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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.

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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Vol.14, No.2
6 de agosto de 2021

Tabla de Contenido

Vol. 14, No. 2

Revista AIDIS de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica. ISSN 0718-378X

Vol.14, No.2
6 de agosto de 2021

Revista AIDIS de Ingeniería y Ciencias Ambientales:
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6 de agosto de 2021

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Vol.14, No.2
6 de agosto de 2021

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

CONTABILIDADE ECONÔMICA E AMBIENTAL DO TERRITÓRIO: UMA ANÁLISE DA ZONA URBANA PARA CIDADES DE MÉDIO PORTE

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TERRITORY ECONOMIC AND ENVIRONMENTAL ACCOUNTING: AN ANALYSIS OF THE URBAN ZONE FOR MIDDLE CITIES

Recibido el 7 de agosto de 2019; Aceptado el 17 de mayo de 2021

Abstract

From the need for integration between the economy and the environment, the System of Environmental Economic Acounting (SEEA) emerged in 1987, introducing environmental concerns into national accounts, providing a database for assessing environmental resources. This study proposes a methodology of measurement and evaluation in physical / monetary terms for the resource "land", analyzing the Passo Fundo-RS urban area. The analyzes were based on the zoning map of the municipal master plan for the survey of physical assets and the Basic Unit Cost (CUB) for the survey of monetary assets. It was found a territorial area of 800 km² and a building potential of 700 km², ie, buildable area very close to the territorial area showing a high buildable potential, which was estimated at 939 billion reais. The methodology proposed in this study is relevant so that it can be further explored and applied to the planning controls of use and occupation and environmental impacts in the territory.

Keywords: SEEA, environmental accounting, land use and occupation, territorial management, territory.

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AVALIAÇÃO DA APLICABILIDADE DO REUSO DA ÁGUA CINZA DE MÁQUINA DE LAVAR ROUPA APÓS TRATAMENTO COMPLETO E SIMPLIFICADO

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Antonio Adelúzio Gomes Azevedo [1]
Roseanne Veloso de Camargo [1]
Marcelo Mendes Pedroza [1]
Juan Carlos Valdés Serra [1]

EVALUATION OF THE APPLICABILITY OF WATER REUSE WASHING MACHINE GRAY AFTER COMPLETE AND SIMPLIFIED TREATMENT

Recibido el 3 de octubre de 2019; Aceptado el 14 de septiembre de 2020

Abstract

The use of gray water is an effective way to reduce the demand for drinking water, when the technology works efficiently. This study aims to evaluate the applicability of the gray water reuse of the washing machine through a bench test using Jartest with different dosages of aluminum sulfate, selecting the optimal coagulation condition (optimal dose) comparing the parameters pH, turbidity, conductivity and temperature for the samples of raw water, water subjected to simple treatment and water with complete treatment, whereas the COD parameters and total solids will be evaluated only for raw gray water and for water after complete treatment. All results will be evaluated according to the quality parameters for the use of non-potable water in accordance with the ABNT NBR 16783: 2019 standard. The gray water from the washing machine showed an alkalinity of 77 mg/L of HCl and a turbidity of 66.1 uT. The sample that showed the best results was the second with the dosage of 100 mg/L of aluminum sulfate with turbidity of 3.7 uT and pH 6.1. This sample was subjected to simple filtration and activated carbon and showed turbidity of 0.8 uT and pH 8.3. The Total Solids values varied from 980 to 1073 mg/L for the treated water and the raw effluent, representing a 9% removal of total solids. As the proposal is the treatment for water reuse in less noble uses, the result obtained is within the expected for the analyzed parameters, being sufficient for the objective defined in this research.

Keywords: coagulation, filtration, Jartest, reuse.

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

INFLUÊNCIA DA RELAÇÃO ALIMENTO/MICRORGANISMO E CODIGESTÃO DE PALHA DE MILHO E RESÍDUO ALIMENTAR NA PRODUÇÃO DE METANO

Tiago Borges Ferreira [1]
Timóteo Gomes Parise [1]
Carla Vieira Serufo [1]
* Cláudio Leite de Souza [1]

INFLUENCE OF THE FOOD/MICROORGANISM RATIO AND CODIGESTION OF CORN STRAW AND FOOD WASTE ON METHANE PRODUCTION

Recibido el 20 de octubre de 2020; Aceptado el 12 de abril de 2021

Abstract

The population growth and changes in the lifestyle witnessed in the recent past have become the organic waste generation and energy demand very current issues. Anaerobic digestion can provide the organic waste treatment and enable the energy recovery of the methane. Thereby, this work evaluated different operational conditions to improve this process stability and productivity. Three food/microorganism ratio (F/M) were evaluated: 0.2; 0.35 and 0.5 gVS gVS^{-1}, in addition to three different ratios of food waste and corn straw (FW:CS): 1:1, 3:1 and 5:1. The rotation shaking and operating temperature were 125 rpm and 35 °C, respectively, using methane production as the main evaluative parameter. As result, isolated and associated influences of these two variables were verified, with higher yields, 408 and 337 mL CH_4 gVS^{-1}, at 30 days of the test, for the F/M ratio 0.2 and FW:CS 3:1 and 1:1, respectively. Permanent inhibition was found for the F/M 0.5 with FW:CS 3:1 and 5:1. Therefore, it can affirm that the F/M ratio and substrate proportion were important factors for the process stability and increase of productivity in less operation time.

