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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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Cada edición muestra los trabajos que derivan del arbitraje académico de carácter internacional. También se publican números especiales de trabajos destacados 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 AIDIS. La Revista AIDIS está indizada en Latindex 2006 y en Periódica (DGB-UNAM).

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Juliana Alencar Firmo de Araújo[1]
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DEVELOPMENT OF A FUZZY METHODOLOGY TO STUDY UNCERTAINTIES IN THE PROPAGATION OF A FLOOD WAVE, USING DATA OF THE POTENGI RIVER, RIO GRANDE DE NORTE- BRAZIL, AS STUDY OF CASE

Recibido el 22 de enero de 2013; Aceptado el 26 de agosto de 2013

Abstract

This research analyzes the flood wave propagation, checking how it can be used to evaluate uncertainties from the mathematical models, and input data. In such way, a mathematical model was formulated based on the hydrodynamic equations, jointly with the fuzzy set theory. The model developed is capable to evaluate the behavior of the control variables, as membership functions. To find the solution of the partial differential equations contained in the model, the Finite Differences Method was used. In order to get the solution of the nonlinear algebraic equations system, the Newton-Raphson Iterative Method was applied. From the results it can be observed that the use of the fuzzy set theory, in the hydrodynamic models, can become a viable alternative to evaluate uncertainties and, with that, to determine the risk of flood occurrences, in areas susceptive to flood waves propagation.

Key words: Fuzzy Set Theory; Hydrodynamic Model; Flood wave control.

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MODELO DE APOIO À DECISÃO PARA ALTERNATIVAS TECNOLÓGICAS DE TRATAMENTO DE RESÍDUOS SÓLIDOS URBANOS NA REGIÃO NORDESTE DO BRASIL

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A DECISION SUPPORT MODEL FOR ALTERNATIVE TECHNOLOGY OF MUNICIPAL SOLID WASTE TREATMENT IN REGION NORTHEAST OF BRAZIL

Recibido el 18 de marzo de 2013; Aceptado el 29 de noviembre de 2013

Abstract

The study of models for decision support technology alternatives for treating municipal solid waste for the Northeast Region of Brazil aimed to propose alternative treatment in the form of technological arrangements, criteria based on environmental, social, economic and political. To this end, we used two models for decision support, model Analytic Hierarchy Process - AHP and Preference Ranking Organization Method for Enrichment Evaluations – PROMETHEE II(V), so depending on their relevance, was proposed a way of ranking the identified technologies for the treatment of the waste in the region. The ranking produced as the final result a set of technologies that have become analyzed technological arrangements for the treatment of solid wastes in northeastern Brazil, given that determines National Policy on Solid Waste - PNRS. The results showed that the models used were found to be a suitable tool for the proposition of alternative waste treatment technology and can be applied in isolated situations or in public consortia.

Keywords:decisionsupportmodel, management andwastetreatmenttechnologies.

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TOXICIDADE DE ESPÉCIES DE ENXOFRE EM REATOR ANAERÓBIO TRATANDO ESGOTOS DOMÉSTICOS

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TOXICITY OF SPECIES OF SULPHUR IN ANAEROBIC REACTOR TREATING DOMESTIC WASTEWATER

Recibido el 7 de agosto de 2013; Aceptado el 29 de noviembre de 2013

Abstract

This study aimed to monitor the operation and inhibitory effect of sulfur (sulfate and sulfide) in UASB reactor treating domestic sewage. To achieve the objectives of this research were collected weekly samples in the influent and effluent of the UASB. To determine the effect of toxicity of sulfur during monitoring, four sampling points were marked on the inside of the UASB reactor at different depths (P1, P2, P3, P4), and the point P1 was 1m of the bottom of the reactor and the other points located 2, 3 and 4 m from the bottom of the reactor. The pH values ranged from 6.4 to 7.5 in the reactor effluent. Average concentrations of volatile fatty acids in the influent and effluent were 75.9 and 34.8, respectively. The removals of BOD and COD were 61 and 58%. The reactor showed low removal of ammonia nitrogen, indicating that anaerobic reactors have a poor capacity to remove nutrients during treatment. The highest sulfide was found to be 1.3 mg / L in the reactor at the point P1. It was possible to check a decay of the concentration of sulfide from the entry of raw sewage into the reactor. The experimental data and the literature surveyed show that the values of sulfide inside the reactor are well below those required to inhibit the methanogenic activity.

Key Words: wastewater, sulphur, toxicity, UASB reactor.

