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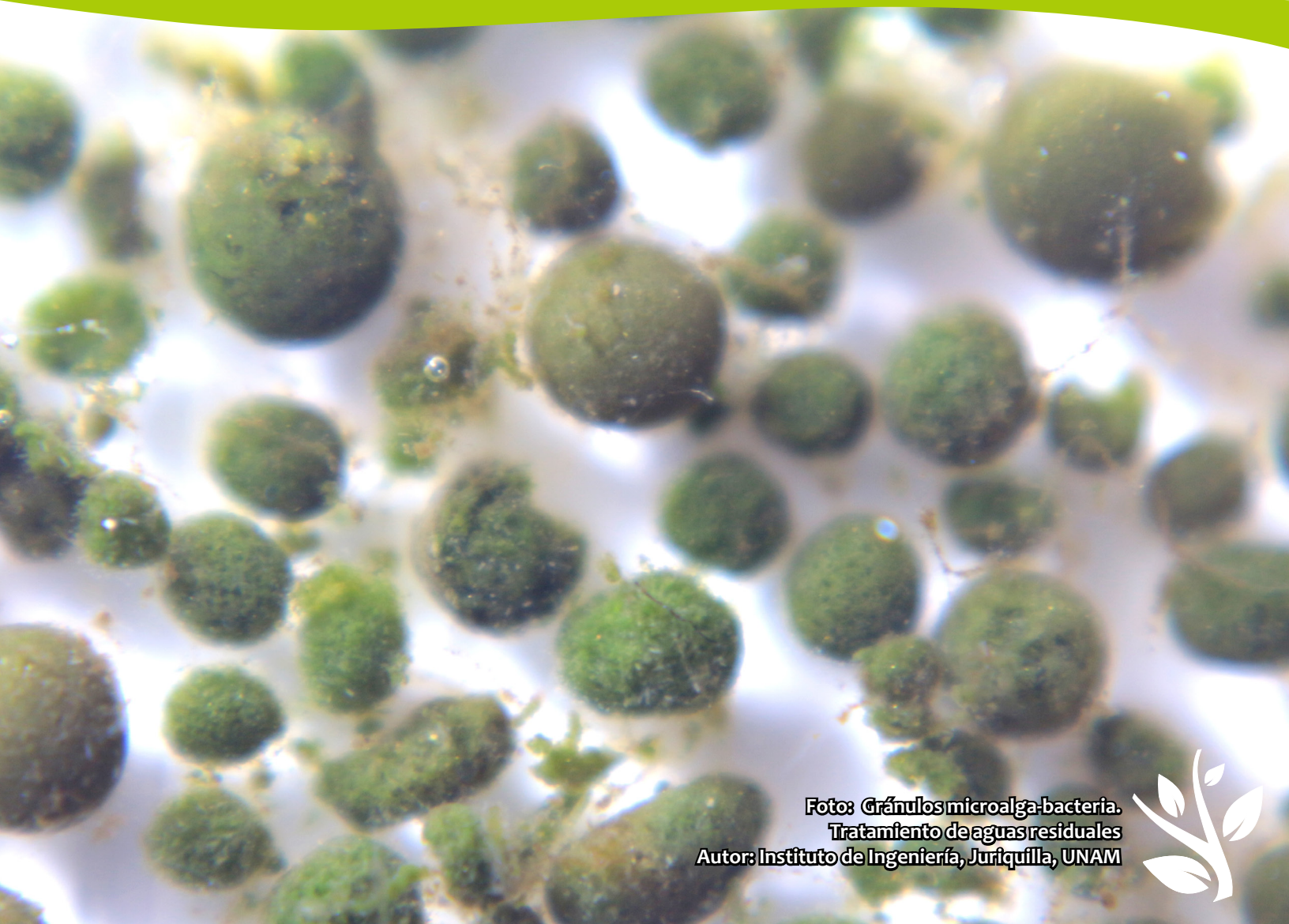

Foto: Gránulos microalga-bacteria.
Tratamiento de aguas residuales
Autor: Instituto de Ingeniería, Juriquilla, UNAM

