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Foto: Israel Chávez Reséndiz
Planta de tratamiento de aguas residuales
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REVISTA AIDIS

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

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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, que publica contribuciones evaluadas por pares originales, de calidad y actualidad, dentro de su área de competencia. De esta forma se presentan trabajos que abarcan aspectos relacionados con el conocimiento científico y práctico, tanto tecnológico como de gestión, dentro del área de la Ingeniería Sanitaria y Ambiental en Latinoamérica.

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Tabla de Contenido

Vol. 6, No 1.

- 1.- **TRANSPORTE RODOVIÁRIO DE CARGA NO BRASIL** 1 - 11
ROAD TRANSPORT CARGO IN BRAZIL

Leticia Cestari Hidalgo da Silva Campos, Claudio Barbieri da Cunha, Hugo Tsugunobu Yoshida Yoshizaki, Vanessa Meloni Massara

- 2.- **CAVITAÇÃO HIDRODINÂMICA APLICADA AO TRATAMENTO DE ÁGUA COM ALTA CONCENTRAÇÃO DE INDICADORES DE CONTAMINAÇÃO MICROBIOLÓGICA** 12 - 20
HYDRODYNAMIC CAVITATION TO TREAT WATER WITH HIGH CONCENTRATION OF MICROBIOLOGICAL CONTAMINATION INDICATORS

Eliezer Fares Abdala Neto, Marisete Dantas de Aquino, Alexandre ColziLopes, Arislete D. Aquino

- 3.- **QUALIDADE DA ÁGUA EM RIOS URBANOS: UM ESTUDO DE CASO SOBRE O RIO TAMBAY-BAYEUX-PB/BRASIL** 21 - 31
URBAN RIVERS WATER QUALITY: A CASE STUDY ON TAMBAY RIVER – BAYEUX – PB/BRAZIL

Déborah Melo Alves, FlavianaKalinaCâmara de Lima, Claudia CoutinhoNóbrega, Jakeliny Costa Falcão, Elisabeth Sousa de Araújo, HelianaLeiteFernandes Barros, Alice de Sousa Moreira Lima

- 4.- **PLANO DE SANEAMENTO AMBIENTAL DE PENÁPOLIS, BRASIL: UMA AVALIAÇÃO À LUZ DAS TEORIAS DE PLANEJAMENTO** 32 - 48
ENVIRONMENTAL SANITATION PLAN OF PENÁPOLIS, BRAZIL: AN ASSESSMENT UNDER THE LIGHT OF THE PLANNING THEORIES

Rogério Braga Silveira, LéoHeller, Severina Sarah Lisboa

- 5.- **A BIODEGRADAÇÃO DE CORANTES TÊXTEIS ASSOCIADA AO CULTIVO DE *Geobacillusstearothermophilus*: UMA ALTERNATIVA PARA PRODUÇÃO DE BIOSURFACTANTE** 49– 61
BIODEGRADATION OF TEXTILE DYES ASSOCIATED WITH CULTIVATION OF Geobacillusstearothermophilus: AN ALTERNATIVE FOR BIOSURFACTANT PRODUCTION

Ana KarinePortela Vasconcelos, Marisete Dantas de Aquino, Tailena Naiara Fabrício, Marylia Albuquerque Braga, Isabelly da Silva Lima, Rinaldo dos Santos Araújo

