO DISTRIBUÍDAS ALEATORIAMENTE NA CURVA CARACTERÍSTICA DE RETENÇÃO DE ÁGUA DE UM SOLO ARGILOSO COMPACTADO**
INFLUENCE OF RANDOMLY DISTRIBUTED SHORT COCONUT FIBERS ADDITION ON THE WATER RETENTION CHARACTERISTIC CURVE OF A COMPACTED CLAY SOIL
Antônio Italcy de Oliveira Júnior, José Fernando Thomé Jucá,
Alice Jadneiza Guilherme de Albuquerque Almeida, Riadny Patrícia de Souza Ferreira,
Fellipe José Reis Brandão 218-231
14. **ANÁLISE DOS IMPACTOS DA PENETRAÇÃO DA GERAÇÃO DISTRIBUÍDA NA REDE DE DISTRIBUIÇÃO RELACIONADOS AO SISTEMA DE COMPENSAÇÃO BRASILEIRO**
PENETRATION IMPACT ANALYSIS OF THE DISTRIBUTED GENERATION IN THE DISTRIBUTION NETWORK RELATED TO THE BRAZILIAN COMPENSATION SYSTEM
Daduí Cordeiro Guerrieri, Tiago Argollo Silva 232-256
15. **INDICADORES DE DESEMPENHO PARA AVALIAÇÃO DE ESTAÇÕES DE TRATAMENTO DE ESGOTOS DE UMA BACIA DE ESGOTAMENTO EM FORTALEZA, CEARÁ, BRASIL**
PERFORMANCE INDICATORS FOR THE EVALUATION OF WASTEWATER TREATMENT PLANTS IN A SEWAGE BASIN IN FORTALEZA, CEARÁ, BRAZIL
Stephanie de Oliveira Souza, Ana Bárbara de Araújo Nunes 257-284
16. **AVALIAÇÃO DE VAPORES E COMPOSTOS ORGÂNICOS VOLÁTEIS LIBERADOS DURANTE A TORRA INDUSTRIAL DO CAFÉ**
EVALUATION OF VAPORS AND VOLATILE ORGANIC COMPOUNDS RELEASED DURING THE INDUSTRIAL ROAST OF COFFEE
Saad Barbar Netto, Pedro Henrique Ferreira Pires, Murilo Daniel de Mello Innocentini, Cristina Filomena Pereira Rosa Paschoalato, Sílvia Helena Taleb Contini, Júlio Henrique de Lima 285-295
17. **PREDIÇÃO DE OPERAÇÃO DE BOMBAS COMO TURBINA E SUA APLICAÇÃO PARA RECUPERAÇÃO DE ENERGIA EM SISTEMAS DE DISTRIBUIÇÃO DE ÁGUA**
PREDICITON OF PUMPS AS TURBINE OPERATION AND ITS APPLICATION FOR ENERGY RECOVERY IN WATER DISTRIBUTION SYSTEMS
Juliana Garcia Gaia, Juliana Melo de Sousa, Davi Edson Sales e Souza, André Luiz Amarante Mesquita 296-308
18. **TRATAMIENTO ANAEROBIO Y VALORIZACIÓN ENERGÉTICA DE LAS AGUAS RESIDUALES DEL PROCESO DE NIXTAMALIZACIÓN DEL MAÍZ**
ANAEROBIC TREATMENT AND ENERGY RECOVERY OF WASTEWATER FROM THE CORN NIXTAMALIZATION PROCESS
Montserrat Vázquez-López, Ulises Emmanuel Jiménez-Ocampo, Iván Moreno-Andrade 309-325

19. **AVALIAÇÃO TÉCNICA DE MEDIDA DE MANEJO SUSTENTÁVEL DA ÁGUA PLUVIAL COM ORIFÍCIO REGULADOR DE VAZÃO**
ASSELEMENT OF SUSTAINABLE URBAN DRAINAGE SYSTEM WITH CONTROL PIPING
[João Marcos Bosi Mendonça de Moura, Bruna Luiza Steffen](#) 326-338

20. **AVALIAÇÃO DO CICLO DE VIDA APLICADA A EDIFICAÇÕES EM CONTÊINERES: REVISÃO CRÍTICA E CONTRIBUIÇÕES PARA A PADRONIZAÇÃO DAS PESQUISAS**
LIFE CYCLE ASSESSMENT APPLIED TO CONTAINER BUILDINGS: CRITICAL REVIEW AND CONTRIBUTIONS FOR RESEARCH STANDADIZATION
[Giusilene Costa de Souza Pinho, João Luiz Calmon, Bárbara Maria de Paula Justino](#) 339-360

21. **AÇÃO DE FUNGOS NA REMOÇÃO DE METAIS DE ÁGUAS RESIDUÁRIAS E COMPARTIMENTOS AMBIENTAIS: UMA REVISÃO**
ACTION OF FUNGI IN THE REMOVAL OF METALS FROM WASTEWATER AND ENVIRONMENTAL COMPARTMENTS: A REVIEW
[Nathália Araújo Magalhães, Milena Kelly Justino Vieira, Glória Marinho, Kelly Rodrigues](#) 361-385