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REGRESIÓN PONDERADA GEOGRÁFICAMENTE PARA EL ESTUDIO DE LA TEMPERATURA SUPERFICIAL EN MEDELLÍN, COLOMBIA

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GEOGRAPHICALLY WEIGHTED REGRESSION TO ANALYZE THE LAND SURFACE TEMPERATURE OVER MEDELLIN, COLOMBIA

Recibido el 9 de agosto de 2013; Aceptado el 29 de noviembre de 2013

Abstract

Rural areas have different thermal properties than urban materials such as concrete and asphalt, which show higher evidence of the urban heat island (UHI) effect. The intensity of an UHI is related to the land cover configuration and physical factors affecting the urban terrain. In this research a multiple regression analysis was carried out to examine the spatial patterns of the UHI phenomena in Medellin, Colombia. Landsat 7 ETM+ from 2010 and WorldView-2 from 2011 and 2012 satellite images were used. The regression analysis was based on the Ordinary Least Squares and the Geographically Weighted methods using average information from the 344 of the 537 barrios situated in the Aburra valley, the place where Medellin is located. Results showed that the valley's rugged relief influences UHI spatial patterns and that this phenomena depends not only on the presence of hard surfaces or vegetation, but also on physical factors such as solar exposure and average height of the terrain.

Key Words: geographically weighted regression, satellite imagery, urban heat island.

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ANÁLISE DO MARCO LEGAL DA REGULAÇÃO DOS SERVIÇOS DE SANEAMENTO EM CASOS LATINO-AMERICANOS

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Sonaly Rezende[2]

ANALYSIS OF THE LEGAL FRAMEWORK OF THE REGULATION OF SANITATION SERVICES IN LATIN AMERICAN CASES

Recibido el 10 de septiembre de 2013; Aceptado el 29 de noviembre de 2013

Abstract

Water and sanitation services are in the process of being developed in Latin America. The reforms initiated in the 1990's are responsible for the current situation of the institutions that regulate water and sanitation services. This paper focuses on understand the profiles of regulation agencies in Brazil, Colombia, Panama, Paraguay and Uruguay, examples of institutions responsible for regulating water supply and sanitation services were evaluated in this study, of which four were federal institutions, five were state institutions and three were municipal institutions. The analyzed corpus, which comprised legal documentation of the regulation agencies, was hierarchically classified by means of content analysis. Case studies and empirical analyses suggest the agency's rules are unlikely to public policy in environmental sanitation. The set of federal agencies, however, was shown to have a profile of tax regulation, determination of rules and forms of control, and another set whose characteristics are related to the quality of the services provided, the competencies of the regulation office and the organization of the institutions management system. On the other hand, the legislation comprised in the state and municipal agencies is characterized by technical regulation, determination of rules, definition of the institutions' competencies, as well as the organization of their management system. The limits of public policies in regard to the principle of universalization and equity of water supply and sanitation services, for instance, were hardly expressed in the legislation texts, which shows the lack of explicit links between the legal framework and public management.

Key Words: regulation, water and sanitation, social control.

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DEGRADAÇÃO DO CORANTE REMAZOL VERMELHO RB POR H_2O_2/UV

DEGRADATION OF DYE RED REMAZOL RB BY UV/H_2O_2

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Abstract

Many industrial activities, including the textile industry, use a large volume of water in the process and produce a huge amount of wastewater. Chemical oxidation, including the Advanced Oxidation Processes (AOP), is one of the alternative technologies for the treatment of dye containing effluents. AOP is based on the generation of highly oxidizing hydroxyl radicals (·OH) which can decompose quickly and non-selectively the compounds, leading to their partial or complete mineralization. The paper aimed to study UV/H_2O_2 AOP for the degradation of the dye Remazol Red RB 133%, and the evaluation of experimental conditions such as hydrogen peroxide concentration, pH and potency of UV lamp on the process kinetics. It was observed that at 240 minutes irradiation time, all color was removed by using a dosage of 1% H_2O_2 and the COD removal was 78.4%. The pH 3, 6 and 8 did not influence the color removal, however at pH 10 a difference was found. COD removals at pH 3, 6 and 8 were higher which suggest a dye mineralization increase with the pH. However, COD removal at pH 10 did not show the same trend. The potency of UV lamp plays a role in the process in which 210 W was the best potency for color and COD removal. Therefore, AOP UV/H_2O_2 seems to be an interesting option for the treatment of textile effluents.

Key Words: textile industry, AOP, mineralization, dye Remazol Red RB 133%, COD.

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PROCESSO FÍSICO-QUÍMICO E BIOLÓGICO PARA TRATAR EFLUENTE CONTAMINADO POR CIANETO

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PHYSICAL-CHEMICAL AND BIOLOGICAL PROCESS TO TREAT CONTAMINATED EFFLUENT BY CYANIDE

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Abstract

Cyanide has been used in thermal processes as an important enabler in the treatment of the steel. However, their presence can cause human poisoning when inhaled and contamination of water bodies when disposed without proper treatment. Accordingly, due to the importance of the issue to human health and environmental quality, this study aims to evaluate the effectiveness of the combined treatment biological and physico-chemical industrial wastewater contaminated contaminated by cyanide. The methodology used for the removal of cyanide was coagulation-flocculation (ferrous sulfate), followed by activated sludge biological reactor and filtration. The results achieved an average efficiency of 90.3% removal of cyanide in the final effluent, thus indicating the efficiency of the system. Furthermore, the quality of the final effluent was supplying the demand of the Brazilian legislation in relation to the parameter total cyanide, and secured the reduction of the concentration of barium and parameters of Chemical Oxygen Demand (COD) and Biochemical Oxygen Demand (BOD) which made possible the release of effluent into waterways by service quality limit established by Brazilian legislation.

