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## ANÁLISE QUALITATIVA DA QUESTÃO DA DISPOSIÇÃO DE PILHAS E BATERIAS EXAURIDAS

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QUALITATIVE ANALYSIS OF THE ISSUE OF DISPOSAL OF  
BATTERIES AND BATTERY DEPLETED

*Recibido el 16 de agosto de 2011; Aceptado el 4 de octubre de 2011*

### Abstract

Batteries because they contain heavy metals, pose a potential threat to the environment. Aiming to make an assessment of the problem of disposal of these devices was carried out desk research of the main types of batteries, and analyzed the Brazilian law which investigated the actions taken by dealers and manufacturers for disposal of such waste through a search field next to the dealers and multiple case study with the manufacturers. We conclude that for the materialization of this legislation is urgently needed effective monitoring, implementation of an efficient logistics of collection as well as a collective awareness campaign, because if there is no disclosure, no knowledge, and even in awareness. Although there is reverse logistics regarding cell phone batteries, there is not a faithful commitment of manufacturers and resellers or to clearly inform the consumer on this issue.

**Key Words:** Field Research, Multiple Cases, Waste.

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## ESTUDO DA DISPOSIÇÃO FINAL DE RESÍDUOS SÓLIDOS URBANOS NOS MUNICÍPIOS DA BACIA HIDROGRÁFICA DO RIO DO ÍNDIO-ESTADO DO PARANÁ, BRASIL

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*STUDY OF FINAL DISPOSAL OF URBAN SOLID WASTE IN THE  
MUNICIPALITIES OF RIVER BASIN OF INDIAN PARANA STATE,  
BRAZIL*

*Recibido el 9 de junio de 2011; Aceptado el 8 de noviembre de 2011*

### Abstract

The urban sprawl without proper planning for urban systems brings environmental, health, social and economic. Among them, the final disposal of solid waste has become one of the biggest problems faced by the Brazilian government. In this context the present work aimed to study the units of final disposal of household waste and commercial districts of the basin of the Indian River, state of Parana, Brazil. It used as instruments to characterize the municipalities surveyed, questionnaires with managers, assessed by the Quality Index Landfill Waste (IQR) units of final disposal of waste as well as technical visits on the spot. The results showed that are generated 1.813 tons / month of household and commercial waste and 80% are allocated appropriately to landfills, and 20% is used inappropriately in controlled landfills and garbage dumps. The evaluation of the disposal units resulted in appropriate operations in the municipalities of Sao Tome and Cianorte, controlled the cities of Indianapolis and Tapejara, and inadequate in the municipalities of Tuneiras Japurá and the West.

**Key words:** disposição final de resíduos sólidos, planejamento urbano, bacia hidrográfica.

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## PROPUESTA DE UN SISTEMA DE RECUPERACIÓN DE CASCO INHOUSE EN UNA EMPRESA DEL SECTOR VIDRIO

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PROPOSAL FOR A RECOVERY SYSTEM IN A COMPANY TOWN IN  
HOUSE GLASS SECTOR

Recibido el 25 de agosto de 2011; Aceptado el 10 de noviembre de 2011

### Abstract

The company studied is a leading manufacturer of glass containers in Venezuela, led by its environmental policy, has invested for years in the glass recycling process, an activity that has aroused interest in many economic and operational benefits that are obtained, using glass as a raw material. However, the helmet used to meet quality standards, requiring systems that are capable recover the town-house to be used without affecting the quality of the final product. It evaluates the hull recovery system in house, keeping track of its travel in the process of glass containers. Were sampled to identify and quantify contaminants, their main characteristics and origin, in order to establish alternatives for improvement. From the results we find that the town-house has high levels of magnetic contamination from the same process. Areas with the highest impact in pollution are: general maintenance, slag, and miscellaneous cold zone with percentages of 25, 24, 23.61 and 20.06 respectively. Rejections are also generated by the presence of stones in the containers which represent 41% of rejections by the inspection systems. The most common stones are metal sulfides, pottery, oversized silica, silica refractory tabular alumina refractory Fireclay. It was also found that the metal removal system is in the silo of raw materials, installed at distances greater than the recommended (5 "-6") on the layer of the hull, this does not provide the necessary protection to the breaker located before removal system. To improve the current system is proposed and an electromagnet magnetic drum type Chute, both mechanisms are able to offer protection to the breaker.