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AVALIAÇÃO DA REMOÇÃO DE DIURON EM ÁGUA COM USO DE TECNOLOGIAS COMPLEMENTARES ASSOCIADAS AO TRATAMENTO EM CICLO COMPLETO

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EVALUATION OF DIURON REMOVAL IN WATER WITH USE OF COMPLEMENTARY TECHNOLOGIES ASSOCIATED WITH COMPLETE CYCLE TREATMENT

Recibido el 2 de septiembre de 2021. Aceptado el 6 de marzo de 2022

Abstract

In this work were proposed two complementary alternatives to be associated to the complete cycle for diuron removal, present in surface waters: advanced oxidative process, with hydrogen peroxide and ultraviolet radiation, and adsorption in granular activated carbon. The study water solution was prepared with characteristics similar to Pardo River. It was observed that the water treatment technology in complete cycle, after jarrest trials, presented an average removal of 27% of the herbicide. The filtered water was submitted to the oxidative process, through different initial concentrations of hydrogen peroxide and residence times, through the variation of the volumetric flow of the liquid stream affluent in tubular reactor, operated in continuous flow. Diuron removal was increasing at the time and dose of applied radiation, resulting in 99.9% degradation. However, the total organic carbon analysis showed maximum removal of 54%, which indicates the formation of smaller organic unwanted compounds after the degradation of the initial molecule. The adsorption tests in granular activated carbon were performed using the methodology of rapid tests on a small scale to obtain the experimental rupture curve. The maximum herbicide concentration allowed by potability standards was adopted as a breaking point. From the methodology of rapid tests in reduced scale, was obtained the operation time for adsorption column in real scale of approximately 6 months. Thus, complementary technologies, in association with full-cycle surface water treatment, reproduced satisfactory results regarding diuron removal.

Keywords: surface water, advanced oxidative processes, adsorption, granular activated carbon.

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QUANTIFICAÇÃO DE METAIS PESADOS E ANÁLISE DOS PARÂMETROS FÍSICO-QUÍMICOS E MICROBIOLÓGICO NA ÁGUA DO ESTUÁRIO DO RIO CEARÁ

QUANTIFICATION OF HEAVY METALS AND ANALYSIS OF PHYSICOCHEMICAL AND MICROBIOLOGICAL PARAMETERS IN THE WATER OF THE CEARÁ RIVER ESTUARY

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Antonia Mayza de Moraes França ³
Ronaldo Ferreira do Nascimento ³

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Abstract

The APA of the Ceará River Estuary faces environmental problems, such as the presence of garbage in the estuary and water pollution, mainly caused by industrial and domestic sewage. The work was based on the analysis of the water of the Ceará River Estuary through physicochemical and microbiological parameters and quantification of heavy metals Cd, Cu, Mn, Pb, and Ni. The APA of the Ceará River Estuary, in the rainy and dry seasons. Ammonia, chemical oxygen demand-COD and conductivity samples were prepared in duplicate and the analysis methodology was adopted according to Standard Methods APHA, 2005. The microbiological test was based on the presence/absence method with the Colilert (IDEXX's Quanti-Tray). For the analysis of the quantification of metals, they were performed in a Flame Atomic Absorption Spectrophotometer (FAAS) Perkin Elmer, model Analyst 1000. The quantification method used for metals is external standardization. High values of COD and ammonia were quantified, as well as the existence of the presence of total coliforms and *E. coli*. The metals Cd, Pb, Mn, and Ni obtained values above those recommended by CONAMA Resolution nº 357/05, Pb quantified more significant values compared to the metals analysis and Cu was detected at only one point of the analysis, in the rainy season, which showed the highest concentration of metals. The increase in metal concentrations can cause damage to the ecosystem, as it is possible to visualize the long-term consequences, such as urbanization and intense occupation in the Ceará River Estuary.

Keywords: estuary, mangrove, environment pollution.

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SUBSÍDIOS PARA ELABORAÇÃO DE UM PLANO DE GERENCIAMENTO DA DEMANDA DE ÁGUA EM CENTRAIS DE AULAS DE CAMPUS UNIVERSITÁRIO

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Maria Josicleide Felipe Guedes ²

SUBSIDIES FOR THE DEVELOPMENT OF A WATER DEMAND MANAGEMENT PLAN IN UNIVERSITY CAMPUS CLASSROOMS

Recibido el 26 de enero de 2022. Aceptado el 15 de abril de 2022

Abstract

The elaboration of a water demand management (WDM) plan requires the execution of a series of activities, including: diagnosis of the situation, establishment of objectives, goals and deadlines. Through this study, the objective was to provide subsidies for the preparation of a WDM plan in the classrooms of the Federal Rural of the Semi-Arid University. Contributions to the preparation of the plan were organized with the help of a management tool. This was based on the stages of survey and characterization of the hydrosanitary devices installed in the studied places, in the consultation with specialists, in the verification of costs for the implementation of the suggested actions and in the GUT matrix (severity, urgency and tendency) of prioritizing actions. Finally, the environmental feasibility of the proposed actions was analyzed. There was a possibility of a reduction in water consumption of up to 31.84%, provided by the adoption of technological alternatives and correction of leaks.

Keywords: saving sanitary appliances, universities, water rational use.