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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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INFLUÊNCIA DE UM DISPOSITIVO REGULADOR DE PICOS DE VAZÃO NA EFICIÊNCIA DE REMOÇÃO DE MATÉRIA ORGÂNICA EM FILTROS ANAERÓBIOS

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José Dorivaldo Florêncio de Oliveira[1]
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EFFECT OF A PEAK FLOW CONTROL DEVICE ON THE ORGANIC MATTER REMOVAL EFFICIENCY IN ANAEROBIC FILTER

Recibido el 9 de marzo de 2015; Aceptado el 8 de febrero de 2016

Abstract

There are many technologies that seek efficient and cost compatible solutions to minimize the problem caused by fluctuations sewage discharge. In cases of low density occupation, or in peri-urban communities, where a sewerage system is difficult to implement, individual solutions can work satisfactory and economically. However, these solutions for effluent treatment are subject to more pronounced peak flow than the large systems, due to the proximity from their location to the sewage sources. The objective of this study was to evaluate the use of a device that provides limitation of peak flows in treatment efficiency in anaerobic filters filled with granite rocks (mesh 4) fed with septic tank effluent. It was conducted as comparative study between two identical filters, being only one of them preceeded by the device that provides limitation of peak flows. Over the period of a year of monitoring, the inclusion of a peak flow control chamber, preceeding one of the filters, provided an average reduction in peak flow of 48.6%, however, according with the chosen parameters, the removal efficiency of organic matter wasn't significantly influenced by using this device.

Keywords: Anaerobic filters, Hydraulic Shock, Sewage treatment.

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CONTRIBUIÇÃO DO TRAFEGO URBANO NA QUALIDADE DO AR EM CIDADE BRASILEIRA DE PORTE MÉDIO

Denise Daris[1]
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Eduardo Pavan Korf[3]
Francisco Dalla Rosa[2]

URBAN TRAFIC CONTRIBUTION TO THE AIR QUALITY IN MID-SIZED BRAZILIAN CITY

Recibido el 27 de abril de 2015; Aceptado el 1 de diciembre de 2015

Abstract

Urban air pollution became one of the main factors of degradation and preoccupation of the quality of life in cities. The urban traffic is one of the most important causes of this pollution. The pollutants carry several toxic substances that can cause acute and chronic effects to the human health, besides causing local and global environmental impacts. The difficulty of monitoring pollution in urban areas, as in Passo Fundo city, arises due to the high demand for investments, especially when resorting to the techniques of active monitoring. Thus, this study aims to use inexpensive passive samplers to monitor and diagnose emissions of nitrogen oxide and ozone in the city of Passo Fundo – Brazil. The data collection monitored six points located in the urban area of this city, during the period one year. The concentrations found for NO2 and O3 were below to the values presented by the legislation, therefore, it should not impact to the human health. The data show that three points monitored presented the highest concentrations of NO2 and O3, which they are also the points with the greatest flow end congestion, confirming the direct relation with the pollutant concentration level. Considering that Passo Fundo don't have monitoring forms of pollutant emissions, this research is important to diagnose the impacts and if necessary provide control measures in generating sources.

Key Words: Atmospheric Emission, Passive samplers, Pollution, Urban traffic.

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AVALIAÇÃO DO IMPACTO DAS MUDANÇAS CLIMÁTICAS NO BALANÇO HÍDRICO NA BACIA DO ÓROS USANDO OS MODELOS DE MUDANÇAS CLIMÁTICAS DO IPCC-AR4 PARA O CENÁRIO A1B

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IMPACT ASSESSMENT OF CLIMATE CHANGE ON WATER BALANCE IN Oros BASIN USING THE CHANGES OF CLIMATE MODELS IPCC AR4-FOR SCENARIO A1B