Keywords: anaerobic digestion, bioenergy, biological treatment, biomethanation.

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Vol. 14, No.2,550-563
6 de agosto de 2021

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

ENSAIOS PARA TRATABILIDADE DE EFLUENTE ORIUNDO DO BENEFICIAMENTO DO AÇAÍ

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TESTS FOR EFFLUENT TREATABILITY FROM THE AÇAÍ BENEFIT

Recibido el 22 de octubre de 2019; Aceptado el 13 de enero de 2021

Abstract

The objective of this research is to verify the treatability of the effluent from açaí production by physical-chemical process to achieve the best removal efficiency in this effluent. Qualitative characterization of raw sewage and Jar Test assay has been performed, using tannin, aluminum polychloride and polymer. In the treated effluent, the parameters has been analyzed: pH, apparent color, turbidity and COD to evaluate the pollutant removal efficiency. A treated effluent quality index has been calculated with the support of Principal Component Analysis (PCA). As a result of the treatability tests, the best combination of polyaluminium cloride and polymer has been obtained at pH 8.0, resulting in an apparent color removal of approximately 98%; turbidity of 99% and COD equal to 90%. The results suggest that the physical-chemical treatment of this effluent obtained removal efficiency above 80% for most of the pollutants analyzed, being acceptable for the standard of discharge of treated effluent of resolution 430/2011 of CONAMA.

Keywords: Açaí effluent, Jar Test, physical-chemical treatment.

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

PREMISES FOR ECO-EFFICIENCY ANALYSIS ON CONSTRUCTION AND DEMOLITION WASTE RECYCLING

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Abstract

The construction industry is associated with significative impacts such a consumption of natural resources and waste generation. Eco-efficiency is an instrument for sustainable analysis which indicates the relation between environmental costs and impacts. While the most environmental method used is the lifecycle assessment (LCA), standardized by ISO 14040, the economic indicator should be selected according to the stakeholder. Total cost, Unit Cost, Net Present Value (NPV) and Internal Rate of Return (IRR) are some of the economic indicators used in the economic analysis of Construction and Demolition Waste (CDW) recycling, however, the search for literature regarding the Eco-efficiency analysis shows a tendency to use the total cost regardless of its objective. In this sense, the objective of this paper is to propose the main premises to be considered in the selection of the economic indicator and in the normalization of the analysis of the CDW recycling Eco-efficiency index results. The search method adopted was comprised for three steps: Systematic review of literature; Analysis and comparison of Eco-efficiency indicators (including economic and environmental inputs); Discussion about the main assumptions in the CDW recycling Eco-efficiency analysis. 14 articles were identified in the Science Direct and Springer platforms. This paper provides information to propose premises to the Eco-efficiency analysis on CDW recycling. As a result, was defined a standard Eco-efficiency analysis according the objective: assessment of the cost to minimizing impacts, a simple comparison between scenarios or economic and environmental viability. The first two objectives refer to the input data variation and the scenarios evaluated, respectively. The third objective needs to compare the results with the current scenario, the final disposal and established market material that recycled aggregate can replace. Using the simplified flowchart proposed for each CDW recycling Eco-efficiency analysis objective will allow to standardize studies of this aspect, thus enabling more credible, replicable and comparable development.

Keywords: eco-efficiency, construction waste, demolition waste; LCA, LCC, sustainability.

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Investigación, desarrollo y práctica.

IMPACTO DA FERTIRRIGAÇÃO COM VINHAÇA NAS PROPRIEDADES QUÍMICAS E MICROBIOLÓGICAS DE SOLOS

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IMPACT OF VINEYARD FERTIRIGATION ON CHEMICAL AND MICROBIOLOGICAL PROPERTIES OF SOILS

Recibido el 15 de noviembre de 2019; Aceptado 18 de septiembre de 2020

Abstract

Vinasse is an effluent generated in the process of ethanol production from sugarcane, and due to its characteristics is used in soil fertigation, but can also present high pollutant potential when used improperly. The objective of this work was to evaluate the changes in chemical and microbiological characteristics of soil fertigated with vinasse in different cropping systems. For this, soil samples were collected in sugarcane and pasture areas that have a history of vinasse fertigation. These collections were performed at two different times, 15 days and 2 years after the last vinasse application. As control was used samples of pastures cultivated with pasture and sugar cane, which never received applications of vinasse. The chemical characteristics analyzed were: pH, Al, CO, P, mineral N, K, Ca, Mg, Cu and Zn. The microbiological characteristics evaluated were: RBS, BMS-C, N mineralization, qCO_2 and qMic. The application of vinasse in the soil influenced the chemical and microbiological characteristics of the soil, with different effects for each crop and over the time following the application.

Keywords: effluent, environmental impact, soil microbiology.