- 6.- **TRATAMIENTO DE EFLUENTES CLOACALES UTILIZANDO CÁMARA SÉPTICA Y ZANJA FILTRANTE** 62 - 72
SEWAGE TREATMENT USING SEPTIC TANK AND INFILTRATION TRENCH
Panigatti, Ma. Cecilia, Boglione Rosana, Griffa Carina, Boidi Marco, Schierano Ma. Celeste
- 7.- **MICROORGANISMOS BENÉFICOS PARA EL COMPOSTAJE DE MACRÓFITAS INVASORAS DE LA LAGUNA COLOMBIANA DE FÚQUENE** 73 - 88
BENEFICIAL MICROORGANISMS FOR POLLUTING MACROPHYTES COMPOSTING OF A COLOMBIAN LAKE FÚQUENE
Martinez-Nieto Patricia, Chaparro-Rico Beatriz
- 8.- **TRATAMENTO DA ÁGUA DE PRODUÇÃO DE PETRÓLEO ATRAVÉS DE PROCESSOS COMBINADOS** 89 - 99
TREATMENT OF OIL WATER PRODUCTION THROUGH COMBINED PROCESSES
Érica Tatiane Rodrigues Mendonça, Joelma Morais Ferreira, Mauricio Alves da Motta Sobrinho
- 9.- **EVALUACIÓN DEL EFECTO DE LOS BIOSÓLIDOS SOBRE EL CULTIVO DE LA LECHUGA (*Lactuca sativa* L.)** 100 - 109
*EVALUATION OF THE EFFECT OF BIOSOLIDS ON THE LETTUCE CROP (*Lactuca sativa* L.)*
Ortiz González María Teresa, Tamariz Flores José Victor, Lazcano Herrero María Eugenia, Castelán Vega Rosalía del Carmen
- 10.- **INDICADORES SOCIO-AMBIENTAIS COMO INSTRUMENTO DE GESTÃO NA COLETA SELETIVA DE RESÍDUOS SÓLIDOS URBANOS** 110 - 121
SOCIO-ENVIRONMENTAL INDICATORS AS A TOOL IN THE MANGEMENT OF SELECTIVE COLLETION OF MUNICIPAL SOLID WASTE

*Darci Barnech Campani, Dieter Wartchow, Guilherme Gastal de Castro Ramos



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TRANSPORTE RODOVIÁRIO DE CARGA NO BRASIL

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ROAD TRANSPORT CARGO IN BRAZIL

Recibido el 7 de diciembre de 2011; Aceptado el 5 de diciembre de 2012

Abstract

This paper shows the result of a simulation done on the route Três Lagoas (State of Mato Grosso) to Pederneiras (State of São Paulo) to calculate emissions of greenhouse gases emissions (GHG) in freight road transportation using the program Artemis. This simulation is part of a project to create a model that adapts the conditions in Brazil. In conclusion the current state of research, it is considered that the Artemis is based on consistent and important factors, but adaptation is essential to Brazil. It was observed that among several important aspects in the issue, are the quality of the road, the vehicle, being that, as older, without maintenance and more congested is the traffic, higher as the pollution.

Key Words: Road Transport, GHG Emissions, Artemis Model, Três Lagoas (Mato Grosso), Pederneiras (São Paulo).

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CAVITAÇÃO HIDRODINÂMICA APLICADA AO TRATAMENTO DE ÁGUA COM ALTA CONCENTRAÇÃO DE INDICADORES DE CONTAMINAÇÃO MICROBIOLÓGICA

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*HYDRODYNAMIC CAVITATION TO TREAT WATER WITH
HIGH CONCENTRATION OF MICROBIOLOGICAL
CONTAMINATION INDICATORS*

Recibido el 26 de julio de 2012; Aceptado el 14 de diciembre de 2012

Abstract

Cavitation is an advanced oxidation process which consists in the formation and subsequent growing and implosion of cavities. The process generates large amounts of energy in a short period of time. Cavitation reactors constitute a widespread application in the area of chemical processing, water and effluent treatment and biotechnologies. The objective of this research was to investigate the effects of hydrodynamic cavitation caused by the use of a high speed homogenizer with an optimized flow rate, operating in continuous mode, in the disinfection of water containing high concentrations of total coliforms (19.33×10^5 MNP/100mL) and *Escherichia coli* (46.26×10^4 MNP/100ml). The raw water samples were collected and treated in 3 minutes interval, monitoring pressure, temperature, physico-chemical and microbiological parameters, following the general guidelines of Standard Methods for Examination of Water and Wastewater. Results show that the optimization of water flow supplied to the homogenizer has a direct influence in the time necessary to stabilize the boiling water temperature. Hence, cavitation constitutes a promising technology for treating drinking water supplies. Cavitation reduces contaminants concentration, highlighting the decrease achieved for nitrites and nitrates and the complete microorganisms inactivation (total coliforms and *Escherichia coli*), even for different and high initial concentrations, regardless of the chemical disinfection.