**Key words:** recovery, town-house, glass, oven, rotating magnetic drum, chute type electromagnet.

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## REMOCIÓN DE LAS FORMAS REDUCIDAS DE AZUFRE, HIERRO Y MANGANESO DE AGUA POTABLE POR PROCESOS DE SEPARACIÓN EN MEMBRANA DE NANOFILTRACIÓN

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REMOVAL OF REDUCED FORMS OF SULFUR, IRON AND  
MANGANESE FROM WATER BY NANOFILTRATION MEMBRANE  
SEPARATION

Recibido el 28 de septiembre de 2010; Aceptado el 17 de noviembre de 2011

### Abstract

Many regions are affected by quality problems in their water sources' supplies. Sometimes, the distributed drinking water may have problems associated with the presence of compounds that cause color, taste and odor leading to growing consumer's complaints, mistrust, and increasing consumption of bottled water. It is well known that hydrogen sulfide ( $H_2S$ ), iron ( $Fe^{+2}$ ) and manganese ( $Mn^{+2}$ ) cause taste, odor and color in drinking water. This research used a pilot plant nanomembrane filtration system to investigate the removal of those compounds from water. The pilot plant was supplied with raw water taken from a reservoir used as water source for a treatment plant of the city of Porto Alegre, Brazil. The measurements demonstrated that nanomembrane filtration was effective in the removal of iron, manganese and hydrogen sulfide from water, for the operational conditions tested in the investigation.

**Keywords:** Drinking water quality, sulfur, iron, manganese, nanofiltration.

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## ESTUDIO COMPARATIVO DE LA ACCIÓN COAGULANTE-FLOCULANTE DEL MUCILAGO DE *Opuntia ficus indica* POR LOS MÉTODOS: COAGULACIÓN Y ELECTROCOAGULACIÓN EN LOS LIXIVIADOS DEL RELLENO SANITARIO PIRGUA DE TUNJA

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COMPARATIVE STUDY OF THE FLOCCULANT ACTION OF  
*Opuntia ficus indica* MUCILAGE BY TWO METHODS:  
COAGULATION AND ELECTROCOAGULATION IN THE  
LEACHATES OF PIRGUA LANDFILL IN TUNJA

Recibido el 25 de mayo de 2011; Aceptado el 17 de noviembre de 2011

### Abstract

The flocculant effect of the cactus nopal (*Opuntia ficus indica*) aqueous extract mucilage on the suspended solids that cause turbidity and pollutants load the leachates produced in the Pírgua landfill of Tunja city (Colombia) was studied. Two comparative methods were applied: the coagulation - flocculation and the electrocoagulation in three mediums: acid (pH 4), neutral (pH 7) and basic (pH10). The best results in the removal of suspended solids and subsequent correction of physicochemical parameters of leachate reached 67%, which were obtained with the method of electrocoagulation at a concentration of mucilage / leaching of 30/70 and a pH of 7.

**Key words:** Coagulation, Electrocoagulation, Flocculation, Leachate treatment, Turbidity removal.

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Investigación, desarrollo y práctica.

## APLICABILIDAD DEL PROCESO DE LODOS ACTIVADOS EN EL TRATAMIENTO DE EFLUENTES DE UNA INDUSTRIA PROCESADORA DE CAMARON

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APPLICABILITY OF ACTIVATED SLUDGE PROCESS IN THE  
TREATMENT OF EFFLUENTS FROM SHRIMP PROCESSING  
INDUSTRY

Recibido el 10 de agosto de 2011; Aceptado el 17 de noviembre de 2011

### Abstract

An activated sludge process for shrimp processing wastewater treatment had been studied. Initially, the volumetric flow of effluent per kilogram of processed shrimp was calculated; the result was 12.7 L/kg, and the average volumetric flow of discharge from the processing plant was 349250 L/d. After that, a characterization of the effluents of the plant was carried out, showing that most of the parameters analyzed don't achieve the effluents quality parameters established by the Venezuela's environmental requirements. Subsequently, a wastewater treatment system by activated sludge was simulated in a lab scale, using three continuous flow stirred-tank reactors with different residence times (4h, 6h and 8h), and the biokinetics constants were calculated, once pseudo-stationary conditions were reached in the continuous flow stirred-tank reactors; they were:  $k=0.0057$  L/mgDQO.d,  $Y_T=0.3904$  mgSSV/mgDQO and  $k_d=0.1601$  d<sup>-1</sup>. At last, the design of the wastewater treatment system for the shrimp processing plant was developed, and it results the following features: F/M of 0.21, biological solids retention time ( $\theta_c$ ) of 29 days, 2000 mg/L of activated sludge concentration, reactor's volume of 171 m<sup>3</sup> and 8 hours of residence time. With this treatment system, 85% of COD, 96% of BOD, 86.4% of nitrogen and 27% of phosphor removal efficiencies are expected, based on the simulation of the wastewater system using continuous flow stirred-tank reactors.