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EVALUACIÓN DE LA EFICIENCIA DE UN VERMIFILTRO CON LA ESPECIE *Eisenia Foetida* PARA EL TRATAMIENTO DE AGUAS RESIDUALES DE USO DOMÉSTICO

* Flor Angela Meza Pinedo ¹

EVALUATION OF THE EFFICIENCY OF A VERMIFILTER WITH THE *Eisenia Foetida* SPECIES FOR THE TREATMENT OF WASTEWATER FOR DOMESTIC USE

Recibido el 26 de enero de 2022. Aceptado el 7 de junio de 2022

Abstract

The vermifilter with the species *Eisenia Foetida* to treat wastewater for domestic use had a flow rate of 217 L/d, a Hydraulic Head (CH) of 150 ml/m².min and a Hydraulic Retention Time (HRT) of 5.7 days. Wastewater samples without treatment and with treatment were analyzed on three dates, every 7 days, and the following results were obtained: Total Suspended Solids (TSS) from 1708 mg/L to 32 mg/L on the first date, 321 mg/L to 34 mg/L on the second and 154 mg/L to 2.5 mg/L on the third date. Total Nitrogen (NT) from 13.05 mg/L to 0.32 mg/L, from 3.04 mg/L to 0.19 mg/L and 2.75 mg/L to 0.09 mg/L. Total Phosphorus (PT) from 1 mg/L to 0.568 mg/L, from 1 mg/L to 0.23 mg/L and 0.302 mg/L to 0.092 mg/L. Oils and Fats (AyG) from 72.5 mg/L to 2 mg/L, from 4.3 mg/L to 2 mg/L and 19.8 mg/L to 2 mg/L. Chemical Oxygen Demand (COD) from 3210 mg/L to 201 mg/L, from 1110 mg/L to 101 mg/L and 434 mg/L to 84 mg/L. Biochemical Oxygen Demand (BOD) from 1690 mg/L to 112 mg/L, from 572 mg/L to 48 mg/L and 230 mg/L to 40 mg/L respectively. Total Coliforms (TC) from 7.0E+07 NMP/100mL to 2.6E+06 NMP/100mL, 1.1E+08 NMP/100mL to 5.4E+05 NMP/100mL and 4.7E+07 NMP/100mL to 3.5E+04 NMP/100mL. It is concluded that the vermifilter with the *Eisenia Foetida* species is efficient to treat wastewater for domestic use.

Keywords: wastewater for domestic use, efficiency, treatment, vermifilter.

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AVALIAÇÃO DA EFICIÊNCIA DO USO DE COAGULANTES PARA A REMOÇÃO DE FÓSFORO EM EFLUENTES

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EFFICIENCY EVALUATION OF COAGULANTS USE FOR PHOSPHORUS REMOVAL IN EFFLUENTS

Recibido el 28 de enero de 2022. Aceptado el 6 de junio de 2022

Abstract

Phosphorus from wastewater is an important macronutrient, and its discharge in large amounts can favor the eutrophication of lakes and streams. Thus, specific treatments can be used for their removal in effluents. The use of coagulation and flocculation for phosphorus removal has been widely used due to its flexibility and high efficiency, and, for this, there are several products available. Therefore, the objective of the present study was to evaluate the efficiency of using aluminum sulfate, polyaluminum chloride (PAC), ferric chloride, and tannin coagulants to remove phosphorus from domestic and industrial effluents, using data available in literature works. When ferric chloride and aluminum sulfate were used, the median was approximately 90%, and the PAC was 80%. The use of tannin resulted in a greater variation in efficiency values and minor phosphorus removal (<75%). The mean coagulant dosage, in mg coagulant.mg initial TP⁻¹, was 9.33 mg.mg⁻¹ for the PAC; 8.09 mg.mg⁻¹ and 7.96 mg.mg⁻¹ for ferric chloride and aluminum sulfate, respectively.

Keywords: polyaluminum chloride, aluminum sulfate, effluents phosphorus removal, ferric chloride, tannin.

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REVISTA AIDIS

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

EDUCAÇÃO AMBIENTAL E OS HÁBITOS DE MANEJO DOS RESÍDUOS DOMICILIARES DOS MORADORES DO MUNICÍPIO DE GUARUJÁ, BRASIL

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ENVIRONMENTAL EDUCATION AND HOUSEHOLD WASTE MANAGEMENT HABITS OF RESIDENTS OF THE MUNICIPALITY OF GUARUJÁ, BRAZIL

Recibido el 13 de febrero de 2022. Aceptado el 27 de mayo de 2022

Abstract

The world development of the last decades combined with the growth in the production of consumer goods has directly impacted the production of urban solid waste, becoming a major socio-environmental problem. It was in this scenario that in 2010 Law 12.305 called National Policy on Solid Waste was instituted, regulated by Decree No. 10.936/2022. The effectiveness of the actions required and recommended by this legislation is consolidated in the National Environmental Education Program and in the Environmental Education Policy. The general objective of this study was to know the level of environmental awareness and the habits of disposal of household waste of the residents of Guarujá, Brazil. The methodology adopted was based on a descriptive research with a qualitative and quantitative approach. A survey was carried out with 384 university students in the city. The results allowed us to conclude that there is a moderate environmental awareness regarding knowledge about the correct form of waste disposal, however, it is possible to affirm that they are not engaged in the adoption of environmentally responsible behaviors, given that the research revealed that 77% of respondents discard recyclable waste along with regular collection. In this scenario, environmental education must be promoted as a participatory and continuous process, promoting the capillarity of society and dialogue with the different levels of power, awakening a citizen attitude through a critical conscience and the acquisition of ecologically correct and responsible habits. of waste management that contribute to reducing or mitigating environmental degradation.