Key Words: Disinfection; Advanced oxidation process; Hydrodynamic cavitation.

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QUALIDADE DA ÁGUA EM RIOS URBANOS: UM ESTUDO DE CASO SOBRE O RIO TAMBAY-BAYEUX-PB/BRASIL

URBAN RIVERS WATER QUALITY: A CASE STUDY ON
TAMBAY RIVER – BAYEUX – PB/BRAZIL

Recibido el 26 de agosto de 2012; Aceptado el 21 de enero de 2013

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Abstract

With the advent of discussion regarding the environment nowadays, this article brings a reflection on the present situation of urban rivers across the world throughout a case study of the Tambay River in the city of Bayeux-PB/Brazil. The water quality was determined by laboratory analysis concerning the following parameters: Thermo-tolerant Coliform, Biochemical Oxygen Demand (BOD5), Dissolved Oxygen, Translucence, Color, Total Dissolved Solids, pH, Nitrites, Nitrates, Aluminum, and Lead. To confirm the results achieved, in loco visits took place and socio-economic questionnaires were answered and collected. The Laboratory results and the field trips resulted in the confirmation of polluted waters. The lack of basic sanitation and the need for instruction on environmental practices to result in a betterment of the water quality in the Tambay River as well as the improvement of the surrounding population quality of life were corroborated.

Keywords: Environment, sanitation, Tambay River, water quality, population.

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PLANO DE SANEAMENTO AMBIENTAL DE PENÁPOLIS, BRASIL: UMA AVALIAÇÃO À LUZ DAS TEORIAS DE PLANEJAMENTO

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Léo Heller²
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*ENVIRONMENTAL SANITATION PLAN OF PENÁPOLIS,
BRAZIL: AN ASSESSMENT UNDER THE LIGHT OF THE
PLANNING THEORIES*

Recibido el 1 de julio de 2012; Aceptado el 21 de enero de 2013

Abstract

This article aims to present an assessment of the Plano de Saneamento Ambiental de Penápolis, from the perspective of normative and conceptual elements. To that end, a specific assessment model was developed. The model seeks to identify guiding principles of the plan, based on analytical categories, and to compare them with the values defended by three currently distinguished planning schools. This comparison allowed the evaluation of the coherence between the principles that guided the initial planning proposal and the ones really undertaken in each of the elaboration phases. In the assessment, the evaluation of the coherence of the plan is assumed as fundamentally important, once its absence might negatively impact the implementation phase. The data for the analysis was collected through documental research, in meeting minutes and documents related to the elaboration of the plan, as well as through eight in-depth interviews, besides non-participant observation during the 10° Forum Municipal de Saneamento. For data analysis, the content analysis method was undertaken. The research highlighted that the major point in Penápolis is the participative culture built over time, making its principles prevalent in the directioning and monitoring of the sanitation practices, in the last 20 years, independently of the world views from municipal administrators that followed up. However, the consistent program of childhood and youth environmental education, implemented with the objective of guaranteeing the continuity and sustainability of the continuous improvement of the services to the future also plays a relevant role.

Keywords: Penápolis, environmental sanitation, planning, participative culture

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A BIODEGRADAÇÃO DE CORANTES TÊXTEIS ASSOCIADA AO CULTIVO DE *Geobacillus* *stearothermophilus*: UMA ALTERNATIVA PARA PRODUÇÃO DE BIOSURFACTANTE

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BIODEGRADATION OF TEXTILE DYES ASSOCIATED WITH
CULTIVATION OF *Geobacillus stearothermophilus*: AN
ALTERNATIVE FOR BIOSURFACTANT PRODUCTION