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

ANÁLISE DAS EFICIÊNCIAS DOS ECOPONTOS DA CIDADE DE FORTALEZA NO CEARÁ PELO MODELO DEA SBM ORIENTADO A OUTPUT

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EFFICIENCIES ANALYSIS OF ECOPOINTS OF FORTALEZA CITY IN CEARÁ BY MODEL DEA SBM ORIENTED OUTPUT

Recibido el 19 de noviembre de 2019; Aceptado el 7 de mayo de 2020

Abstract

This research was carried out to analyze the efficiency of the Ecopoints of the city of Fortaleza, in the state of Ceará, using the Data Envelopment Analysis (DEA) model that uses the Slacks-Based Measure (SBR) method oriented to output (products) with variable scales (SBM- O- V). The Decision Making Unit (DMUs) of the model are twenty-five Ecopoints, where there are two incentive collection programs, the "Recicla Fortaleza" and "E-carroceiro". The inputs of the model are the production of construction waste (rubbish), cutting and pruning vegetation, bulky waste (useless as old furniture, refrigerator and others), OGR (oil and fat in general), recyclable waste with the outputs from the revenues from bonuses in reais (R$) of OGR and recyclable waste. The efficiencies found by the SBR-O-V model of classical and inverted boundaries are transformed into composite efficiencies and these into standardized ones. A scaling of standardized efficiencies from least efficient to most efficient is demonstrated. The scheduling analysis indicates the least efficient Ecopoints and which management attitudes should be taken seeking a maximization of production with the minimization of bonuses.

Keywords: analyze the efficiences of Ecopoints, DEA SBM oriented to output, standardized efficiencies, incentive urban collection programs.

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Investigación, desarrollo y práctica.

GERENCIAMENTO DE RESÍDUOS SÓLIDOS DOMICILIARES NO MUNICÍPIO DE FORTALEZA/CE, BRASIL

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HOUSEHOLD SOLID WASTE MANAGEMENT IN THE MUNICIPALITY OF FORTALEZA/CE, BRAZIL

Recibido el 19 de noviembre de 2019; Aceptado el 14 de septiembre de 2020

Abstract

The management of household solid waste (RSD) consists of the stages of collection, transportation, treatment, destination and final disposal, so the purpose of this article was to describe its phases and present the amount of waste that is managed in the city of Fortaleza (CE) in regular, ecopolo, selective and ecopoint collection; transport, transshipment station, recycling and landfill. For that, literary definitions related to the stages of RSD management and secondary data on this management in the studied municipality were presented, showing its functional organization and quantities of waste managed. It was observed in the results that Fortaleza has a diversified collection system, in addition to having a transshipment station, sanitary landfill and recycling industries. It was found that the amount of RSD from regular door-to-door collection and underground dumps (ecopolises) was the largest of the collection systems with a value of 808271.15 tons; followed by ecopoints with 12790 t. debris and recycled materials and selective collection with 6263.6 t. In addition, it was found that transportation is approximately 19 km between transshipment and landfill. The amount of waste managed at the transshipment station was 405596.9 t. in 2017 and to the landfill 1452132.4 t. It was observed that the diversity in the collection of RSD in the city provides a greater efficiency in its management, thus aiming to reduce irregular points of garbage throughout the city.

Keywords: household solid waste, landfill, management, regular collection, selective collection.

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

ESTIMATIVA DA PRODUÇÃO DE PERCOLADO DO ATERRO DE DISPOSIÇÃO DE RESÍDUOS SÓLIDOS DE BOA VISTA POR MEIO DE METODOLOGIAS EMPÍRICAS

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ESTIMATION OF PERCOLATE PRODUCTION FROM THE BOA VISTA SOLID WASTE DISPOSAL EMBANKMENT USING EMPIRICAL METHODOLOGIES

Recibido el 23 de noviembre de 2019; Aceptado el 7 de mayo de 2020

Abstract

This work aims to estimate, using the Swiss, Rational and Water Balance empirical methods, the percolate production of the Boa Vista / RR solid waste disposal area, considering the climatic data of the region corresponding to a historical series of 35 years (1980 - 2015). For this reason, the BHídrico GD 4.0-2004 electronic spreadsheet was used to calculate the climatological water balance and to determine the evapotranspiration that was used to estimate the percolate production. The results indicated, for the rational methods and water balance percolate, a generation only in the months of water surplus, with very expressive values. However, for the Swiss method, the percolate production was observed throughout the year. These results are very important, considering that the landfill, object of this study, does not have a percolate treatment system or adequate base coating, besides it has been located about 150 m from the Wai Grande Stream.

Keywords: solid waste, water balance, lixiviate.

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VOLUME DE CISTERNAS RURAIS: UMA CONTRIBUIÇÃO PARA ABASTECIMENTO REGULAR DE ÁGUA

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RURAL CISTERN VOLUME: A CONTRIBUTION TO REGULAR WATER SUPPLY

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Abstract

The Training, Social Mobilization e Coexistence with the Semi-Arid Program: One Million Rural Cisterns - P1MC installed a training process with rural communities in the Brazilian semiarid that will directly involve one million families. This program has brought advances in improving the quality of life of the population with easy access to water, however, despite the excellent results achieved, the strategy of installing a 16,000 liter cistern regardless of the variables present in the system has become less suitable. The present study aimed to evaluate the steardization of these cisterns in the State of Bahia, based on a daily water balance model, to meet the deme of 20 L / (p.d) at 95% reliability e under different pluviometric zones. Data from the Articulation in the Semi-Arid Region (ASA) e the National Water Agency (ANA) were used e it was found that 60% of homes would not have these conditions met, either due to insufficient catchment area, or due to the need for larger volumes of cisterns. The other 40% could be served with volumes from smaller cisterns, concluding that a variation in the volumes of the reservoirs increased in the catchment areas of the systems would represent both an increase in the efficiency of the program e the application of its financial resources.

Keywords: rainwater harvesting, rural Sanitation; water supply.