Keywords: *environmental education, Guarujá, household waste.*

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REVISTA AIDIS

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AVALIAÇÃO AMBIENTAL DA ÁREA DE PRESERVAÇÃO PERMANENTE AO LONGO DO IGARAPÉ SANTOS LOCALIZADO NA CIDADE DE TUCURUÍ – PA

ENVIRONMENTAL ASSESSMENT OF THE PERMANENT PRESERVATION AREA ALONG THE IGARAPÉ SANTOS LOCATED IN THE CITY OF TUCURUÍ – PA

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Abstract

Industrialization has caused major changes in cities, especially the disordered occupation near water courses. These occupations directly affect the Permanent Preservation Areas (APP) generating negative consequences for the environment and for the local population. The objective of this research is to evaluate the environmental conditions of the Igarapé Santos' APP, located in the municipality of Tucuru , PA, Brazil, verifying the specifications and compliances related to the environmental laws and regulations in force regarding the process of expansion and urban occupation. The method used for this work is the deductive one, where the consultation of environmental laws and regulations at the Federal, State and Municipal levels, in addition to articles, books and similar studies, began. Subsequently, visits, photographic records, and visual evaluations of the APP and the riverbed of the Igarap  were carried out at points accessible to Igarap  Santos. Finally, using the QGIS software version 3.16.8 and using the Quick Map Services tool to obtain images through Google Satellite for the elaboration of thematic maps and the "Buffer" tool to trace the polygon delimiting the APP range. In this way, it was possible to observe that the urban area of the APP is more degraded than the rural area due to the presence of old and new buildings in the APP, the release of raw sewage and solid waste in the riverbed and on the banks of the Igarap  Santos, and eutrophication. Therefore, the urban area suffers greater environmental degradation caused by disordered occupation and lack of urban infrastructure, compromising Igarap  Santos and the population's quality of life.

Keywords: riparian forest, urban zoning, environmental legislation, disorderly occupation, environmental pressure.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

APROVEITAMENTO DOS RESÍDUOS AGROINDUSTRIAIS DA CASTANHA-DO-BRASIL ATRAVÉS DO TRATAMENTO PIROLÍTICO EM REATOR DE LEITO FIXO

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USE OF BRAZIL NUT AGRICULTURAL WASTE THROUGH PYROLYTIC TREATMENT IN A FIXED BED REACTOR

Recibido el 4 de marzo de 2022. Aceptado el 26 de septiembre de 2022

Abstract

The Brazil nut (*Bertholletia excelsa*) is one of the main products of the Amazon region due to trade and use in food, in its processing, the shell is removed, generating a residue. The study aimed to produce and characterize the residue (biomass) and activated carbon produced from pyrolysis from a Brazil nut processing plant in Acre (Brazilian state). The thermal conversion was carried out in a stainless steel fixed bed reactor. In order to obtain the solid fractions, a multivariable design was carried out in the pyrolysis system with two factors: temperature and heating rate. The analyzes carried out showed a biomass with an average moisture of 14.73% and the dehydrated crushed biomass of 5.06%. The biomass presented 69.21% of volatile material, ash (1.5%) and fixed carbon (24.21%). The results of the elemental analysis of the biomass showed 48.68% of carbon, 5.42% of hydrogen and 0.71% of nitrogen, and in the activated carbon, 80.87% of carbon, 2.8% of hydrogen and 1.07% nitrogen. The lowest temperature tested (409°C) in the pyrolysis obtained more charcoal (47%), it was found that of the variables evaluated, only the temperature influenced the yield. The biomass studied revealed a great potential for use, by taking advantage of residues and obtaining a charcoal with high efficiency in the removal of the methylene blue dye, demonstrating that it can be an opportunity to add value to the brazil nut production chain and have a return environmental and social.

Keywords: activated carbon, biomass, brazil nuts, pyrolysis.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

DESEMPENHO DE FILTROS LENTOS COM MEIO FILTRANTE DE MISTURAS DE AREIA E MATERIAIS SUSTENTÁVEIS

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PERFORMANCE OF SLOW FILTERS WITH FILTER MEDIA MADE OF MIXTURES OF SAND AND SUSTAINABLE MATERIALS