**Key Words:** wastewater, shrimp, characterization, biokinetics constants, activated sludge.

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## INVESTIGACIÓN DEL SITIO DE DISPOSICIÓN FINAL DE RESIDUOS SÓLIDOS DE LA CIUDAD DE SAN CRISTÓBAL DE LAS CASAS, CHIAPAS

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RESEARCH OF THE SITE FOR THE FINAL DISPOSAL OF SOLID  
RESIDUES IN THE CITY OF SAN CRISTOBAL DE LAS CASAS,  
CHIAPAS

Recibido el 30 de mayo de 2011; Aceptado el 2 de diciembre de 2011

### Abstract

This research project set out to discover the characteristics of the site currently being used for dumping rubbish produced in the city of San Cristobal de las Casas, Chiapas; the conditions under which the dump operates; and how closely said conditions comply with the stipulations laid down in Official Mexican Standard. To estimate the volumes of rubbish at the Municipal Dump, 5 vertical electrical probes were sunk into the underlying matter to assess its depth. Results show that the per capita generation of solid waste is 1.215 Kg; that according to official regulations the dump is classed as Category A; that the rubbish is covered over every 3 months; that the average depth of the residues is in the order of 15 metres, thus being approximately equivalent to 1,050,000 m<sup>3</sup> volume and 655 kg/m<sup>3</sup> volumetric weight. This means an overall total of 687,434 tons of rubbish has been dumped at the site, and there was found to be no control whatsoever over the leachates and biogas this waste matter generates. The fauna consists mainly of colonies of stray dogs, rats and flies; the local flora is mainly *Pinus sp.*, *Quercus sp.* and *Crataegus sp.*, with very few bushes, and none of the species is in danger of extinction. This study still recommends the taking of measures necessary to prevent further damage to the local environment, and the permanent closing of the dump.

**Key words:** damage, environment, final disposal, standards, solid residues.

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## UN PROYECTO PILOTO PARA VIVIR SIN RELLENO MUNICIPAL

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*A PILOT PROJECT FOR LIVING WITHOUT A  
MUNICIPAL LANDFILL*

*Recibido el 10 de agosto de 2011; Aceptado el 2 de diciembre de 2011*

### Abstract

The municipality of A has been the object of various studies by the authors' team. In the present case, the objective was to prepare the routing to reach a "zero waste" situation within a timeframe of 15 years. The study provided an analysis of the present state of municipal waste collection and identified all stakeholders with their respective activities and aims. With the data collected and ideas from intellectual zero waste movements, the authors developed a plan for improving the existing operating system towards a situation where the landfill would be unnecessary. This report presents the analysis and the proposed timetable for administrative measures and targets with their respective deadlines.

**Key words:** divided waste collection, local policies for solid waste, long term waste management planning, municipal landfill, urban waste management, zero waste projects.

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# REVISTA AIDIS

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## ESTUDO DAS EMISSÕES GERADAS NO PROCESSO DE EVAPORAÇÃO DE LIXIVIADOS DE ATERROS SANITÁRIOS

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*STUDY OF THE EMISSIONS GENERATED BY THE PROCESS OF  
EVAPORATION OF LANDFILL LEACHATE*

*Recibido el 23 de agosto de 2011; Aceptado el 28 de febrero de 2012*

### Abstract

Landfilling is still the most frequently employed alternative in most countries for the treatment and disposal of solid waste. This form of waste treatment is considered safe from the environmental point of view, although it results in the emission of gaseous and liquid pollutants, which, if not properly collected and treated, may become potential sources of environmental pollution. Landfill leachate treatment through evaporation has been investigated by several researchers since the eighties (KONRAD, 1989; BIRCHLER et al., 1994, MARKS et al., 1994; YUE et al., 2007), however, published articles on the subject are still incipient. This work aims to deepen the understanding of leachate evaporation process, in order to identify and measure the pollutant emission resulting from this type of treatment. For the accomplishment of this study, a distillation apparatus has been used, in order to obtain a condensate from the evaporation of the landfill leachate. Physical and chemical analyses of the resulting effluents (condensate and concentrate) have been carried out, in order to quantify the emission of organic and inorganic pollutants generated by leachate evaporation. The tests have been accomplished with leachate from two landfills, two pH conditions being studied in each leachate (with and without adjustment). The results have revealed that ammonia was the pollutant of greatest environmental concern, due to the high concentrations which have been noticed in the condensate obtained from the process without pH adjustment, although it was possible to observe that by adjusting the leachate pH to a slightly acidic condition, it was possible to reduce significantly the ammonia emissions of the condensate effluent.

**Key Words:** Ammonia, landfill, leachate evaporation

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# REVISTA AIDIS

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## TRATAMIENTO DE LIXIVIADOS PRODUZIDOS EM ATERROS SANITÁRIOS UTILIZANDO EVAPORADOR UNITÁRIO

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TREATMENT OF LEACHED PRODUCED IN SANITARY  
LANDFILLS USING UNITARY EVAPORATOR

Recibido el 9 de agosto de 2011; Aceptado el 6 de marzo de 2012

### Abstract

Currently, one of the great concerns of the cities with high demographic densities is the treatment of the leachate generated in the sanitary landfills of municipal solid wastes.