Recibido el 18 de mayo de 2015; Aceptado el 29 de enero de 2016

Abstract

Projections flows to the basin of Óros - Ceará were obtained using the precipitation of global mo-dels of the fourth report of the Intergovernmental Panel on Climate Change (IPCC AR4-) for the period 2010-2099 the A1B scenario. It can be observed both a quantitative superiority as a qualitative superiority of the fourth report of the data before the fifth report, a decisive factor for choosing such a report in the construction of the results, where the proper handling of data is critical. Another determining factor in the choice of the fourth report was the range of referential work, guiding factor in comparison of results. Flows were generated by the hydrological model Soil Moisture Account Procedure (SMAP), initializing by rainfall corrected statistically from observed data and evaporation estimated by the Penman-Montheith method. To analyze the impact on the annual average flow of the XXI century was assessed the trend of the series using the Mann-Kendall-Sen method. To identify the frequency of extreme events we compared the distribution curves of acu-mulada probability of the twentieth and twenty-first century. For seasonal analysis considered the anomaly in the average weather of the twenty-first century designs for the twentieth century. In terms of seasonal projections can observe a small dispersion of the models along with a monthly increase of the potential evaporation, achieving a difference of up to 53.47 %. For the seasonality of flows, it was observed greatest impact in the months of the rainy season, resulting in a possible shift of the ITCZ to further north or further south.

Key Words: Orós. IPCC AR4. Climate Changes.

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RECICLAGEM DE ÁGUA EM UNIDADE RESIDENCIAL EM CAICÓ-RN-BRASIL: ANÁLISE QUALITATIVA DA ÁGUA COM BASE NA LEI MUNICIPAL DE REUSO E IDENTIFICAÇÃO DE ALGUNS IMPACTOS SOBRE OS RECURSOS HÍDRICOS

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Mirna Guimarães Pipolo[1]
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WATER RECYCLING IN RESIDENTIAL UNIT IN CAICÓ-RN-BRAZIL: QUALITATIVE ANALYSIS OF THE WATER BASED ON REUSE MUNICIPAL LAW AND IDENTIFICATION OF SOME IMPACTS ON WATER RESOURCES

Recibido el 29 de mayo de 2015; Aceptado el 22 de febrero de 2016

Abstract

In this paper was evaluated a spontaneous experience of water recycling in a middle class home in Caicó -RN – Brazil. A qualitative analysis of water was made in the context of the recent municipal reuse legislation (Law N ° 4603/2013 of 26 August 2013) and some impacts on water resources were identified. This experience involves the use of secondary sewage (wastewater from showers and sinks), whose contributions correspond approximately one third of household water consumption, for irrigation of lawn and garden fruit trees. In order to analyze its compliance or not with the quality standards recommended by the Law N ° 4603/2013 and to verify the feasibility of the project, ten samples were collected between June to November 2014, always at 6:30 (a.m.).Based on the results obtained, it can be inferred that the health risk and concentrations of organic matter and solids in suspension greater than 30 mg / L are the main concerns for employment of gross reuse water analyzed in landscape irrigation. Further studies are needed to define forms of treatment to conform to legislation the parameters that did not meet the quality standards. The recycling of 3.2 m³ / month of the secondary sewage in residence searched, without addition of supply water, meant a reduction in the monthly cost of water of approximately 21.5%.

Key Words: reuse municipal legislation, reuse water quality, water recycling, wastewater reuse.

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MONITOREO DE DESCARGAS DE AGUAS RESIDUALES Y SU IMPACTO EN EL LAGO DE PÁTZCUARO, MÉXICO (2006-2011)

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Javier Sánchez Chávez [1]
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MONITORING WASTEWATER DISCHARGWS AND IT'S IMPACT ON LAKE PÁTZCUARO, MEXICO (2006-2011)