Recibido el 14 de marzo de 2022. Aceptado el 7 de junio de 2022

Abstract

Slow filters are easy to build, operate and maintain, making them suitable for water treatment also in small communities. Although the filter media commonly used is sand, studies suggest its full or partial replacement by unconventional materials, as long as it maintains efficiency in water treatment. Thus, the objective of this work was to verify the efficiency of slow filters using sustainable materials coconut fibers and ceramic residue mixed with sand as a filter medium. For this, three slow filters with different filter media were set up on a laboratory scale, they are: sand mixed with ceramic residue (Filter 1), sand mixed with coconut fibers (Filter 2), and conventional sand filter (Filter 3). The filters operated with a downward flow at a filtration rate of 3 m³/m².d (± 10%) continuously, fed with groundwater with the addition of WTP sludge. Raw water and water treated by filters were analyzed according to the quality standards of current legislation. The filters were also compared with each other in terms of efficiency, to verify which one presented the best performance in the treatment. Although the three models of filters analyzed had similar performances and brought benefits to the treatment of water contaminated with total and thermotolerant coliforms, Filter 1 showed greater efficiency in removing the physical-chemical parameters turbidity and apparent color, Filter 2 showed greater efficiency only in removing of thermotolerant coliforms and Filter 3 in the removal of total dissolved solids. Therefore, in cases where ceramic residue or coconut fiber is available, it is suggested that these materials are mixed with sand for better performance of the filter media.

Keywords: slow filtration, unconventional materials, coconut fibers, ceramic residue.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

ANÁLISE DA TENDÊNCIA DE SÉRIES HISTÓRICAS DE VAZÃO NA BACIA HIDROGRÁFICA DO RIO AMAZONAS

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TREND ANALYSIS OF HISTORIC DISCHARGE SERIES IN THE AMAZON RIVER HYDROGRAPHIC BASIN

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Abstract

Studying flow trends is important to understand hydrological variability and to determine what has influenced their increases or decays. The present work analyzes the spatio-temporal trends of the annual series of average flow in the Amazon River Basin (Brazilian portion) of 92 fluviometric stations through non-parametric Mann-Kendall and Sen's Slope tests for five distinct periods (1975-2014, 1980-2014, 1985-2014, 1995-2014 and 2000-2014). The results indicate that the series of average flows are increasing in the Amazon Basin for all analyzed periods. In the sub-basins of the right bank of the Amazon River, Tapajós and Madeira, the most recent period (2000-2014) records the greatest trends of significant increase in the average annual flow from 1998 onwards, reaching the highest values ever observed. Mean flow decay trends were found at six stations in the Tapajós and Madeira sub-basins. The magnitude of trends by Sen's Slope test, of significant or non-significant data, shows that there is behavior of increase in flow rates throughout the Amazon basin, which can be influenced by atmospheric systems operating in the Amazon (such as the Intertropical Convergence Zone, ENOS, General and Upper Circulation in Bolivia) or changes in land use and occupation, such as deforestation of the right bank of the Amazon River.

Keywords: Amazon, trends, discharge.

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REVISTA AIDIS

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

A IMPLANTAÇÃO DA COBRANÇA PELO USO DA ÁGUA NO BRASIL: CONTRIBUIÇÕES E DESAFIOS

THE IMPLEMENTATION OF WATER CHARGES IN BRAZIL: CONTRIBUTIONS AND CHALLENGES

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Abstract

The first charges for water use in Brazil occurred in 1996, in the state of Ceará, with other river basins adopting the strategy over time. Despite the 1997 Water Law, charging in federal hydrographic basins only began in 2003, as is the case in the Paraíba do Sul river basin. In this context, the article aims to evaluate the implementation of charging models in Brazilian hydrographic basins, in addition to highlighting the main contributions of the resources derived from such charges and understanding the most urgent challenges. The methodology consisted of a literary search and an analysis of charging methods adopted in Brazil. The organizational model established by the Water Law is an adequate platform for the implementation of different charging models, constituting a significant institutional advance, as it allows democratic discussion between users, public authorities and organized civil society. However, from this investigation, it was found that charging models are adopted in few Brazilian basins, most of which do not even have a water resource plan. In cases where there is a charge for the use of water, this practice proved to be insufficient to change the behavior of the user to rationalize this natural resource.

Keywords: economic instruments, rational use of water, water management.

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REVISTA AIDIS

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

IMPACTO DA RECIRCULAÇÃO DE LIXIVIADO NA PRODUÇÃO E QUALIDADE DO BIOGÁS GERADO EM ATERROS SANITÁRIOS: REVISÃO SISTEMÁTICA

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IMPACT OF LEACHATE RECIRCULATION ON THE PRODUCTION AND QUALITY OF BIOGAS IN LANDFILLS: SYSTEMATIC REVIEW

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Abstract

Biogas and leachate generated from the decomposition of municipal solid waste (MSW) in landfills, when not collected and treated, might cause environmental impacts. Leachate recirculation (LR) is a technique that has been used, among others factors, as a way of reducing the costs associated with the transport and treatment of leachate, as well as contributing to a faster stabilization of the organic fraction of MSW, which could impact an increase in biogas production in a shorter period of time. This work aimed to evaluate the influence of LR on the production and quality of biogas generated in landfills through a systematic review of research carried out in the last decade, thus to support an updated synthesis of the main results obtained in laboratory and large scale. The results found showed that the accumulation of toxic compounds is one of the main problems observed with the practice of LR. The use of additives, the control of the rate and frequency of recirculation and the supplementation of heat to the recirculated leachate were some of the techniques observed that have been investigated as a way of improving the influence of recirculation in the process of biodegradation of waste and increase the production of biogas. The results found showed that LR impacted in different ways the production and quality of the biogas generated through the decomposition of waste, proving to be effective in some studies to increase the production and quality of biogas, as well as ineffective in other studies.