In the case of Gramacho sanitary landfill, operated by the Public Cleansing Company of Rio de Janeiro -COMLURB, that takes care of the boroughs of Rio de Janeiro, Duque de Caxias, São João de Meriti, Nilópolis, Belford Roxo, Queimados and Mesquita, a total of 8 millions of peoples, is estimated 200 milliliters of leachate generated by inhabitant per day.

One of the options for leachate treatment is its evaporation through equipment, developed by COMLURB named Unitary Evaporator that uses the biogas generated in the landfill as the source of energy. This type of treatment also contributes to reduce the potential of global warming due to the burning of methane, biogas main component. However, it's necessary a more detailed study on the sub-products generated by leachate evaporation so that this type of treatment results more efficient, preventing the generation of others pollutants harmful to the human health and the environment.

**Key Words:** biogas, evaporation, leachate, sanitary landfill.

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## AVALIAÇÃO DA EMISSÃO DE METANO EM ATERRO EXPERIMENTAL DE RESÍDUOS SÓLIDOS NA MURIBECA/PE – BRASIL

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EVALUATION OF METHANE EMISSIONS FROM AN EXPERIMENTAL  
LANDFILL OF SOLID WASTE IN MURIBECA /PE-BRAZIL

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### Abstract

The landfill gas (LFG) generated in Municipal Solid Waste (MSW) landfills can be emitted to the atmosphere through the gas collection system or by its escape through the final cover layer. The objective of this paper is to present the preliminary results of the methane (CH<sub>4</sub>) superficial emissions investigation at three different cover layers in an experimental cell, located at Muribeca Landfill, Recife/PE. The static flux chamber methodology was used in order to evaluate CH<sub>4</sub> emissions "in situ", which was associated with laboratory tests for soil characterization. Eight flux chamber tests for measuring CH<sub>4</sub> emission, as well as four tests for biogas concentrations along the cover layer depth were done to evaluate CH<sub>4</sub> retention and/or oxidation. They were performed from September to December/2008. The CH<sub>4</sub> flux in the capillary cover layer (BAC) was 0.37 NI/m<sup>2</sup>.h, in the methanotrophic layer (MET) was 1.90 NI/m<sup>2</sup>.h, and in the conventional layer (CONV) was 4.97 NI/m<sup>2</sup>.h. The lowest CH<sub>4</sub> flux determined in the BAC layer was related to the gas distribution layer at the bottom of this cover that equalized gas pressure and concentration before its passage through the soil. It was also verified that CH<sub>4</sub> volumetric concentration and the relation CO<sub>2</sub>/CH<sub>4</sub> increased from the bottom to the top of all cover layers. This behavior was more accentuated at the methanotrophic layer, which was an indication of CH<sub>4</sub> oxidation. The study of alternative cover layers and its physical-chemical and constructive properties to reduce CH<sub>4</sub> emissions and prevent pollution to the atmosphere is extremely important for most small and medium sized landfills in Brazil, where the recovery of LFG is incipient and unviable.

**Key Words:** solid waste, landfill, biogas, final cover layer.

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# REVISTA AIDIS

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

## IMPACTO EN LA SALUD DEL ALMACENAMIENTO TEMPORAL Y DE LA RECOLECCIÓN DE RESIDUOS SÓLIDOS DOMICILIARIOS EN SALVADOR, BAHÍA, BRASIL

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*HEALTH IMPACT OF HOUSEHOLD SOLID WASTES CONDITIONING  
AND COLLECTION IN SALVADOR, BAHIA, BRAZIL*

*Recibido el 1 de diciembre de 2011; Aceptado el 10 de abril de 2012*

### Abstract

This paper presents a study on the conditioning and collection of household solid wastes and the health implications for children. The research was conducted in nine human settlements on the outskirts of Salvador, Bahia, Brazil. Intestinal nematode infection, predominantly involving *Ascaris lumbricoides*, *Trichuris trichiura* and hookworms, was used as an epidemiologic indicators in 1,893 children from 5 and 14 years of age. The study also included diarrhea incidence and nutritional status as shown by anthropometric indicators in 1,204 children less than 5 years of age. There was a higher prevalence of the three nematodes in children living in households without proper conditioning and collection of household solid wastes as compared to those in areas with regular household solid wastes collection and adequate household solid wastes conditioning. The differences were statistically significant when other socioeconomic, cultural, demographic, and environmental risk factors were considered in the analysis. Similar results were also observed for epidemiological indicators, diarrhea incidence, and nutritional status.

**Keywords:** Diarrhea; Nematode Infections; Solid Wastes Conditioning; Solid Wastes Collection.

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