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de Ingeniería y Ciencias Ambientales:
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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 originales evaluadas por pares, 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.

El enfoque es interdisciplinario 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, legislación y política ambiental, gestión ambiental, gestión de empresas de servicios de saneamiento, sostenibilidad y participación social, entre otros.

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EFEITOS DE REAGENTES QUÍMICOS NO EFLUENTE DA INDÚSTRIA DE BIODIESEL: CONTRIBUIÇÃO NA CARGA ORGÂNICA E ECOTOXICIDADE

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*EFFECTS OF CHEMICAL REAGENTS IN THE BIODIESEL
INDUSTRY EFFLUENT: CONTRIBUTION IN THE ORGANIC
LOAD AND ECOTOXICITY*

Recibido el 22 de enero de 2014; Aceptado el 22 de enero de 2015

Abstract

The technologies used for the biodiesel production, utilizing chemical reagents such as ethanol, methanol, sodium hydroxide among others during the purification of the biodiesel, is the usage of water in an amount of about 30%, as compared to the volume of the biodiesel in question. The potential effects of these said reagents in the industrial effluent, as well as the environment, are unknown in this particular study, however, this study is aimed in formulating a synthetic effluent of each chemical reactant (analyte), in order to evaluate the physico-chemical and its toxicity against organisms, such as the *Daphnia magna* and the *Daphnia similis*. In the process of quantifying the physico-chemical parameters, the following effects were also observed: organic contaminants such as ethanol, methanol, propanol and glycerol showed acid characters and the inorganic sodium hydroxide, showed basic characters in synthetic effluents. Furthermore, it was observed as well that the chemical oxygen demand (COD), was influenced by the presence of oxygen in the chemical composition of the analyte, and the propanol showed a higher experimental COD, duly searched among all the analytes in all the concentrations. Concerning toxicity, the sodium hydroxide and the propanol analytes showed a high toxic effect for both *Daphnia similis* and *daphnia magna*, in all predetermined concentrations.

Keywords: Biodiesel, chemical reagent, environmental legislation, effluent and ecotoxicity.

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NITROGEN REMOVAL FROM SEWAGE IN A SERIE OF AEROBIC-ANOXIC SUBMERGED BIOFILTERS

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

Abstract

This paper presents the results of an alternative technology with combination of aerated and anoxic biofilters, filled with corrugated cut conduit, low cost and simple operation. These filters receiving domestic sewage previously treated in anaerobic reactors. The study was divided in three phases: during the first phase the air flow to the aerated filter was 0.10 m³/minute, and in phases 2 and 3 air flow increased to 0.15 m³/minute. In the last phase 1 m³/day of the anaerobic effluent was used as a supplemental source of carbon to the anoxic filter. The filters were capable of reducing the ammonia concentration to below 10 mg/L. In addition, the system was able to produce the final effluent concentrations of TSS and COD of 5.3 mg/L and 25 mg/L, respectively, without sludge removal, or any other step for phase separation.

Keywords: sewage, denitrification, nitrification, nitrogen removal, submerged biofilter, sludge retention.

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CONDICIONANTES ENVOLVIDOS NA PRESENÇA DE DIFERENTES MODELOS DE PRESTAÇÃO DE SERVIÇOS DE ABASTECIMENTO DE ÁGUA NO BRASIL

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Marco Túlio da Silva Faria²
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Léo Heller³

*CONDITIONS INVOLVED IN DIFFERENT MODELS OF
WATER SUPPLY SERVICES IN BRAZIL*

Recibido el 10 de marzo de 2014; Aceptado el 27 de enero de 2015

Abstract

The purpose of this study is to understand the reasons why cities choose a certain management model for water supply services in Brazil. In order to achieve such purpose, the researchers used microdata from the 2008 National Survey of Basic Sanitation conducted by the Brazilian Institute of Geography and Statistics. The results were assessed by means of non-parametric statistic methods of analysis of variance and multiple comparisons, characterized by different indicators of each urban area studied. It was shown that the administrative nature of the service provider varies among Brazilian macroregions and that, statistically, the size of the population, the total number of areas assisted and the non-payment rates in the last 12 months are significantly different. In that sense, it was observed that Autarchies, Public Corporations and Government Controlled Companies operate in the most populated cities with the most areas assisted. On the other hand, Private Companies and Public Consortium, Foundation and Association had the lowest non-payment rate. It was further observed that the kind of service provision model for water supply in Brazil is related to different implementation of public policies by the governors and to the way the population responds differently to sanitation problems due to regional, social-economical, demographic, cultural and historical divergences in Brazil.