Keywords: biogas, landfill, leachate recirculation, systematic review.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

INFLUÊNCIA DA ADIÇÃO DE FIBRAS CURTAS DE COCO DISTRIBUÍDAS ALEATORIAMENTE NA CURVA CARACTERÍSTICA DE RETENÇÃO DE ÁGUA DE UM SOLO ARGILOSO COMPACTADO

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INFLUENCE OF RANDOMLY DISTRIBUTED SHORT COCONUT FIBERS ADDITION ON THE WATER RETENTION CHARACTERISTIC CURVE OF A COMPACTED CLAY SOIL

Recibido el 8 de abril de 2022. Aceptado el 8 de junio de 2022

Abstract

The disposal and treatment of coconut fruit, called coconut, in landfills of solid urban waste is a recurring problem in places where its consumption is quite high. The biological properties of this material, added to its large volume, contribute to reduce the useful life of landfills. As a way to search for alternatives for the use of this type of waste in the unsaturated geotechnical context, this work proposes the insertion of coconut fibers to improve the geotechnical behavior of compacted clay soils. For that, soil mixtures with fiber content in the proportions of 0, 0.5, 1 and 2% in dry weight of the soil were analyzed for a matrix of compacted clay soil. The water retention curve obtained experimentally and numerically was evaluated. The results showed that mixtures with 0.5 and 1% of coconut fibers showed an increase in saturation and residual volumetric humidity in relation to the natural soil, reflecting a higher level of suction for air intake. In order to find geotechnical applications of these mixtures, there was an improvement in significant characteristics in applications where the soil is subject to variations in the wetting and drying cycles, such as in the landfill cover layers and contaminant barriers. The insertion of these fibers tends to reduce the production of leachate and the emission of gases through layers of landfill cover or contaminant barriers.

Keywords: soil improvement, geotechnical behavior, unsaturated soils.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

ANÁLISE DOS IMPACTOS DA PENETRAÇÃO DA GERAÇÃO DISTRIBUÍDA NA REDE DE DISTRIBUIÇÃO RELACIONADOS AO SISTEMA DE COMPENSAÇÃO BRASILEIRO

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PENETRATION IMPACT ANALYSIS OF THE DISTRIBUTED GENERATION IN THE DISTRIBUTION NETWORK RELATED TO THE BRAZILIAN COMPENSATION SYSTEM

Recibido el 14 de abril de 2022. Aceptado el 20 de junio de 2022

Abstract

The growing world demand for electrical energy associated with the increasing greenhouse gas emissions is resulting in a growing need to use clean energy. Solar energy is one of the clean energy solutions that has been growing and consolidating around the world. In Brazil, to incentivize the use of solar energy, the government enabled and stimulated the Distributed Generation sector through the Normative Resolution 482/2012. Although, the Distributed Generation growth is impacting the distribution network. Due to it, the bodies responsible for energy planning in Brazil are proposing changes to the current resolution. In this context, this work aims to discuss the revenue reduction impacts caused by the penetration of Distributed Generation in the distribution network, where ten main Brazilian energy distributors are analyzed. To this end, documentary research is carried out through databases, laws, and regulations. In addition, a method is proposed to quantify the Distributed Generation penetration rate and its impact on the distribution networks. The results present the Distributed Generation penetration rates in distribution networks and the Distributed Generation quantified impact, in kWh, in the distributor. It also presents indicators that might help energy sector managers to formulate and/or create strategies to solve the negative impacts of the Distributed Generation penetration in the distribution network.

Keywords: distributed generation, solar energy incentive, GD penetration.

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REVISTA AIDIS

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INDICADORES DE DESEMPENHO PARA AVALIAÇÃO DE ESTAÇÕES DE TRATAMENTO DE ESGOTOS DE UMA BACIA DE ESGOTAMENTO EM FORTALEZA, CEARÁ, BRASIL

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PERFORMANCE INDICATORS FOR THE EVALUATION OF WASTEWATER TREATMENT PLANTS IN A SEWAGE BASIN IN FORTALEZA, CEARÁ, BRAZIL

Recibido el 22 de abril de 2022. Aceptado el 8 de agosto de 2022

Abstract

Wastewater treatment plant are considered punctual sources of pollution, which may compromise the receiving water bodies. The effective and efficient performance of WWTPs contributes to the sustainable management of water resources. In this study, the most relevant performance indicators (PIs) for evaluating the performance of WWTPs in a sewage basin in the city of Fortaleza, Ceará, Brazil, were selected and analyzed based on expert opinions. The answers obtained through the Delphi method were used to define the weights of the PIs, using the AHP method. Of the 18 selected PIs, the following stand out: "Removal of polluting load from affluent sewage at the treatment plant", "Conformity of analyzes of treated sewage for total suspended solids" and "Compliance of analyzes of treated sewage for BOD". Then, the global performances of 3 WWTPs in the study area were determined by the TOPSIS-Sort multicriteria method. The WWTPs Aldemir Martins and José Euclides obtained "Unsatisfactory" performance, while the WWTP Castelão obtained "Satisfactory". It's expected that the PIs structured in this study will be used by the actors involved in the decision-making process, as well as the methodology developed can be applied in other studies, considering their characteristics and local conditions.