Recibido el 2 de junio de 2015; Aceptado el 21 de marzo de 2016

Abstract

Many water bodies in Mexico and in the world continue to increase their water quality deterioration; this is mainly due to the excessive population growth, the discharge of municipal sewage and land use change (e.g., the decrease of the forest coverage). For this reason Lake Pátzcuaro, an emblematic water body in the country was selected. This lake receives multiple discharges of municipal wastewater. During 2006 to 2011, the water quality of these effluents was sampled in order to review the degree of compliance with the Mexican Waste Water Criteria (NOM-001-SEMARNAT-1996). The selected sampling sites were: Tzintzuntzan raw discharge DM-2; effluents of six wetland discharges: Janítzio; DM-1, Pátzcuaro DM-3, Erongarícuaro DM-4, DM-6, Cuchuchucho DM-7, Santa Fe de la Laguna DM-8 and San Jerónimo DM-9; one perennial river, Río Guani DM-5; and one canal, Dren Tzurumútaro. In one or more parameters, the water quality results obtained during this six year study complied with the NOM-001-SEMARNAT-1996; but results were out of the established nutrient limits, having high concentrations of total nitrogen and total phosphorus reaching the lake. This excess of nutrients is causing trophic problems in the waterbody, such as algal blooms. Cyanobacteria dominance showed a 99.3% presence in relation to other plankton groups present in the lake; this caused a decrease transparency, bad odor, low dissolved oxygen and a probable increase in fish mortality. Eutrophication of this water body is also causing the growth of certain hydrophytes in the southern part of the lake, such as water hyacinth and cattail. The high number of cells/mL of cyanobacteria and the concentration of Microcystin-LR, indicate that this symptoms could cause acute effects to health in the range of high to very high; being the stations of Quiroga, Espiritu and Pacanda (north and center zones) the most affected areas. In conclusion, the water quality of the lake is not suitable for recreation or human consumption.

Key Words: Criteria, Cyanobacteria, Eutrophication, Maximum allowable limit, Municipal wastewater, Nutrients.

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ESTIMATIVA DE EMISSÕES DE GEE DEVIDO AO TRANSPORTE DE RESÍDUOS EM ESTAÇÕES ELEVATÓRIAS DE ESGOTO NA ÁREA DE ATUAÇÃO DA Embasa- BAHIA, BRASIL

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Márcia Mara de Oliveira Marinho[3]
Adalberto Noyola Robles[4]
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AN ESTIMATE OF GREENHOUSE GASES EMISSIONS DUE TO THE TRANSPORTATION OF WASTE FROM SEWAGE PUMPING STATIONS IN THE AREA OF Embasa OPERATION-BAHIA, BRAZIL

Recibido el 5 de junio de 2015; Aceptado el 29 de enero de 2016

Abstract

The transport sector is currently the second largest source of greenhouse gas (GHG) emissions in Brazil, second only to changes in land use. The operation of pumping stations for sewage systems generates a significant amount of waste and requires transportation services for its adequate disposal. Therefore, it is important to assess the GHG emissions by operating organizations involved with this activity. Knowledge of these emissions allows a sanitation company to evaluate the logistics involved in transportation and implement improvements, with a view towards low-carbon operations. Thus, this paper estimates the GHG emissions resulting from transporting waste produced at pumping stations, submarine outfall pre-treatment plants and preliminary treatment at wastewater treatment plants in the city of Salvador, Bahia, Brazil, operated by Embasa (Bahian Water and Sanitation Company SA). *The results show that the transportation of waste in the company under study is an important emission source of indirect GHG emissions (Scope 3) and indicate opportunities for improvement of the inventory.*

Keywords: Greenhouse gases, transportation, solid waste, Embasa, Brazil.

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REMOÇÃO DE ALUMÍNIO EM ÁGUAS PARA ABASTECIMENTO PÚBLICO POR MEIO DE PRECIPITAÇÃO QUÍMICA COM HIDRÓXIDO DE CÁLCIO

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ALUMINUM REMOVAL IN PUBLIC WATER SUPPLY BY CHEMICAL PRECIPITATION WITH CALCIUM HYDROXIDE