Keywords: Public policies; sanitation; management of water supply services.

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ANÁLISE E PROJETO DE SOFTWARE PARA GESTÃO PÚBLICA INTEGRADA DE RESÍDUOS SÓLIDOS URBANOS

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*ANALYSIS AND DESIGN SOFTWARE FOR INTEGRATED
PUBLIC MANAGEMENT OF URBAN SOLID WASTE*

Recibido el 11 de abril de 2014; Aceptado el 11 de diciembre de 2014

Abstract

The production of municipal solid waste has grown considerably in recent decades, mainly due to population growth and consumption of industrial products, which creates social, economic and environmental problems. Considering the lack of computerized information systems in Brazil, the management of such waste occurs through disjointed and inaccurate actions. The aim of this paper is to present the analysis and design of an integrated information system for public management of urban solid waste to medium size municipalities. The methodology includes an investigation of the current structure of public management of urban solid waste in a city in the south of Brazil; requirements elicitation and the analysis and computerized information system design. This model allows the recording of data, reporting and performance indicators, storing date information seamlessly. We intent, therefore, the possibility of improvements in public management of urban solid waste, bringing advancements like organization and bringing greater reliability to the process.

Keywords: information system, solid waste management, urban solid waste.

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CARACTERIZAÇÃO DO LODO AUTOTRÓFICO DE SISTEMAS DE LODO ATIVADO GERADO A PARTIR DE DIFERENTES SUBSTRATOS

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*CHARACTERIZATION OF AUTOTROPHIC SLUDGE IN
ACTIVATED SLUDGE SYSTEMS GENERATED FROM
DIFFERENT SUBSTRATES*

Recibido el 8 de mayo de 2014; Aceptado el 11 de diciembre de 2014

Abstract

The association of anaerobic pre-treatment, for example in a UASB reactor with activated sludge systems has been an object of several studies and has been applied in practice of waste water treatment systems. Activated sludge systems with different substrates (for example raw or digested sewage) tend to produce sludges with different mechanical and biological characteristics. In order to evaluate the characteristics of the autotrophic fraction of sludge generated from different substrates an experimental investigation was carried out, where three activated sludge systems of the sequencing batch reactor (SBR) type, were operated with raw sewage, digested sewage and ammonium solution as substrates. The systems were evaluated with respect to the suspended solids, organic material and ammonium, settleability and activity of the sludges. The Volumetric Sludge Index (VSI) and the Oxygen Uptake Rate (OUR) were used for the assessment of the mechanical and biological characteristics. The obtained results during the experimental investigation showed that the systems were equally efficient in the removal of organic material and suspended solids with efficiencies of 83% for COD and 91% for TSS. The settleability of the sludge was considered good and median for systems fed with raw sewage and digested sewage, respectively. However, the autotrophic sludge did not exhibit high biological activity having values of the specific growth rate constant for *Nitrosomonas* (μ_m) in the range of 0.31 d⁻¹ and 0.21 d⁻¹ respectively for systems fed with raw sewage and ammonium substrate and, whereas no activity was detected in the system fed with digested sewage.

Key Words: wastewater treatment, activated sludge, respirometry, sludge autotrophic.

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EFFECTS OF NUTRIENT DEPLETION ON THE GROWTH AND CELL CONCENTRATION OF *Cylindrospermopsis Raciborskii*

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EFEITOS DA DEPLEÇÃO DE NUTRIENTES NO
CRESCIMENTO E NA DENSIDADE DE CÉLULAS DA
ESPÉCIE *Cylindrospermopsis Raciborskii*

