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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.

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REGIONALIZAÇÃO DA VAZÃO $Q_{95\%}$ NA AMAZÔNIA

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REGIONALIZATION OF $Q_{95\%}$ FLOW IN THE AMAZON

Recibido el 10 de abril de 2017; Aceptado el 16 de octubre de 2018

Abstract

Studies on estimated flows in ungauged basins are of great importance for the management and planning of water resources. The regionalization of flows is an alternative to obtain this information. Current analysis proposes regional models that determine minimum flows of reference $Q_{95\%}$ in the Amazon. Models were developed by multiple regression analysis, where $Q_{95\%}$ was explained in terms of drainage area, mean annual rainfall and main river length. The Jack-Knife cross validation method evaluated the performance of regional models. Since performance indexes presented NASH rates above 0.60 and errors ($\epsilon\%$) lower than 10% for all cases, they indicated a good and acceptable adjustment. The linear model was the most adopted out of the 22 regional models defined, representing 45.5% of the total, similar to the logarithmic (27.3%), potential (22.7%) and exponential (4.5%). On the other hand, the cubic model did not provide satisfactory results when compared to other models. Therefore, models may be used in a large part of the Amazon region to estimate $Q_{95\%}$, due to the physical-climatic characteristics of basins without flow data.

Keywords: *multiple regression, physical-climatic characteristics, hydrographic basins.*

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ESTABILIDADE OXIDATIVA DO BIODIESEL DE MACAÚBA NA PRESENÇA DE ANTIOXIDANTES

OXIDATIVE STABILITY OF MACAÚBA BIODIESEL IN THE PRESENCE OF ANTIOXIDANTS

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Melissa Budke Rodrigues¹

Recibido el 6 de junio de 2017; Aceptado el 16 de octubre de 2018

Abstract

This work aimed to evaluate the oxidative process of macaúba biodiesel, in the absence and presence of the antioxidants butyl hydroxytoluene (BHT) and β -naphthol. Samples with 0, 100, 500, 1000 and 5000 ppm of BHT were prepared which were subjected to the thermal degradation test for a period of 6 hours at 150°C and the oven test at 65°C for 30 days. Samples with 1000 and 5000 ppm of β -naphthol were prepared and subjected to the accelerated test. All the samples were analyzed through the acid, peroxide, iodine and infrared spectroscopy indices. The results showed that the presence of BHT was able to minimize the oxidation in the biodiesel only at the concentration of 5000 ppm, while the β -naphthol could inhibit the oxidation at both the 1000 ppm and the 5000 ppm concentrations.

Keywords: β -naphthol, oxidative process, thermal degradation..

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VERIFICAÇÃO DAS CONDIÇÕES ACÚSTICAS DE HABITAÇÃO DE INTERESSE SOCIAL DE ACORDO COM A NORMA BRASILEIRA NBR 15575

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ACOUSTIC ANALYSIS OF SOCIAL HOUSING PROJECT ACCORDING TO THE BRAZILIAN PERFORMANCE STANDARD NBR 15575

Recibido el 23 de junio de 2017; Aceptado el 6 de septiembre de 2018

Abstract

The acoustic comfort is essential for the well-being of the buildings users. Some studies indicate that Brazilian buildings have low acoustic comfort, with noise propagation through several mechanisms. The notices of social housing projects that have been performed using the minimum allowed satisfying the requirements of their future residents. The Standard NBR 15575:2013 establishes the minimum required performance for some systems. The aim of this paper is to analyse the acoustic performance conditions of a social housing project, in order to verify that the slabs and walls systems of the building meet the Performance Standard and the estimates of costs for adapting buildings to the Brazilian Standard. A case study was developed based on a typical project. It was verified that the Weighted Sound Reduction Index (Rw) calculated for the slabs meets the minimum required by the Performance Standard. Regarding the walls system, half of the analyzed sections indicated that the original construction system did not meet the limits of NBR 15575, demonstrating the need to make small changes in the project, with an increase of less than 0.5% in the project costs. It can be concluded from the results that small changes in design and the use of appropriate materials for each type of construction, depending on their occupation and other factors, can ensure minimum levels of performance without significantly changes in the cost of the final product.