Recibido el 15 de junio de 2015; Aceptado el 29 de enero de 2016

Abstract

The presence of residual aluminum in drinking water has become a matter of concern due to its relation to neurological diseases (such as neurodegeneration, encephalopathy, dialysis dementia, Alzheimer's disease and neurobehavioral changes) and possible contribution to the Haze formation at the end of the treatment, thus reducing the efficiency of the disinfection process. Since the aluminum species present in the water may provide greater bioavailability and potential are more readily absorbed from the gastrointestinal tract. The project's main objective was to study the removal of metal ion Al^{3+} present in water intended for supply, using calcium hydroxide as coagulant due to high availability, low cost and complexity of it. By increasing the pH, Ca $(OH)_2$ involves chemical precipitation of aluminum by formation of gelatinous precipitate of aluminum hydroxide. The methodology generally has been carried out in laboratory scale at the University of Tocantins by testing in evaluating Jartestes two treatment technologies: direct filtration, and the conventional treatment (full cycle), using both the Ca $(OH)_2$ as coagulant agent. The study was from synthetic water solution of aluminum prepared in the laboratory by diluting in distilled water. The results showed that to meet the recommended levels by decree 2,914 / 2011 of the Ministry of Health, of Brazil, concentration below 0.200 mg/L of Al in potable water and pH between 6.0-9.5, one should opt for chemical precipitation $Ca(OH)_2$ in direct filtration technology. The same was shown to be superior to conventional treatment technology in terms of aluminum removal, being required only 2 mg/L of Ca $(OH)_2$ 0.5% to reach 0.179 mg/L, which is below the recommended threshold ceiling .

Key Words: Aluminum removal,Ca $(OH)_2$, conventional processing technology, direct filtration technology.

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REVISTA AIDIS

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INFLUÊNCIAS DA OSCILAÇÃO ATLÂNTICO NORTE E DO ÍNDICE DE OSCILAÇÃO SUL EM ÍNDICES CLIMÁTICOS NA AMAZÔNIA OCIDENTAL

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INFLUENCES ON NORTH ATLANTIC OSCILLATION AND CONTENT OF INDICES IN SOUTHERN OSCILLATION CLIMATE OF WESTERN AMAZON

Recibido el 1 de julio de 2015; Aceptado el 21 de marzo de 2016

Abstract

The objective of this research was to study the influence existing between the Southern Oscillation Index (IOS) and the North Atlantic Oscillation (NAO) on the extremes of total annual climate indices in climate in western Amazonia. For that we used the precipitation indices based on total annual precipitation (PRCPTOT), simple index of daily rainfall intensity (SDII), consecutive dry days (CDD) and consecutive wet days (CWD); and maximum temperatures of maximum (Txx), minimum temperatures of maximum (TNX), maximum temperature minimum (TXN) and minimum temperatures of the minimum (TNN), based on the data of air temperature. These data, extracted from the ERA-40 reanalysis for the period 1970-2001 and data from annual anomalies of IOS and NAO were obtained from the electronic site of the NCEP (National Centers for Environmental Prediction). Regarding correlation between IOS and NAO with the climate indices in the Western Amazon used the linear correlation coefficient of Pearson. Correlations between CWD and IOS had positive results with statistical reliability in the Northeast and Southeast Region and a negative core in the northwestern part of western Amazonia. It was observed that the smaller the IOS temperature rise occurs, it is due to the influence of El Nino these regions of higher gain producing surface solar radiation. The strong trade winds that bring moisture from the Atlantic to the Amazon are associated with the shift to the south of the ITCZ and the CDD are associated with warming of the North Atlantic Ocean, which weakens the NAO.

Keywords: Rainfall, Teleconnections, Air temperature.

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USO DA FLOTAÇÃO POR AR DISSOLVIDO (FAD) PARA COLHEITA DE MICROALGAS PRESENTES EM LAGOAS DE POLIMENTO

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USE OF DISSOLVED AIR FLOTATION (DAF) FOR HARVESTING OF MICROALGAE FROM POLISHING PONDS

Recibido el 20 de agosto de 2015; Aceptado el 29 de enero de 2016

Abstract

The harvest of microalgae has been one of the biggest difficulties for production of biofuels. The high cost and low efficiency achieved by different microalgae harvesting methods are the factors that have made the production of biodiesel unfeasible to date. The dissolved air flotation emerged as a promising alternative on microalgae harvesting. Its high efficiency and speed on the separation process are the main features of the system that has attracted attention. However, the process cost is still expensive. The determination of the best conditions of the different factors that interfere in this process is the key to decrease costs during the microalgae harvesting. This work aims to evaluate the efficiency of the flotation process by dissolved air, preceded by a process of coagulation / flocculation with ferric chloride ($FeCl_3$), in the microalgae harvesting present in the effluent from a polishing pond, through a Flotateste, developed in scale bench.The dissolved air flotation, preceded by a process coagulation / flocculation with $FeCl_3$ presented as a good technique for the separation and harvesting of microalgae present in polishing ponds and provided an efficiency of up to 96.22% at the conditions adopted for this research.