Recibido el 22 de junio de 2014; Aceptado el 27 de enero de 2015

Abstract

Eutrophication damages water supply by promoting the proliferation of potentially toxin-producing cyanobacteria. In Ceara State, the abundance of these algae in artificial reservoirs has been reaching up to 95% phytoplankton density of cells. The knowledge of the species growth dynamics depending on the availability of nutrients can promote the understanding of a recurring natural phenomenon, the cyanobacteria blooms. This study aimed to evaluate the influence of macronutrient depletion on the development of *C. raciborskii* T3 cultures. Experiments were conducted in ASM-1 medium and variations with the removal of 75 and 50% phosphorus and nitrogen from its original composition. Cultures were grown in non-axenic conditions, under constant light of $6.75 \mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$, 12: 12 photoperiod, and at temperature of $24 \pm 2^\circ\text{C}$. Nitrogen-depleted cultures clearly showed lower growth in comparison with other experiments, reaching the stationary phase earlier, besides lower cell concentrations. Whereas, phosphorus-depleted cultures presented steeper growth curves, similar to the growth registered in the regular ASM-1 medium, and thereby demonstrating that under these experimental conditions, nitrogen was the limiting nutrient for the growth of *C. raciborskii*.

Key words: cyanobacteria, limiting nutrients, reservoirs.

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ESTUDO COMPARATIVO ENTRE REATORES DE CRESCIMENTO ADERIDO E DISPERSO PÓS TANQUES SÉPTICOS TRATANDO ESGOTOS DOMÉSTICOS

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Gilson Barbosa Athayde Junior¹
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COMPARATIVE STUDY BETWEEN ADHERED AND
SUSPENDED GROWTH REACTORS AFTER SEPTIC TANKS
TREATING DOMESTIC WASTEWATER

Recibido el 30 de junio de 2014; Aceptado el 11 de diciembre de 2015

Abstract

The removal efficiency of BOD₅, COD, TSS and SSV were studied in two anaerobic reactors which received semi-equalled effluent of a septic tank, one being adhered growth (R1, with bed of gravel N^o. 4) and the other dispersed growth (R3, without support material for microbial growth). This system was installed in the Student Residence at UFPB in João Pessoa-PB. The sewage came from two bathrooms that attended to a theoretical population of 4 inhabitants. Eleven samples of the effluent from the septic tank and from the reactors 1 and 3 were collected in the period between 28/02/2013 and 10/12/2013. Temperature and pH of the reactors ranged from 24.5 to 28.1 ° C and from 7.3 to 8.1, respectively, which are adequate for the anaerobic treatment of sewage. The BOD₅ removal efficiencies (32.8 and 27.1% in R1 and R3, respectively), COD (43.4 and 33.0% in R1 and R3, respectively), SST (56.2 and 48.0% in R1 and R3, respectively) and VSS (54.7 and 46.2% in R1 and R3, respectively) were high. It demonstrates a good applicability of these low-cost housing units, which are devoid of collective sewage system in the reduction of pollution load discharged in water bodies systems. Analysis of variance showed no significant difference at the level of 5% between the average of the corresponding parameters of the two reactors, suggesting that reactor that receives discharges from the attenuation peaks, there is no need of support bed, which may represent a reduction in costs involved.

Key Words: household sewage, sewage treatment, anaerobic reactor, attached growth, suspended growth.

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ESTIMATIVA DO POTENCIAL DE GERAÇÃO DE BIOMASSA, METANO E ENERGIA PELAS PRINCIPAIS CRIAÇÕES PECUÁRIAS DO BRASIL

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*ESTIMATE OF THE POTENTIAL GENERATION OF
BIOMASS, METHANE AND ENERGY BY MAJOR ANIMAL
BREEDING OF BRAZIL*

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Abstract

Brazil's participation on the international trade of animal protein grows every year, and inevitably, leads to worsening environmental problems. Due to that, the objective of this study was to quantify the manure generated by the livestock population (broilers, layers, swine and dairy cattle), methane production, energy potential and electric power from this biomass in the years 2008-2012. Data containing actual livestock population was obtained from Brazilian Institute for Geography and Statistics – IBGE. A methodology that considers the initial and final weight of the animal, as well as residence time, was developed to estimate waste generation. Methane production, energy potential and electric power were calculated based on bibliographic references. Methane production and potential energy produced were calculated based on bibliographic references. Results show an increase in animal production in the years analyzed, and consequently an increase in the generation of waste, methane, energy potential and electric power. The estimates indicate that the electric power produced, for example, would be enough to supply about 10% of the Brazilian residential demand of 2011. The results were quite significant, however, studies with a regionalized focus, for the implementation of individual or collective systems, should be encouraged.