Keywords: wastewater treatment plant, multi-criteria decision analysis, Analytic Hierarchy Process, Delphi method, TOPSIS-Sort.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

AVALIAÇÃO DE VAPORES E COMPOSTOS ORGÂNICOS VOLÁTEIS LIBERADOS DURANTE A TORRA INDUSTRIAL DO CAFÉ

EVALUATION OF VAPORS AND VOLATILE ORGANIC COMPOUNDS RELEASED DURING THE INDUSTRIAL ROAST OF COFFEE

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Abstract

To provide for coffee consumption, roasting is carried out industrially on large scales. The duration and degree of roast not only determine the temperature profile of the coffee but also the extraction content. Several factors are related to the formation of vapors and volatile organic compounds during roasting. Currently, during roasting, vapors and volatile organic compounds are emitted into the atmosphere. In this context, the current work developed a procedure that allows the recovery on an industrial scale of the released compounds. To carry out the present work, a partnership was made with a coffee production company where the sizing of the system to carry out the collection of compounds was based. One roast was carried out for the arabica type coffee with 10 kg of green coffee and another for the conilon type coffee with 5 kg of green coffee. For the Arabica type, the collection time was 10 minutes, resulting in a collected volume of 119.5 mL. For the conilon type, the roasting time was 10.5 minutes with a volume of 47.5 mL. The results obtained for total organic carbon concentration were between 2753 mg/L to 12030 mg/L for the arabica type and between 2937 mg/L to 8651 mg/L for the conilon type. The pH in both samples was acidic with values between 2.99 and 3.24 for the arabica type and between 2.44 to 3.73 for the conilon type.

Keywords: coffee roasting; volatile organic compounds; condensation.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

PREDIÇÃO DE OPERAÇÃO DE BOMBAS COMO TURBINA E SUA APLICAÇÃO PARA RECUPERAÇÃO DE ENERGIA EM SISTEMAS DE DISTRIBUIÇÃO DE ÁGUA

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PREDICTION OF PUMPS AS TURBINE OPERATION AND ITS APPLICATION FOR ENERGY RECOVERY IN WATER DISTRIBUTION SYSTEMS

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Abstract

Pumps as turbines (PAT) are a sustainable alternative for generating energy by taking advantage of the hydraulic potential of a site. However, there are difficulties in predicting the turbine mode characteristic curves for off-design operating points, based on the curves provided by the pump manufacturers. The purpose of this work is to predict the PAT operating range of pumps selected to work as pressure-reducing valves (PRV) in the water supply system (WSS) of Vila Permanente, in Tucuruí - Pará, Brazil. Three experimental studies were evaluated for the prediction of head (Ht) and flow (Qt) of PATs in turbine mode at the best efficiency point (BEP). Then, a second method was applied that considers the entire operating range of PAT, combined with the methods in the BEP to obtain characteristic curves QxH (flow x head) and Qxη (flow x efficiency) of PAT. With the head and flow values of the pressure points in the WSS under study, centrifugal pumps were selected to work as turbines, applying the best combination of method and obtaining the characteristic curves of PAT in turbine mode, in order to obtain the operation range of the PAT, in addition to the calculations of partial energy recovery with values of 372.3 MWh/year.

Keywords: pump-as-turbine, water supply system, energy recovery.

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REVISTA AIDIS

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

TRATAMIENTO ANAEROBIO Y VALORIZACIÓN ENERGÉTICA DE LAS AGUAS RESIDUALES DEL PROCESO DE NIXTAMALIZACIÓN DEL MAÍZ: UNA REVISIÓN

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ANAEROBIC TREATMENT AND ENERGY RECOVERY OF WASTEWATER FROM THE CORN NIXTAMALIZATION PROCESS: A REVIEW

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Abstract

In Mexico, the generation of wastewater from the corn nixtamalization industry (also named nejayote) is 14.4 million m³/year. This type of wastewater is characterized by an alkaline pH>10, high content of organic matter (33.2 gCOD/L on average), and a BOD₅/COD ratio of 0.4, indicating a high biodegradability through anaerobic biological processes with energy recovery. Dark fermentation and anaerobic digestion processes offer alternatives for using this residual water. In addition to stabilizing the residue, it generates value-added by-products such as volatile fatty acids, methane, hydrogen, and digestate. Few investigations have focused on the production of biogas from nejayote, reporting maximum yields of 282 mLCH₄/gCOD and 49.3 NmLH₂/gCOD, offering organic matter removal from 50% to 95% in terms of COD. The energy recovery of wastewater from nixtamalization has an energy potential that can reach up to 20.4 kWh/m³, which can be used to cover the energy requirements of the dynamic equipment and auxiliary services in the treatment, and the rest can be used in the industry.

Keywords: anaerobic digestion, dark fermentation, hydrogen, methane, nejayote.