Keywords: *acoustic comfort, social housing, Standard NBR 15575, costs.*

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FERRAMENTA ESPACIAL PARA GERENCIAMENTO DE RESÍDUOS: ELABORAÇÃO DE UMA METODOLOGIA QUALITATIVA PARA IDENTIFICAR ÁREAS DE DESTINAÇÃO FINAL DE LODOS DE ETA E ETE

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SPATIAL TOOL FOR WASTE MANAGEMENT: DEVELOPING A QUALITATIVE METHODOLOGY TO IDENTIFY FINAL DESTINATION AREAS FOR WATER AND WASTEWATER TREATMENT PLANTS SLUDGES

Recibido el 6 de julio de 2017; Aceptado el 16 de octubre de 2018

Abstract

Disposal of water treatment plants (WTP) and wastewater treatment plants (WWTP) major residuals, i.e., sludges, become an increasing problem in highly urbanized regions. Supply and demand imbalance between landfills and urban and industrial solid wastes has driven regional market prices up. Also legal restrictions based on sustainability push water companies to find beneficial use markets. A GIS-based qualitative methodology to manage sludge final destination selection was firstly proposed. An emblematic highly urbanized and industrialized region in southeastern Brazil, i.e., the watersheds of Piracicaba, Capivari and Jundiá (PCJ) rivers, was chosen as a case study. Environmentally appropriate destination of general solid wastes challenges 76 municipalities, counting 100 WTP and 116 WWTP sludge sources. The best final destinations assumed to WTP and WWTP sludges were, respectively, incorporation into ceramic materials and disposal in sugar-cane crop areas. Circle areas of 10 km-radius around georeferenced treatment plants (buffers) were created and thus analysed in two ways. The first analysis superimposed buffers to identify areas with higher sludge generation. The second analysis clustered neighboring treatment plants and suggested joint actions for sludge management. GIS-based methodology merged to multicriteria analysis or operational research may be applied for more complex scenarios showing multiple sources and destinations points and areas.

Keywords: Sewage sludge, water treatment sludge, geographic information system, sludge final destination, ceramic industries.

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ANÁLISIS DE LA TRANSMITANCIA TÉRMICA DE LAS PAREDES Y COBERTURAS PARA CONSTRUCCIONES UTILIZANDO HORMIGÓN LIGERO CON VERMICULITA Y EPS

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ANALYSIS OF THE THERMAL TRANSMITTANCE OF WALLS AND ROOFS FOR CONSTRUCTIONS USING LIGHTWEIGHT CONCRETE WITH VERMICULITE AND EPS

Recibido el 26 de julio de 2017; Aceptado el 6 de septiembre de 2018

Abstract

The thermal performance of buildings is important to make a more economic and comfortable building, thereby improving the quality of life. An analysis of thermal comfort in a building involves the materials used to compose its walls and roof. This work developed a comparison of thermal resistance and thermal transmittance of walls with conventional concrete blocks and lightweight concrete with vermiculite and EPS (expanded polystyrene). It were also evaluated the calculations related to the roofs. The thermal transmittance and the thermal capacity of the walls and roofs were analyzed according to NBR 15220 and National (Brazilian) Program for Energy Conservation - Procel, considering the levels A (most efficient), B, C, D and E. For conditioned rooms only roofs with vermiculite concrete are adapted to the requirements of Procel at level B (thermal transmittance $<1.5 \text{ W} / \text{m}^2 \text{ K}$). It was calculated the thermal transmittance to classify according to the requirements for external walls (thermal transmittance $<3.7 \text{ W} / \text{m}^2$, according Procel). It was concluded that the roofs (concrete) and walls (blocks) that used lightweight concrete have provided better thermal performance for the building when compared to hedges and walls that will use ordinary concrete.