Recibido el 10 de octubre de 2012; Aceptado el 25 de febrero de 2013

Abstract

Nowadays environmental issues have a great appeal before society. Among these, wastewater from textile industries is a precursor of pollution for water bodies, by the degrading water quality, harming the biota and impairing more noble uses. Given this, the biological treatment is a viable alternative for biodegradation of aquatic pollutants. To this end this study aimed to analyze the degradation of textile dyes (methyl orange and methylene blue) associated with the cultivation of *Geobacillus stearothermophilus*, UCP 986, under thermophilic aerobic condition and in the absence of additional sources of carbon, as an alternative for biosurfactant production. During the cultivation, it was evaluated the variables color, pH, total protein, biomass, emulsification index and emulsification activity. Our results showed degradation after 24h cultivation, through the reduction of color, both for methyl orange (15 mg/L) and methylene blue (10 mg/L). This ratified the ability of *G. stearothermophilus* for treating colorful waste without impacting the environment, besides producing biomass for further treatments of recalcitrant molecules. The production of biosurfactant was satisfactory and promising, confirming its biotechnological potential in the recalcitrant degradation.

Key Words: methyl orange, methylene blue, biodegradation, biosurfactant, *Geobacillus stearothermophilus*

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TRATAMIENTO DE EFLUENTES CLOACALES UTILIZANDO CÁMARA SÉPTICA Y ZANJA FILTRANTE

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*SEWAGE TREATMENT USING SEPTIC TANK AND
INFILTRATION TRENCH*

Recibido el 18 de diciembre de 2012; Aceptado el 22 de marzo de 2013

Abstract

The study and construction of a septic tank-infiltration trench as a sewage treatment alternative is proposed. It originates from a cesspool groundwater-contamination problem at Rafaela, Santa Fe, Argentina. Effluents from treatment outlets and the incidence of this system on surrounding groundwaters have been studied for three years.

In the wastewater the following parameters were analyzed: pH, chemical oxygen demand (COD), biological oxygen demand (BOD5), Total Nitrogen, Phosphorus and Ammonia. In groundwater the following variables were studied: pH, total solids, chlorides, total hardness, calcium, magnesium, total alkalinity, sulfate, nitrite, nitrate, ammonium and arsenic. In both cases, bacterial determinations were performed. A house with no sewerage yet, was evaluated as case study, aiming to extend the system to neighborhood houses under similar conditions. A significant decrease in COD and BOD5 concentrations was found on the treated effluents. Nearby groundwater measurements, in turn, demonstrate treatment advantages, since no pollution by nitrates, nitrites, ammonia and fecal bacteria was detected.

Key Words: Contamination, groundwater, infiltration trench, septic tank.

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MICROORGANISMOS BENÉFICOS PARA EL COMPOSTAJE DE MACRÓFITAS INVASORAS DE LA LAGUNA COLOMBIANA DE FÚQUENE

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*BENEFICIAL MICROORGANISMS FOR POLLUTING
MACROPHYTES COMPOSTING OF A COLOMBIAN LAKE
FÚQUENE*

Recibido el 4 de enero de 2013; Aceptado el 22 de marzo de 2013

Abstract

Water hyacinth (*Eichhornia crassipes* C. Mart.) and Brazilian elodea (*Egeria densa* Planch.) are non-native aquatic macrophytes in Lake Fúquene (Colombia) that cover more than 70% of the water body. As a control technique, the macrophytes are harvested by mechanical means and they can be exploited by composting using native beneficial microorganisms to accelerate the process and also to improve the final product quality. In this research, from five composting treatments with these macrophytes, 159 microbial strains were isolated and by testing antagonism, 16 bacteria, 24 fungi and 21 actinomycetes were chosen to produce three inoculants by submerged fermentation. The microbial inoculants were added in a second composting, using the best first composting treatments. By inoculating the microorganisms, the degradation process was accelerated between 23 to 35%. The assay conducted on radish seedlings (*Raphanus sativus* L.), using as treatments, compost with microbial inoculants (T2i, T4i and T5i) and chicken manure at 33% mixed with soil (control), showed no significant differences ($P < 0.05$) with respect to growth, bulb formation and bulb weight. However, compost inoculated treatments showed significant increases in leaf nutrients compared with chicken manure. The use of microorganisms showed to be an efficient technique for the aquatic invasive plant management of Lake Fúquene using composting to obtain a very high quality agricultural product with good nutritional and biological quality.

Key words: Water hyacinth, Brazilian elodea, Lake Fúquene, Endogenous microbial inoculants, composting.