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ENERGY EFFICIENCY MEASURES IN ELETRIC MOTORS FOR WATER SUPPLY SYSTEMS

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Abstract

The increase of water and electric consumption has caused concerns in relation to scarcity and water stress, while stimulating the development of energy efficiency techniques in water supply systems. However, these techniques can be considered costly and complex, since they use computational equipment and tools that make it difficult to implement into operational practice. In this regard, especially in developing countries, there is a need for progress in energy efficiency measures with low economic dependence on both equipment and tools, guaranteeing necessary environmental and social benefits. This study evaluated energy efficiency measures in a water supply system through the use of (i) a frequency inverter and (ii) replacing the electric motor with a more efficient motor. The first measure did not show economic attractiveness, revealing that frequency inverters do not always have applicability in reducing energy costs. However, the necessity of a soft starter should be noted, as well as suggested studies that have changes in the operating system that can make this measure attractive. The second measure demonstrated economic potential and reinforced the importance of commercial availability and technical regulation of high-efficiency motors, since the payback period was 4 years, with application potential throughout the water supply system.

Keywords: hydro energy efficiency, high-performance motor, operational control, frequency inverter.

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SYSTEMATIC MAPPING OF PHOSPHORUS RECOVERY FROM INDUSTRIAL WASTEWATER

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Recibido el 24 de diciembre de 2019; Aceptado el 18 de septiembre de 2020

Abstract

Phosphorus is an essential nutrient used in fertilizers and food production but excessive levels in hydrological bodies of water can cause environmental issues. In a geochemical cycle, phosphorus is considered non-renewable, which by itself would be sufficient justification for its recovery from industrial wastewater. The objective of the present work was to conduct a literature review and present a panorama of current wastewater recovery methods. The review focused on the specific conditions of each technique, possible uses of the recovered element and major worldwide locations where this subject was studied. To this end, a systematic mapping technique was used with previously established empirical criteria. Publications from 3 scientific databases were scanned, resulting in 132,551 initial results and, through a rigorous filtering process, 81 studies were selected for review. In the selected studies, physicochemical recovery techniques were the most cited. An increase in studies was observed in 2016, when the number of publications doubled with respect to the preceding year and onwards. Worldwide, this subject is studied the most in Europe and Asia.

Keywords: industrial wastewater, phosphorus, recovery, systematic mapping
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REMOÇÃO E RECUPERAÇÃO DE NUTRIENTES EM SISTEMA UASB SEGUIDO DE LAT E POSTERIOR SEPARAÇÃO DE MICROALGAS POR FAD

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NUTRIENT REMOVAL USING A UASB REACTOR FOLLOWED BY A HIGH-RATE POND AND DAF

Recibido el 31 de diciembre de 2019; Aceptado el 18 de septiembre de 2020

Abstract

The discharge of partially treated effluents with nutrients may cause eutrophication in water bodies. To avoid this process due treatment is necessary to improve the final quality of the effluent to be released. This work presents the treatment of domestic sewage from an Upflow Anaerobic Sludge Blanket (UASB) followed by a high algal rate lagoon (LAT) with subsequent separation of algal biomass by dissolved air flotation (FAD) operated for one year. The UASB reactor was managed at a flow rate of 1.6 m³/h and a HRT of 10.8 h. The pond was worked at a flow rate of 0.8 m³/h with a HRP of 4.1 days. Inorganic coagulant ferric chloride with a dosage of 40 mg/L and organic flocculant Tanfloc SG with a dosage of 50 mg/L were tested to assist the flotation system. The UASB+LAT system showed an average TKN removal of 61.3 ± 11.2 % and the total phosphorus 32.3 ± 5.5 %. The overall removal observed in the pond and separations tests showed that ferric chloride showed a higher performance in the removal of total phosphorus reaching values of 74.5 ± 7.5 %. On the other hand, Tanfloc SG performed better for the removal of volatile suspended solids and organic matter with up to 88.2 ± 4.3 % and 89.8 ± 4.2 %, respectively.

Keywords: algae, HRP, UASB, flocculation, coagulation/flotation.

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APPLICABILITY OF THE APPROXIMATE DELTA METHOD FOR DETERMINATION OF THE REAERATION COEFFICIENT IN SUB-BASINS IN THE CENTRAL REGION OF RIO GRANDE DO SUL, BRAZIL

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Recibido el 12 de enero de 2020; Aceptado el 18 de septiembre de 2020

Abstract

The approximate delta method is a simplified experimental method easy to apply and low cost, it is based on the estimated surface reaeration, primary production, and respiration, basically using diurnal measurements of dissolved oxygen (DO). This study aimed to analyze the feasibility of applying this method to determine the reaeration coefficient (k_a) in sub-basins of the central region of Rio Grande do Sul. The study was carried out in four sub-basins of the Vacacaí Mirim River, and one sub-basin of the Vacacaí River. In the fluviometric stations studied, one determined the values of velocity, depth, and flow rate, as well as the DO profile during the photoperiod. In three of the sub-basins, it was not possible to determine the k_a due to the occurrence of minimum DO deficit before solar noon and/or to the formation of an inappropriate DO profile curve. In the other two sub-basins, it was possible to determine the coefficient, although with some limitations that need to be better investigated since this method is an important alternative to the traditional ones.

Keywords: dissolved oxygen, hydrodynamic characteristics, reaeration coefficient, water quality modeling.