Keywords: *lightweight concrete, thermal comfort, thermal conductivity, vermiculite, expanded polystyrene.*

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ESTUDO COMPARATIVO DOS CUSTOS COM PRODUTOS QUÍMICOS PARA PRODUÇÃO DE ÁGUA A PARTIR DE DOIS MANANCIAIS. O CASO DA CIDADE DE PALMAS/TO, BRASIL

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COMPARATIVE STUDY OF COSTS WITH CHEMICALS FOR WATER PRODUCTION FROM TWO MANANTIALS. THE CASE OF THE CITY OF PALMAS / TO, BRAZIL

Recibido el 2 de agosto de 2017; Aceptado el 16 de octubre de 2018

Abstract

The purpose of this work is to present a comparative study of the costs of chemical products for water treatment between the currently used water stream, the (Taquarussú stream) and the possible new alternative (the UHE Luís Eduardo Magalhães Reservoir). For the current stream, the chemical costs correspond to approximately 12 percent of the total costs of the complete cycle system and there was no significant variation of this percentage over the studied period (2010 to 2015). Whereas, when water is collected directly from the UHE Luís Eduardo Magalhães Reservoir, using double filtration technology, total costs increased to 39 percent. This increase in chemical costs is related to the conditions of the reservoir's water quality. The need for a new alternative of water source is due to the increase in demand for other uses of the Taquarussu Stream and by an increase in demand for public water supply due to the population growth of the city of Palmas.

Keywords: operational costs, sources for public supply, water treatment.

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TRATAMIENTO ANAERÓBIO DE EFLUENTES DE ACIDIFICAÇÃO RÁPIDA USANDO CALCÁRIO COMO AGENTE TAMPONANTE

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ANAEROBIC TREATMENT OF RAPIDLY ACIDIFYING WASTEWATERS USING LIMESTONE AS A BUFFER AGENT

Recibido el 8 de agosto de 2017; Aceptado el 23 de agosto de 2018

Abstract

Agro-industrial effluents such as those produced by distilleries and beverage industries often contain high concentrations of carbohydrates. As a result, during, or even before anaerobic digestion (AD), these effluents can acidify rapidly, hindering methanogenesis and, consequently, biogas production. To avoid this problem, in many cases it is necessary to provide an exogenous source of alkalinity by buffering agents as in the case of present study, the limestone. Thus, to better understand the start-up of an anaerobic reactor treating rapidly acidifying wastewaters (RAWs), with limestone as alkalizing (corresponding to 15% of the reactor), batch experiments with and without recirculation were carried out, where the pH, the dissolution of limestone and the dynamics of acids, alkalinity and methane production during de AD of RAW were studied. The results showed that it is possible the application of limestone as buffer agent and the (temporary) addition of sodium bicarbonate can help to accelerate the anaerobic reactor start-up period. Theoretically, a time of 10.5 ± 0.5 hours per COD concentration ($\text{gCOD} \cdot \text{L}^{-1}$) was required to start the methanogenic activity, in addition it was necessary $0.43 \text{ gNaHCO}_3 \cdot \text{gCOD}^{-1}$ to neutralize the organic acids. Finally, the use of recirculation accelerated by 3.6 times the partial alkalinity production, showing to be important to promote a good performance of the reactor.

Keywords: beverage industries, dissolution of limestone, distillery, methanogenesis, sodium bicarbonate.