Key words: Cyanide, industrial effluent, physical-chemical treatment, biological treatment.

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ANÁLISE DO RISCO DE FALHA NA DISPERSÃO DOS POLUENTES ATMOSFÉRICOS, UTILIZANDO A TEORIA FUZZY

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Raimundo de Oliveira Souza[2]

RISK ANALYSIS OF THE DISPERSION OF AIR POLLUTANTS USING FUZZY THEORY

Recibido el 7 de octubre de 2013; Aceptado el 29 de noviembre de 2013

Abstract

The air pollution problems become more critical, requiring continuous monitoring and controls in order to ensure an appropriate environment for the community. The impact of the sources of air pollution from existing or new sources can be evaluated using air quality models. These tools evaluate the risks of air pollutants to the environment in several variables. In this context, the fuzzy set theory emerged as a viable solution to study the risk of failure of a system of air pollution subject to different releases. This theory, combined with the mass transport principle has allowed that fields of risk are determined and can assess whether the controls adopted are reliable. This paper proposes a methodology, based on a mathematical modeling of the processes of dispersion of air pollutants, where their parameters are membership functions, defined according to the fuzzy theory. The research uses these concepts in the solution of the Fuzzy Dispersion Equation to determine the risk of failure of the release of pollutants at different concentrations for continuous and instantaneous emissions. The results showed that the risk is high for neutral and stable conditions in according to literature, and the results also showed that the better dispersion occurs at the atmosphere unstable conditions.

Key Words: dispersion, fuzzy modeling, air pollution, risk.

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INTRODUCCIÓN A LA INGENIERÍA AMBIENTAL Y DE SALUD PÚBLICA: UN COMPONENTE CURRICULAR PARA LOS RECIÉN INGRESADOS EN EL CURSO DE GRADO EN INGENIERÍA SANITARIA Y AMBIENTAL DE LA UNIVERSIDAD FEDERAL DE BAHÍA, BRASIL

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INTRODUCTION TO ENVIRONMENTAL ENGINEERING AND PUBLIC HEALTH: A CURRICULAR COMPONENT FOR NEW ARRIVALS IN UNDERGRADUATE COURSE IN SANITARY AND ENVIRONMENTAL ENGINEERING OF THE FEDERAL UNIVERSITY OF BAHIA, BRAZIL

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Abstract

The undergraduate program in Sanitary Engineering of the Federal University of Bahia, created in 1978, used to offer the course Environmental Sciences in the first year of its curriculum. After some time, professors, former students and students actual, identified that subjects of the Environmental Sciences course were part of other obligatory courses. It was also observed a high contingent of students' evasions from that course. Some causes were identified as the large number of initial basic courses taken in Institutes other than the Engineering School and the lack of motivation due to the long time to access the Engineering School and their specific courses. In 1994, the undergraduate program in Sanitary Engineering had its curriculum reformulated passing to be named Sanitary and Environmental Engineering. At that time, the problems referred above were taken into consideration and a new basic course was created in substitution to the Environmental Sciences, aiming to introduce and discuss the major and professional issues of the Sanitary and Environmental Engineering, including the profile of the future citizens-engineers. It was named Introduction to Environmental and Public Health Engineering (ENG014). Experience has proved that this new introductory course has contributed to better engaging students in academic life and improving identification with the fields of Sanitary and Environmental Engineering, besides contributing to decrease students' evasions from this major.

Keywords: Curriculum, Curriculum components, Sanitary and Environmental Engineering.

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TALLERES DE IMPLEMENTACION TECNOLÓGICA: UNA OPCIÓN TRANSVERSAL PARA EL CURRICULUM DEL INGENIERO AMBIENTAL EN LA UNIVERSIDAD DEL MAR, MÉXICO

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TECHNOLOGICAL IMPLEMENTATION WORKSHOPS: A CROSS-CURRICULAR OPTION FOR THE ENVIRONMENTAL ENGINEER IN THE UNIVERSIDAD DEL MAR, MEXICO

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Abstract

In this paper, we present the experience of an integration project that was developed during the 2nd, 3rd, and 4th semesters of the programs in Environmental Engineering at the Universidad del Mar in Mexico. It consisted of a series of workshops in technology implementations (TIT, for its acronym in Spanish), which were intended to be rendered not as ends in themselves, but as instruments in achieving educational goals. The preparation of students from a holistic perspective was facilitated by encouraging the development of meaningful learning through the integration of an interdisciplinary curriculum and contextualized learning. Specifically, this work gives an account of the development of TIT applied by a generation of ten students who were organized in five pairs. Each chose and justified the construction of a prototype, in this case, a solar oven, a grease separator, an evaporator, a wetland and a biodigester. The teams built, assessed, and implemented operational improvements for each prototype by integrating the knowledge learned in other courses, while discovering new concepts that would be reinforced in subsequent courses, all through their cooperative work.

Key Words: crosscurricular courses, significative learning, educative innovation, environmental engineering.

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