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REVISTA AIDIS

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AVALIAÇÃO DOS IMPACTOS SÓCIO-AMBIENTAIS E DE SAÚDE PÚBLICA DE FAMÍLIAS REMANEJADAS. ESTUDO DE CASO DO RESIDENCIAL MORADA DO SOL, PARAGOMINAS, PA

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EVALUATION OF THE SOCIO-ENVIRONMENTAL AND PUBLIC HEALTH IMPACTS OF REMAINED FAMILIES. CASE STUDY OF THE RESIDENCIAL MORADA DO SOL, PARAGOMINAS, PA

Recibido el 18 de enero de 2020; Aceptado el 11 de enero de 2021

Abstract

The construction of Residencial Morada do Sol, in the municipality of Paragominas, PA, aimed to reduce the housing deficit of the municipality, provide healthy housing, and improve the quality of life with the environment. The objective of the research was to verify that housing structures with basic sanitation infrastructures have a reflection on the quality of life of the beneficiaries. For this, the work was divided into four stages. Initially, a technical visit was made to the Federal Savings Bank in Belém, Pará. In the second stage, a visit was made to the Secretariat of Sanitation in Paragominas. In the third stage, a visit to the Secretariat of Social Assistance in Paragominas took place. And in the fourth stage, interviews were conducted with the residents of the Residencial Morada do Sol. Thus, this work brings a synopsis of the improvement of the health and quality of life of families relocated from risk areas in Paragominas (PA) to Residencial Morada do Sol, of the PMCMV, the first of this category in the municipality, destined to families of 0 to 3 minimum salaries. It was possible to analyze how the interference of the sanitation system can offer improvements to the population, as well as to eliminate them and interrupt the life cycle of pathogens, the main cause of diseases related to the absence of basic sanitation.

Keywords: area of risk, sanitation systems, quality of life.

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QUALIDADE DA ÁGUA SUBTERRÂNEA PARA CONSUMO HUMANO EM ÁREA DE INFLUÊNCIA DE LIXÃO DESATIVADO

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QUALITY OF GROUNDWATER FOR HUMAN CONSUMPTION IN DISABLED WASTE INFLUENCE AREA

Recibido el 25 de enero de 2020; Aceptado el 18 de septiembre de 2020

Abstract

Groundwater contamination by leachate is still a problem faced in Brazil. In Tucuruí, southeastern of Pará, it operated a final municipal solid waste disposal (MSW) area for 13 years, from 1983 to 1996, without any management criteria, that has been occupied by residents since its deactivation. Many residents currently consume water from shallow wells, disregarding that a landfill has operated in this area and that this water source may be compromised. The objective of the work was to investigate the quality of groundwater in the area and to check possible contamination by the disposal of MSW or anthropic in the study area. Ten shallow wells were monitored, five in the dump area and five outside this area, and compared with current legislation for human consumption. The results point to possible interferences in the two analyzed areas. In the dump area, the parameters color, turbidity, pH, iron, electrical conductivity, total coliforms and *E. coli* do not satisfy the drinking water quality parameters provided by the legislation. In the external area of the dump, the parameters color, turbidity, pH, iron, total coliforms and *E. coli* differ from the legislation. Therefore, the groundwater used by users is not suitable for direct consumption, and may be contaminated by natural or man-made activities, as a result of poorly constructed wells, for example. Furthermore, the possibility of decomposition activities linked to the old MSW disposal area is not discarded.

Keywords: groundwater, contamination of leachate, water potability.

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POTENCIAL ENERGÉTICO DO BIOGÁS GERADO A PARTIR DA BIODIGESTÃO DE RESÍDUOS DO PROCESSAMENTO INDUSTRIAL DE ERVA-MATE

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ENERGY POTENTIAL OF BIOGAS GENERATED FROM WASTE BIODIGESTION OF THE YERBA MATE INDUSTRIAL PROCESSING

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Abstract

Considering the high generation of residues and byproducts during the processing of yerba mate allied to the need to seek treatment technologies that enable the valorization of substrates of this nature, the objective of this study was to evaluate the potential of biogas generation from these residues and their energy use. It was possible to verify that the generation of biogas increased in proportion to the addition of inoculum to the environment; in this case, Treatment B, with a S/I ratio equal to 1:5 was the one that presented the greatest potential for biogas generation, 42.25 NmL.gsv^{-1}. However, despite the higher biogas generation among the evaluated scenarios, the low methane content of this treatment (23.1%) shows the low biodegrability of the substrates studied here. In addition to these results, in a later analysis and for the evaluated scenario, it was verified the nonviability of the biogas energy use, since the possible energy potential to be obtained represented only 1% of the energy demand of the evaluated industrial unit.

Keywords: anaerobic digestion, biomass; recovery of industrial waste; renewable energies.

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REVISTA AIDIS

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APLICAÇÃO E ANÁLISE DA ELETROCOAGULAÇÃO PARA O TRATAMENTO DE EFLUENTE DOMÉSTICO

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APPLICATION AND ANALYSIS OF ELECTROCOAGULATION FOR THE WASTEWATER TREATMENT

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Abstract

To achieve a more noble quality and to avoid the degradation of water bodies, wastewater treatment is crucial. In this study, the unit process (EC) electrocoagulation was applied to treat domestic wastewater from a septic tank. The tests were conducted in a cylindrical reactor (1 L) with aluminum electrodes (108 cm²), and connected to a DC power supply. In the first step, the reactor's operational parameters were dimensioned using a 3² (3x3) two-factor experiment. The optimized condition resulted in a current of 2.0 A, electrolysis time of 12 min, cation mass of 0.13 g, voltage of 20.60 V, and the average total operating cost of 4.43 R$.m^{-3}. Secondly, the monitoring was carried out to assess the reactor´s performance in relation to compliance with legislation and efficiency. The average reduction efficiencies achieved in the period were: > 99.6% for P-PO_4^{3-}, 84.6% for COD, 2.32 log decay of total coliform and 2.30 log decay of E. coli, 97.4% of turbidity removal, 96.1 % of apparent color, 11.5% of electrical conductivity, increase of 14.5% in pH and 20.9% in temperature. Throughout the monitored period, the effluent from the EC reactor achieved the limit values set by Brazilian regulations for the discharge of sanitary effluents, CONAMA Resolution and CONSEMA Resolution 355/2017. Thus, EC proved to be an effective and promising process in the treatment of domestic sewage.