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ANÁLISE DO GERENCIAMENTO DE RESÍDUOS DA CONSTRUÇÃO CIVIL NO MUNICÍPIO DE FORTALEZA

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ANALYSIS OF MANAGEMENT OF CIVIL CONSTRUCTION WASTE IN THE MUNICIPALITY OF FORTALEZA

Recibido el 13 de agosto de 2017; Aceptado el 21 de agosto de 2018

Abstract

The civil construction waste (CCW) from construction and demolition (C&D) stands out from other solid waste because it represents a significant portion of the amount collected. In 2002, CONAMA Resolution No. 307 was established to discipline the administration and management of CCW. However, incoherent practices prevail in Brazilian cities in disregard of current legislation. Among these municipalities, Fortaleza has numerous points of irregular disposal. In order to deepen the study on this problem, the objective was to analyze the management and management of RCC in Fortaleza, obtaining indexes related to the public and private collection of RCC and identifying the responsibilities and challenges of the public power and large generators. The bibliographical analysis, followed by the data collection, in the municipal secretariats, and the technical visits to the recycling plants were the methodology. It was verified that the municipal collection rate (kg / hab / day) of CCW of Fortaleza is below the index verified in Brazil and in the Brazilian regions and that the private collection of CCW exceeds the municipal collection. CCW represents approximately 50% of the waste collected in the municipality. A portion of these has been irregularly disposed in Fortaleza as a consequence of the reduced number of ecopoints. It was also found that less than 10% of the collected CCW are sent to the recycling plants. From these data, it is concluded that the public power and the large generators still do not fully meet the legal requirements regarding the management of CCW.

Keywords: *construction and demolition waste, indexes, public power, environmental legislation.*

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VALORIZAÇÃO DE LODO DE ESGOTO ANAERÓBIO DIGERIDO DE ESTAÇÃO DE TRATAMENTO DESCENTRALIZADA POR MEIO DA COMPOSTAGEM.

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VALORIZATION OF ANAEROBIC DIGESTED SEWAGE SLUDGE FROM DECENTRALIZED WASTEWATER TREATMENT PLANTS BY COMPOSTING

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Abstract

This work evaluated the composting process as an alternative for the valorization of anaerobic digested sludge from a decentralized wastewater treatment plant (WWTP). The process stability and performance were investigated by monitoring physico-chemical and microbiological parameters during two distinct and sequential phases. In the first phase, the composting process was evaluated by assembling piles with anaerobic sludge and sawdust as structuring agent. In the second one, food waste was added to compost piles. In addition, a net present value (NPV) calculation was made seeking to investigate the economic viability of the initiative. The results of the first phase showed that the piles did not reach temperatures in the thermophilic range indicating that the microbiological activity was not established. On the other hand, in the second phase, after addition of the food waste as an amendment agent, temperatures above 55°C were registered and maintained for five consecutive days at the top of the piles. The result of the NPV showed that it is necessary to adopt adequate criteria for sampling frequency and number of parameters analyzed, in order to enable the implementation of composting as an alternative to anaerobic sludge valorization in small WWTP.

Keywords: anaerobic sludge, composting, food waste, valorization.

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REVISTA AIDIS

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

AVALIANDO A CISTERNA A PARTIR DO ÍNDICE DE EFETIVIDADE DA CISTERNA – ESTUDANDO O P1MC

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EVALUATING THE CISTERNS ACCORDING TO THE CISTERN'S EFFECTIVENESS INDEX - STUDYING THE P1MC

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Abstract

The use of the cisterns has been adopted in places with little water availability or difficulties in the implementation of regular water supply systems. Rainwater has good quality, including for personal uses such as drinking and cooking. However, the quantity and quality of rainwater are altered due to several factors that influence cistern effectiveness. In Brazil, the cisterns gained greater breadth with the implementation of the One Million Cistern Program. This program was proposed from a public policy of the federal government and implemented from 1993 aiming to provide the resident population in drought areas with means to thrive under water shortage conditions. In order to evaluate whether the cistern actually serves the beneficiary population, this article aims to study the cistern, based on the identification by Cistern Effectiveness Index. This index was built from the results of field survey addressing 28 variables grouped in the environmental, technical, health, social and institutional dimensions. The study addressed 347 P1MC cisterns in five municipalities in Bahia, with rainfall up to 600mm / year. The results are classified by the Cistern Effectiveness Index as critical and alert, due to several factors such as: absence of equipment which compromises the cisterns'operation, lack of information on the use of cistern, resulting in misuse, impacting water quality.