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TRATAMENTO DA ÁGUA DE PRODUÇÃO DE PETRÓLEO ATRAVÉS DE PROCESSOS COMBINADOS

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TREATMENT OF OIL WATER PRODUCTION THROUGH COMBINED PROCESSES

Recibido el 18 de octubre de 2012; Aceptado el 27 de marzo de 2012

Abstract

Petroleum exploration is an essential activity to modern society, however its supply for world demand has been harmful to environment, mainly due the oil produced water. Produced water is the effluent associated to oil and gas production during their extraction from the well and it is considered to be the wastewater that has the hugest volume of all extraction and production processes. Therefore, this wastewater needs to pass through treatments before its final disposal to follow either legal requirements for disposal in the environment (CONAMA 430/2011) or technical requirements for water injection in oil wells. As an alternative to the treatments for produced water, this research used flotation and sorption processes. The sorption process uses a natural sorbent (*Eichhornia crassipes*), also known as Baronesa. This study is based on two factorial planning 2^3 with center point. One factorial planning was used to study how the variables temperature, time and stirring influences on COD in the flotation process. The other factorial planning was used to study how the variables time, mass of sorbent and stirring influences on COD in the sorption process. Then, a statistical evaluation of the results obtained from regression models, analysis of variance, Pareto charts and response surfaces was made. Using the flotation process, the best results were a reduction of about 75% in COD and 51% in TOG and using the sorption process, the best results were a reduction of more than 50% in COD and about 58% in TOG.

Key Words: flotation, adsorption, petroleum exploration.

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EVALUACIÓN DEL EFECTO DE LOS BIOSÓLIDOS SOBRE EL CULTIVO DE LA LECHUGA (*Lactuca sativa* L.)

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*EVALUATION OF THE EFFECT OF BIOSOLIDS ON THE
LETTUCE CROP (*Lactuca sativa* L.)*

Recibido el 27 de octubre de 2012; Aceptado el 27 de marzo de 2013

Abstract

This paper presents a study of the distribution of heavy metals (Fe, Cd, Ni, Pb, Cr, Zn y Cu) in lettuce plants (*Lactuca sativa* L.) grown in sandy soil amended with different rates of biosolid at nursery in order to evaluate the effect of biosolid on yield and quality of the crop. The content of assimilable metals with different rates of biosolid was analyzed with DTPA and its content in leaf, stem and root of lettuce was determined by the method of acid digestion (nitric acid/hydrogen peroxide) to the 60 days of development. The results showed that the amount of heavy metals by the biosolid incorporated under experimental conditions did not represent any risk to the successful development of lettuce and metal content in different parts of the plant did not exceed the tolerance threshold that could cause toxic effects for human consumption. In conclusion, this study indicates that higher rates of biosolid will improve the physicochemical characteristics of the soil, though not necessarily favor the yield of the selected crop. In general the application of biosolid not affects the quality of the plant and does not cause environmental problems.

Key words: biosolid, heavy metals, lettuce, treatments.

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INDICADORES SOCIO-AMBIENTAIS COMO INSTRUMENTO DE GESTÃO NA COLETA SELETIVA DE RESÍDUOS SÓLIDOS URBANOS

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*SOCIO-ENVIRONMENTAL INDICATORS AS A TOOL IN THE
MANGEMENT OF SELECTIVE COLLETION OF MUNICIPAL
SOLID WASTE*

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Abstract

The Selective Collection Project is within the Shared Environmental Program of the municipality of São Leopoldo and consists of the differentiated collection of recyclable waste produced in homes, businesses, schools, local governments and others institutions, generating jobs and income for families working in the program and reducing environmental impacts.

It was noted the lack of effective ways to control and management tools that would help the team coordinator of the project. So, we started monitoring the selective collection and the development of indicators of which deals with this work. In a first phase was a literature review on indicators. It was then necessary to undertake the organization of data sources, including the creation of routine data collection, such as the creation and collection of monthly reports of the materials sold of each association, including aspects of these social workers' associations and tabulation of data from a survey of satisfaction among the population. All these actions help us to have a clearer diagnosis of the situation of selective collection and will be the source of important information for the power of the indicators.

Keywords: Indicators, Selective Collection, Social and Environmental.

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