Keywords: coagulation, coliforms removal, phosphorous removal, sewage.

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REVISTA AIDIS

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PARÂMETROS DA CONTAMINAÇÃO DO SOLO A PARTIR DA ANÁLISE DO DESCARTE DE UM EFLUENTE SANITÁRIO

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PARAMETERS OF SOIL CONTAMINATION FROM THE ANALYSIS OF THE DISPOSAL OF A SANITARY EFFLUENT

Recibido el 21 de febrero de 2020; Aceptado el 18 de septiembre de 2020

Abstract

The disposal of untreated sanitary effluents in the soil, has numerous environmental consequences and human health. The objective of the study was to evaluate changes in the chemical properties of a soil, with a sandy texture, under the influence of sources of discharge of a sanitary effluent. For this, samples were collected at five points near and one far from the sources of effluent releases. The contents of copper, zinc, manganese, iron, phosphorus, cation exchange capacity, pH, organic matter, sand, silt and clay in the soil were determined, as well as environmental quality indexes and correlation analysis, grouping and main components. The levels of MO, Cu, Zn, Fe, Mn, P and Na showed an increase and the soil pH decreased under the influence of the effluent (sampling points P1, P4 and P5) concerning the point without the influence (sampling point P6). In places under the influence of the effluent, especially at points between the sources and close to the drainage channel, the environmental quality indexes were affected.

Keywords: *sewage, pollution indexes, heavy metals, contaminants dispersion.*

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ENTRAVES NA IMPLEMENTAÇÃO DA GESTÃO DOS RESÍDUOS SÓLIDOS URBANOS NO BRASIL

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BARRIERS IN THE IMPLEMENTATION OF URBAN SOLID WASTE MANAGEMENT IN BRAZIL

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Abstract

The problem of solid waste has been constantly discussed in several countries, in order to propose and adopt alternatives to solve these issues. The generation of solid waste is considered one of the major factors related to the environmental crisis, due to the waste of matter and energy, as well as as for environmental impacts caused by improper disposal of materials that could be recycled or reused. Among the various types of waste, there is the high production of solid urban waste (MSW) linked to the consumption patterns of society, especially in places with high population density, characterized by materials that are difficult to degrade in nature and can contribute to damage to the environment and the population, when improperly handled, such as: proliferation of diseases, bad odors, emission of pollutant gases into the atmosphere, among others. Given this scenario, there was the need to create public policies related to waste solid services capable of providing guidelines in order to adjust consumption patterns with the aspects of sustainable development. However, there are several factors related to the difficulties in implementing the guidelines proposed by the current legislation, among them, the limitations in the technical and financial aspects are still considered major challenges in ensuring the efficiency of the National Solid Waste Policy.

Keywords: waste management. integrated management plans. implementation of public policies.

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BALANÇO DE MASSA DE DQO PARA REATORES UASB MODIFICADO TRATANDO ESGOTO SANITÁRIO EM ESCALA PLENA

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COD MASS BALANCE FOR MODIFIED UASB REACTORS TREATING SANITARY SEWAGE ON A FULL SCALE

Recibido el 27 de febrero de 2020; Aceptado el 31 de enero de 2021

Abstract

Anaerobic technology is widely used for treatment of sanitary sewage, specifically the Upflow Anaerobic Sludge Blanket (UASB) reactors. To control the performance of these reactors, the mass balance can be used, clarifying the routes of the organic material, assisting in the evaluation of the system efficiency, identifying the process output compounds and providing support in the approval of new methodologies. Therefore, the general objective of this study was to evaluate the COD mass balance, for modified UASB reactors, treating sanitary sewage on a full scale. For equating the mass balance, a characterization of the inffluent, effluent, sludge and biogas was carried out between July 2018 and November 2018. The results showed a percentage of 32.66 %, 24.24 %, 10.29 %, 4.56 % and 1.65 % for COD transformed into biomass and eliminated with the effluent, COD not transformed and eliminated soluble to the effluent, COD transformed into methane and present in the biogas, COD employed to reduce sulfate and COD transformed into biomass and maintained in the system, respectively.

Keywords: biogas, wastewater treatment plant (WWTP), real time measurement, dissolved methane.