Keywords: cistern, indicator, cistern effectiveness index.

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TRATAMIENTOS APLICADOS Y POSIBLE APROVECHAMIENTO DE LOS RESIDUOS SÓLIDOS, BARRIO LA AMISTAD, GUANARE, ESTADO PORTUGUESA, VENEZUELA

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APPLIED TREATMENT AND POSSIBLE USE OF SOLID RESIDUES, LA AMISTAD NEIGHBORHOOD, GUANARE, PORTUGUESE STATE, VENEZUELA

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Abstract

The analysis of the current management situation in its generation, current treatments, the willingness of the population to participate in use programs, and SW characterization was performed to identify treatments for solid waste (SW) associated with the well-being of the inhabitants at La Amistad neighborhood, Guanare municipality, Portuguesa state, Venezuela. A quantitative and descriptive standpoint, through the survey (questionnaire), direct observation (checklist), and characterization procedures were applied. The research was carried out in a sample of 38 dwellings (residential source), 6 shops and 4 industries. The data was analyzed with the use of descriptive statistics, for then in participatory workshop to form a FODA matrix, whose hierarchy allowed identifying strategies of higher priority. Some results were: 71, 67 and 34% of residential, commercial and industrial respondents, respectively, use SW as a thrifty measure that does not transcend to be profitable. In 65% of the homes visited, it was observed solid wastes and residues were incinerated, and in 66% of all cases their disposal in the open air. It was found that more than 80% of residential and commercial SW are locally marketable. Some treatment strategies identified were: 1. To raise awareness to minimize the fires; 2. To encourage the use of organic residues, paper, paperboard, LDPE and HDPE; 3. To create a recovery company in the sector. The current management of SW responds to economic and cultural factors, which can also foster utilization strategies.

Keywords: cultural, management, treatment, use, strategies.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

PRODUÇÃO DE COAGULANTE A BASE DE TANINO DE *Acacia mearnsii* E POTENCIAIS USOS NO SETOR INDUSTRIAL E NO TRATAMENTO DE ÁGUA PARA CONSUMO HUMANO: A EXPERIÊNCIA BRASILEIRA

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COAGULANT PRODUCTION BASED ON *Acacia mearnsii* TANNIN AND POTENTIAL USES IN THE INDUSTRIAL SECTOR AND IN WATER TREATMENT FOR HUMAN CONSUMPTION: THE BRAZILIAN EXPERIENCE

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Abstract

*In the Rio Grande do Sul state of southern Brazil, there is an intense cultivation of *Acacia mearnsii* intended for the generation of energy and extraction of the tannins for the tanning of skins and the production of organic coagulants. Organic coagulants are alternative products to coagulants that employ aluminium and iron salts commonly used in water treatment and effluent treatment plants. Even though it is economically cheaper, inorganic coagulants have the disadvantage of generating sludge with high amounts of metals and should receive adequate treatment and final disposal. The search for economically viable, sustainable and natural alternatives has encouraged the writing of this article. This article presents a review on the production of the organic coagulant based on tannin extracted from the bark of *Acacia mearnsii*, the cultivation of this species, the synthesis of the coagulant from the extraction and finally its use in industrial effluent treatment and water treatment for the human consumption. This work also presents the Brazilian experience of the use of Organic coagulants in a water plant, in order to minimize Environmental Impacts at the time of disposal in compliance with current legislation. On the basis of this study, it can be concluded that the tannin-based coagulant is efficient, applicable and cost effective, with the main advantage being the removal of aluminium from the water treatment process of public supply and the elimination of the management of metallic sludge, which is complex in its dehydration and costly in its final destination. Replacement by organic coagulants provides metal-free slurries, capable of being used as substrates for organic fertilizers, and recently as an alternative source of energy through combustion after dehydration.*

Keywords: *Acacia mearnsii*, Tannin, Organic Coagulant, Water Treatment, Water Sludge.

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