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AVALIAÇÃO TÉCNICA DE MEDIDA DE MANEJO SUSTENTÁVEL DA ÁGUA PLUVIAL COM ORIFÍCIO REGULADOR DE VAZÃO

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ASSETEMENT OF SUSTAINABLE URBAN DRAINAGE SYSTEM WITH CONTROL PIPING

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Abstract

Compensatory techniques (CTs) are sustainable urban drainage system that temporarily reserve rainwater to reduce the risk of flash flooding. Most CT design methods do not consider the use of control piping, because they assume total infiltration of water into the soil. In this context, the study evaluated the hydraulic and hydrological impact of a CT with a control piping implanted in an urban area in the city of Blumenau, Santa Catarina state. An experimental module allowed estimating the flow rate of the control piping with a nominal diameter of 50 mm and a length of 1.50 meters. Puls's method was used to evaluate the reduction of the flood wave made by CT. The experiment showed that the discharge coefficient of the control piping was 0.60 ± 0.01 , being 10% lower than the value reported by the literature. It was estimated that the maximum flow rate reached by the control piping was 1.5 l/s. The TC reduced the contribution maximum flow of 16.8 l/s to 2.0 l/s. The analysis demonstrated the importance of the control piping verify for that the TCs contribute to the sustainable urban drainage management.

Keywords: rainwater, permeable pavement, piping control, sustainable urban drainage system.

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AVALIAÇÃO DO CICLO DE VIDA APLICADA A EDIFICAÇÕES EM CONTÊINERES: REVISÃO CRÍTICA E CONTRIBUIÇÕES PARA A PADRONIZAÇÃO DAS PESQUISAS

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LIFE CYCLE ASSESSMENT APPLIED TO CONTAINER BUILDINGS: CRITICAL REVIEW AND CONTRIBUTIONS FOR RESEARCH STANDARDIZATION

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Abstract

The container construction system has become attractive for civil construction when recycling and reusing a product, but its much-publicized sustainability has yet to be proven, as it must consider the environmental, economic and social aspects of its complete life cycle. One of the consolidated tools that covers all these issues is the Life Cycle Assessment (LCA). Thus, this work aims to execute a critical review of the literature on the Life Cycle Assessment of buildings built with containers, identify the best practices and deficiencies, using ISO standards as a reference, and propose recommendations for future studies in this area. The methodology used for the systematic review was the Knowledge Development Process – Constructivist (Proknow-C). As a result, the work brings to light recommendations for better LCA practices applied to container buildings. For example, the functional unit (FU) adopted must be explained in detail, as the modules evaluated have different standardizations. Several gaps were highlighted, such as the need to expand studies on other environmental impacts, in addition to energy use and CO₂ emissions into the atmosphere. Finally, the critical review carried out identified a series of points that need greater clarity or to be made explicit. Thus, there is a latent need to standardize the studies, for a better practice of LCA. With the adoption of a standardized protocol, it will be possible to obtain more robust results that can be easily compared with other studies.

Keywords: container for housing, LCA, Proknow-C, sustainability.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

AÇÃO DE FUNGOS NA REMOÇÃO DE METAIS DE ÁGUAS RESIDUÁRIAS E COMPARTIMENTOS AMBIENTAIS: UMA REVISÃO

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ACTION OF FUNGI IN THE REMOVAL OF METALS FROM WASTEWATER AND ENVIRONMENTAL COMPARTMENTS: A REVIEW

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Abstract

Metal-rich effluents are very common and cause great concern, although these elements are easily found in nature, they appear in very small concentrations. Thus, from anthropic actions, the metals end up being disposed in environments where they would be easily found and with high concentrations, in a way that it's necessary these pollutants are treated in an adequate and sustainable way. There are several methods for metal removal, them being chemical, physical and biological. The metal adsorption is one of the most used treatment method for metal removal from liquid media due to its simplicity, ease operation and cost-effectiveness, especially if the adsorbent used is abundant. The adsorption process, when using a biological adsorbent, is called biosorption/bioaccumulation, which, in addition to the advantages already mentioned, expands the possibilities with the use of organic waste, living or dead organisms or other low-cost material. The objective of the present review is to carry out a survey regarding the removal of metals by biosorption and bioaccumulation. The processes known as biosorption and bioaccumulation have gained much prominence in the last two decades due to good results in the removal and recovery of metal ions. Nowadays several types of biosorbents are used, such as organic waste from industrial segments, precisely because it is a sector that produces waste in abundance. In addition to waste, plants and microorganisms are also widely used in metal removal processes. Fungal biomass, living or dead, plays a very important role in this treatment process. They have a great ability to adsorb metals in aqueous media and, when it comes to living biomass, their versatility and ability to resist and adapt to different concentrations of metals can be taken into account. Additionally, metabolism in the bioaccumulation process can be one more tool in the treatment process. The *Aspergillus* and *Penicillium* genera are one of the most used ones for the removal of various metals isolated or in solutions with removal efficiencies that, according to the studies observed, could range from 28 to 99%. That being said, it is important to study and select fungal strains capable of promoting the removal of various metals in different concentrations, with the intention of reducing the impacts caused by effluents contaminated with them.

Keywords: fungi, biosorption, bioaccumulation, metal removal, bioremediation.

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