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APLICAÇÃO DE TÉCNICAS ESTATÍSTICAS PARA IDENTIFICAÇÃO DE TENDÊNCIA PLUVIOMÉTRICA NO SUDESTE PARAENSE

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APPLICATION OF STATISTICAL TECHNIQUES FOR THE IDENTIFICATION OF PLUVIOMETRIC TREND IN SOUTHEAST PARAENSE

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Abstract

The study of time series allowed analyzing possible externalities produced by the changes in the use of the soil or global climatic changes on the pluviometric regimes, emphasizing the detection of trends in series of hydrological observations, especially with respect to the precipitation. The objective of this study was to evaluate the occurrence of trends and/or variations in time series relative to annual rainfall indices and monthly indices, using the non-parametric Mann-Kendall and Sen estimators, considering the seasonality of the period Rainy and less rainy seasons recorded in Southeast Pará, using the historical series between 1986 and 2015 in 19 rainy seasons. The results showed that 73.69% of the rainfall stations did not present trends, while 26.31% of the stations showed a trend, 21.05% with negative tendencies and 5.26% with a positive trend. The analysis of the series in the rainy and less rainy season presented a reduction in the rainfall regime over the years. The month of March, considered the most rainy, presented a decrease in relation to the average value of the rainfall indices of 15.21% and the month of September, considered the least rainy, presented a reduction of 39.55%, however they were not Significant trends were detected in the monthly series, at the significance level of 5%, showing the low efficiency of this test in rainy seasons in the Amazon. The reduction of rainfall records can be directly related to the changes in the use and occupation of the soil and to the different intensities of atmospheric systems and climatic phenomena in the region.

Keywords: historical series, Mann-Kendall, precipitation.

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ESTUDO DO LODO DE ETA CONTENDO ALUMÍNIO PARA A ADSORÇÃO DE FÓSFORO DE ESGOTOS SANITÁRIOS PREVIAMENTE TRATADOS EM WETLANDS CONSTRUÍDOS

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STUDY OF THE ALUM-SLUDGE ON PHOSPHORUS REMOVAL FROM WASTEWATER PREVIOUSLY TREATED IN THE CONSTRUCTED WETLANDS

Recibido el 20 de marzo de 2020; Aceptado el 18 de septiembre de 2020

Abstract

The present study aimed to evaluate the application of two different particle size of alum-sludge (<0,1 mm and 0.1-0.6mm), as an adsorbent material in the phosphorus removal from wastewaters previously treated in the constructed wetlands*. For this, kinetic and isothermal tests were carried out in batch and fixed bed columns. The kinetic tests, performed with an adsorbent dosage of 20 gL^{-1}, and an adsorvate concentration of 12.5 $mgPO_4^{3-}L^{-1}$, resulted in a superior removal for the sludge of smaller particle size, reaching 90% efficiency, and equilibrium concentration of 1.2 $mgPO_4^{3-}L^{-1}$.The isothermal tests, conducted with different masses of adsorbent (0.5; 0.75; 1.0; 1.5; 2.0 and 3.0 g) achieve the maximum adsorption capacities of 1.36 and 1.33 $mgPO_4^{3-}L^{-1}$ for fine sludge and coarse sludge, respectively. The fixed bed columns showed high adsorption capacities, for the different flows 5.0 and 2.0 $mLmin^{-1}$, reaching between 0.76-3.65 $mgPO_4^{3-}g^{-1}$for the coarse sludge and 8.73-12.49 $mgPO_4^{3-}g^{-1}$ for the finer sludge. This results show that smaller particle size resulted in a better adsorption process, leading to a faster removal of the dissolved phosphorus, and also to a lower equilibrium concentration. Thus, the use of alum-sludge not only provides a low-cost technological solution for the wastewater treatment, but also an option for the effective management of this waste in the treatment water plants.*

Keywords: adsorption, alum-sludge, constructed wetlands, phosphorus removal, wastewater treatment.

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AVALIAÇÃO DO CONFORTO AMBIENTAL E DOS BIOAEROSSÓIS FÚNGICOS EM HOSPITAIS PÚBLICOS NA CIDADE DE FORTALEZA, CEARÁ, BRASIL

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EVALUATION OF ENVIRONMENTAL COMFORT AND FUNGAL BIOAEROSOLS IN PUBLIC HOSPITALS IN FORTALEZA, CEARA, BRAZIL

Recibido el 22 de marzo de 2020; Aceptado el 12 de mayo de 2021

Abstract

Indoor air quality and environmental comfort in hospitals are critical factors for the well-being and prevention of diseases for patients, health professionals and visitors. In this context, the present study aimed to assess environmental comfort and atmospheric fungal contamination in hospitals with different degrees of care complexity in a Brazilian big city. The study was carried out in two hospital units of secondary (medium complexity) and tertiary (great hospital) levels, in the city of Fortaleza, Ceará, Brazil. Experimentally, the parameters of temperature, relative air humidity, CO_2 concentration and fungal contamination were evaluated in environments such as the medication room, care room, medical emergency room and intensive care unit. From Brazilian legislation, the results obtained showed that CO_2 showed a high degree of non-compliance (100%) in all hospital environments, except for the emergency room in the tertiary hospital (16%). For fungal contamination, the amount of bioaerosols showed concentrations between 50-250 CFU/m^3, well below the recommended limit of 750 CFU/m^3. A qualitative identification of the fungi indicated the predominance of *Aspergillus* and *Penicillium* genera, which are pathogenic or toxigenic in nature. In general, the results obtained reinforce the need for periodic monitoring of environmental parameters and the nature of microbial bioaerosols in indoor air of the public hospitals to reduce the health risks of patients and other persons.

Keywords: anemophilous fungi, environmental comfort, indoor air quality, public hospitals.