Key Words: Biomass, Ferric chloride, Flotatest.

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RICE HUSK ASH WASTE IN REMEDIATION AREAS CONTAMINATED BY HYDROCARBONS

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RICE HUSK ASH WASTE IN REMEDIATION AREAS CONTAMINATED BY HYDROCARBONS

Recibido el 31 de agosto de 2015; Aceptado el 21 de marzo de 2016

Abstract

This paper presents a study to evaluate Rice Husk Ash adsorption potential in groundwater contaminated by BTEX (benzene, toluene, ethylbenzene and xylene) and TPH (total petroleum hydrocarbons). The methodology used in this research involved characterization of Porto Alegre/Brazil groundwater, characterization of adsorbents (AC and RHA) and laboratory and pilot scale assays (use of remediation system composed by: vacuum suction, aeration and adsorption filter). The results show high concentration and variability of BTEX and TPH in the groundwater studied. For benzene parameter, for example, it was obtained average concentration of 46.5 µg/L. According to the pilot scale study, it was observed decreases in TPH and BTEX ranging from 57.69% to 96.71% at suction system and 96.71% - 99.99% after adsorption mixed filter (50% RHA and 50% AC). The statistical tests ANOVA and Tuckey used here confirm, with a 95% confidence level, that the results obtained from the use of adsorption filter are significant. That is indicative of the importance of this treatment in order to guarantee process efficiency as well as confirm Rice Husk Ash functionality as adsorbent in adsorption filters applied to groundwater contaminated by hydrocarbons.

Key Words: Rice Husk Ash, Solid Wastes, Remediation of Areas, Hydrocarbons, Adsorption.

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ANÁLISE DE RISCO NA CONCESSÃO DE OUTORGA DE LANÇAMENTOS DIFUSOS DE POLUENTES EM RIOS, ATRAVÉS DE UM MODELO FUZZY DE TRANSPORTE DE MASSA

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RISK ANALYSIS ON THE CONCESSION GRANTING, CONSIDERING NON POINT SOURCE DISHARGE OF POLLUTANT IN RIVER, BY A FUZZY MASS TRANSPORT MODEL

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Abstract

This research developed a methodology, based on application of fuzzy theory in the pollutant transport models, to study the fuzzy risk of contamination, in awarding grants for diffuse effluents discharge into rivers. In such way, the differential equations of the transport model are transformed into fuzzy differential equations, so that, the field of concentrations, represented by the mathematical model is transformed into fields of concentration membership functions. The study makes use of parameters defined in the law to establish the class of the river, so that, it calculates, for each type of release, the risk and its assimilative capacity of the river to receive effluents. The results have shown that the fuzzy theory can become a safe alternative to help control pollution of rivers in general, providing, in such way, subsidies for resources management.

Key Words: allocation of grant, water quality modeling, fuzzy risk.

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PROPOSTA DE GERENCIAMENTO DE RESÍDUOS SÓLIDOS DE CENTROS DE BELEZA

SOLID WASTE MANAGEMENT PROPOSAL OF BEAUTY CENTERS

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Abstract

The beauty centers are getting more and more evidence in the market. The search for services and products to improve the looks, as well as the costumer's self-steam is in evidence on the market researches in the segment. The present essay intended to demonstrate the procedures that should be used to control the generation of solid residues from the health department, in the beauty parlors and propose an speculation about the possible environmental and sanitary impacts in two of Fortaleza's beauty centers. Seeing that this segment has had a big growth not only in size, but also in few characteristics which are known by the risks and impacts caused to the beauty industry professionals and the environment. This article was developed through literature review, surveys and documental researches. After analyzing the generated wasted, it was divided in groups so they could be better managed in the beauty parlors. In conclusion there's little information and descriptions about the importance of the management of the waste generated by the beauty centers and the adaptation by similarity to existing laws establishing the Program for Health Service Waste Management - PHSWM hampers the grip of the professionals to the plan preparation, endangering the customers public health and workspace.

Key Words: beauty centers**,** environment**,** environmental education**,** solid waste management.

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