Key-words: animal livestock, livestock waste, biodigestion, energy from biomass.

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AGRUPAMENTO DA QUALIDADE DA ÁGUA DE POÇOS DE UM PEQUENO AQUIFERO ALUVIAL: ESTUDO DE CASO DA BACIA DO RIACHO FORQUILHA EM QUIXERAMOBIM- CE/BRASIL

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GROUPING OF WATER QUALITY OF WELLS FROM A
SMALL ALLUVIAL AQUIFER: A CASE STUDY OF THE
FORQUILHA WATERSHED OF QUIXERAMOBIM-
CE/BRAZIL

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Abstract

In most arid and semi-arid areas, groundwater emerges as an important source of water for human consumption and small irrigation. In the semiarid region of the Northeast of Brazil, alluvial aquifers are presented as a water solution for small isolated communities distant from large urban centers. These aquifers have a moderate hydrogeological potential but water of excellent quality, in comparison with aquifers located in crystalline basement areas, predominant in the Brazilian Northeast. However, these alluvial aquifers are fragile and susceptible to degradation processes of its quality by human activities, climatic variations, or hydrogeological changes. A database consisting of 14 water samples of with hydrochemical analysis of the major ions (Ca^{2+} , Mg^{2+} , Na^+ , K^+ , Cl^- , SO_4^{2-} , and HCO_3^-) from wells distributed throughout the watershed studied, was used in the preparation of water classification diagrams. In addition, multivariate statistical analysis and reverse hydrogeochemical modeling were applied with the purpose of grouping the samples and the identification of the main aquifer recharge mechanisms in a non-rainy season. Satellite images (LandSat 5) were used for delimiting the watershed and alluvial aquifer. The results were interpolated generating maps of similarities of quality levels for human consumption and irrigation.

Key Words: multivariate statistical analysis, alluvial aquifer, Forquilha watershed, Brazilian northeast, PHREEQC.

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Investigación, desarrollo y práctica.

PROGRAMAS DE SEGURANÇA DA ÁGUA: CONCEITOS E PRÁTICAS

WATER SECURITY PROGRAMS: CONCEPTS AND
PRACTICES

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Abstract

The study on water safety, emphasizing the watershed, shows the emergence of another culture of understanding, and involving various segments of society. Although water safety should address in an integrated manner, historically, the focus in the semiarid region of Brazil was on the quantitative aspects. The water quality management was restricted to industrialized humid regions, in the South and Southeast regions. The search to ensure water for society, in appropriate quantity and quality, involves identifying the role of government agencies (federal, state and municipal) in charge of the process. The paper presents conceptual basis of water quality, pollution, possible pollution sources of contamination of water bodies and safety of water quality. Some national and international practices of security of water quality are also described.

Key Words: watershed, water quality, water safety.

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SISTEMA DE GESTIÓN DE RESIDUOS SOPORTADO POR TECNOLOGÍAS DE INFORMACIÓN

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WASTE MANAGEMENT SYSTEM SUPPORTED IN
INFORMATION TECHNOLOGIES

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Abstract

The research proposes a Waste Management System (WMS) based on indicators and supported in Information Technologies (software Ambiens). The main problem it solves is part of the inefficient management of waste management processes of an entity or group of entities related in time and cost variables. This solution focused on the development of this software, integrating the information flow of a proposed WMS and all stages. In order to validate the research, taken as a case study the Business Group of the Ministry of Construction in the province of Granma in Cuba and other companies that advises and controls, allowing evidence that the main results of research, a remarkable decrease in the cost and time of implementation of waste management processes, a proposed based in indicator WMS able to synchronize the work of several roles involved in this set. We used the TIBCO tool suite for modeling and simulation of processes, which yielded simulation results that support the proposed solution. The result of the software is now ready to be deployed at any WMS and its features are adaptable to all types of waste generated, allowing use in any industry or company, this is possible because it integrates data entry based all residues identified by the European waste List.

Key Words: environmental, information, management, technologies, waste.

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