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OXIDAÇÃO FENTON DO AZO CORANTE PONCEAU BS USANDO NANOPARTÍCULAS DE ÓXIDO DE FERRO COMO CATALISADOR

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FENTON OXIDATION OF AZO DYE PONCEAU BS USING MAGNETICS IRON OXIDES NANOPARTICLES AS CATALYSTS

Recibido el 6 de abril de 2020; Aceptado el 13 de enero de 2021

Abstract

The textile industry is a sector of great importance in the world economic scenario; however, it is responsible for the generation of a large amount of liquid effluents rich in dyes, surfactants and other species harmful to the environment and human health. Among the technological alternatives in the treatment of textile wastewater, the heterogeneous Fenton reaction stands out as a process of good efficiency and relatively low cost-benefit. Thereby, this study aimed to evaluate the degradation efficiency of azo dye Ponceau BS in aqueous medium via heterogeneous catalysis on nanoparticles of iron oxides. The experiments were carried out at room temperature (25 ºC) under a fixed concentration of 100 mg L^{-1} of H_2O_2 according to an optimization methodology via factorial planning using the catalyst dosage, the initial pH and the dye concentration as variables. The results for 80 mg L^{-1} of the dye showed a maximum degradation of 57.1% at pH = 3.5 and 46.1% at pH = 6.5 using a dosage of 3.2 g L^{-1} of the catalyst oxide. The statistical analysis confirmed a positive and significant effect of the amount of catalyst and a negative effect of pH and dye concentration on the conversion efficiency of the molecule. These values show the promising character of the application of magnetic iron nanoparticles in the decontamination of colored wastewater.

Keywords: azo dye, Fenton oxidation, iron oxides, optimization, degradation.

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MICROPLÁSTICOS EM ESTAÇÃO DE TRATAMENTO DE ESGOTO – UMA REVISÃO

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MICROPLASTCS IN WASTEWATER TREATMENT – A REVIEW

Recibido el 7 de abril de 2020; Aceptado el 4 de febrero de 2021

Abstract

Although plastic pollution is an old problem, the concern about the presence of microplastics (MP) in environment is recent. MPs are plastics smaller than 5 mm and can be primary and secondary. These materials can be dispersed in large areas and have been found in seawater, beach sand and sediments. Due to presence in personal care products, the use of synthetic fabrics and the inappropriate disposal of plastics, this material has been found in Wastewater Treatment Plants (WWTPs). This may be one of the main sources of MP in the environment. WWTPs have the capacity to remove 70% to 99.9% of MP. Larger efficiencies were found in WWTPs with tertiary treatment. However, due to the large volume of WWTPs the amount of MP particles daily released into the aquatic environment can be a few thousand up to billions of particles per day. Thus, WWTPs are an important source of microplastics in aquatic environments. This pollutant can cause damage to the biota, can occur trophic transfer and transport other contaminants from one region to another through sorption.

Keywords: environment pollution, microplastics, waterwaste treatment plant.

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TENDÊNCIAS TECNOLÓGICAS NO TRATAMENTO DE GÁS TOLUENO

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TECHNOLOGICAL TRENDS IN TOLUENE GAS TREATMENT

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Abstract

Volatile organic carbons are the main air pollutant produced in industrial processes and commonly detected in urban areas. Among them, toluene is a significant pollutant with highly toxic and mutagenic potential, which must be strictly controlled. The methodological procedure involved the selection and analysis of studies published in the last 5 years, as well as the most cited articles prior to that period. From this assessment, it was found that the main methods of toluene gas treatment include biodegradation, absorption, adsorption and catalytic and photocatalytic oxidation, as well as association of these techniques. This paper discusses recent researches for toluene gas treatment, indicating trends and applicability. It was verified that the main advances are related to the use of low cost materials and high availability or high performance materials, as well in hybrid systems, especially the adsorption associated with catalytic and photocatalytic oxidation. This review provides an overview of materials, techniques and systems that correspond to technological advances in toluene gas treatment and identifies trends and gaps in the knowledge of this process.

Keywords: biofiltration, catalytic oxidation, adsorption, absorption, volatile organic carbons, air pollution, gas treatment systems.

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WATER LOSS MANAGEMENT, INTERVENING FACTORS IN BAHIA ACCORDING TO TYPE OF SERVICE PROVIDERS

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Abstract

In Brazil, water losses in public supply systems are still a challenge, with the national average (~ 34%) being much higher than countries like Japan or Germany, which have reduced their rates close to 10%. Despite the importance of the topic, studies that investigated the causes of losses in different types of service providers are still incipient. Thus, this article aims to discuss the factors that have influenced water losses in service providers in Bahia. The study presents a scenario of water losses and develops an investigation in four municipalities, two are served by municipal authorities and two by the state concessionaire Embasa. The investigation involved the analysis of selected indicators and the application of questionnaires with technicians and managers. In 2018, the average distribution loss index reached 27%, below the national average. In this study, it was found that the water supply systems operated by Embasa performed better, especially regarding water losses, macro-measurement, hydrometering and micro-measurement. The municipalities presented difficulties with a performance between unsatisfactory and very unsatisfactory, with emphasis on micro-measurement gauging (average score1.0), water loss policies (1.0), partnerships (0.8), team incentives (1.1), planning (1.2) and new technologies (0.9). It was found that the investments made by Embasa, its planning and the incentives of financing agents certainly contributed to its performance. Conversely, public policies and the basic sanitation financing model have made it difficult for municipalities to access resources, contributing to their weaknesses.

Keywords: types of service provision, water supply, water losses.

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